**PLN-2291-002**

DMS-100 Family

# TOPS MPX NT DA

## Technical Specification

BCS35 and up Standard 02.01 January 1994

northern telecom

DMS-100 Family

# TOPS MPX NT DA

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# Publication history

**January 1994**

BCS35 Standard 02.01

- updated with TOPS software features for BCS35, including ADAS, TOPS E911, and QMS MIS external interface
- revised configuration information to include the standard 20-position configuration

**September 1993**

BCS34 Standard 01.01 First issue, created to describe TOPS MPX NT DA system

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# About this document

*TOPS MPX NT DA Technical Specification* describes operational and functional capabilities and features of the AOSS version of the Traffic Operator Position System (TOPS) MPX with Northern Telecom Directory Assistance (NT DA). The TOPS MPX NT DA system provides directory assistance, customer name and address search, and intercept services. Additional services will be available in the near future through a software upgrade to the TOPS MPX Intelligent Workstation System (IWS), which will provide toll and assistance capability.

> ***Note:*** Information in this document is subject to change, since Northern Telecom reserves the right to make changes *without notice* in equipment design or components as engineering or manufacturing methods may warrant.

## When to use this document

Northern Telecom (NT) DMS software releases are referred to as batch change supplements (BCS) and are identified by a number, for example, BCS29. This document is written for DMS-100 Family offices that have BCS35 and up.

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

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

### How to identify the software in your office

The *Office Feature Record* (D190) identifies the current BCS level and the NT feature packages in your switch. You can list a specific feature package or patch on the MAP (maintenance and administration position) terminal by typing

**>PATCHER;INFORM LIST identifier**

and pressing the Enter key.

*where*

identifier is the number of the feature package or patch ID

You can identify your current BCS level and print a list of all the feature packages and patches in your switch by performing the following steps. First, direct the terminal response to the desired printer by typing

**>SEND printer_id**

and pressing the Enter key.

*where*

printer_id is the number of the printer where you want to print the data

Then, print the desired information by typing

**>PATCHER;INFORM LIST;LEAVE**

and pressing the Enter key.

Finally, redirect the display back to the terminal by typing

**>SEND PREVIOUS**

and pressing the Enter key.

## How TOPS MPX documentation is organized

This document is part of TOPS MPX documentation that supports the Northern Telecom line of TOPS MPX products. TOPS MPX documentation is a subset of the DMS-100 Family library.

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

- DMS-100 Family basic documents in the 297-1001 layer
- TOPS MPX NT DA documents in the 297-2291 layer

TOPS MPX NT DA documents and other documents that contain related information are listed in “Finding TOPS MPX NT DA information” in *TOPS MPX NT DA Product Guide*, 297-2291-011.

### References in this document

The following documents are referred to in this document.

| Document | Title |
|---|---|
| 297-2291-011 | *TOPS MPX NT DA Product Guide* |
| 297-2291-154 | *TOPS MPX NT DA Planning and Engineering Guide* |
| 297-2291-156 | *TOPS MPX Power and Grounding Guide* |
| 297-2291-301 | *TOPS MPX NT DA Operator Guide* |
| 297-2291-311 | *TOPS MPX NT DA Force Management Guide* |
| 297-2291-320 | *Operator Services Administration Guide* |
| 297-2291-350 | *Operator Services Translations Guide* |
| 297-2291-520 | *TOPS MPX Trouble Locating and Clearing Manual* |
| 297-2291-521 | *TOPS MPX Alarm and Performance Monitoring* |
| 297-2291-522 | *TOPS MPX Recovery Procedures* |
| 297-2291-524 | *TOPS MPX Maintenance Guide* |
| 297-2291-525 | *TOPS MPX Card Replacement Procedures* |

## Where to find information

The chart below lists the documents that you require to understand the content of this document, or to perform the tasks it describes. These documents are also referred to in the appropriate places in the text.

More than one version of these documents may exist. To determine which version of a document applies to the BCS in your office, check the release information in *DMS-100 Family Guide to Northern Telecom Publications*, 297-1001-001.

| Number | Title |
|---|---|
| 297-1001-001 | *DMS-100 Family Guide to Northern Telecom Publications* |
| 297-1001-156 | *Power Distribution and Grounding Systems* |
| 297-1001-160 | *AMA Bellcore Format User Guide* |

In addition to TOPS MPX documentation, you may need documents of the following types:

- Reference publications (IBM)
- Reference publications (Bellcore)
- Reference publications (NT DA)

### Reference publications (IBM)

This section lists the IBM documents that are part of the TOPS MPX suite of documents.

| Document | Title |
|---|---|
| 5876-AAA | *IBM Disk Operating System Version 5.02* - Document only (FC 1972) |

### Reference publications (Bellcore)

This section lists the Bellcore document that contains additional information on power and grounding. Northern Telecom is not responsible for distributing the Bellcore document.

| Document | Title |
|---|---|
| TR-EOP-000295 | *Isolated Ground Planes: Definition and Applications to Telephone Central Offices* |

### Reference publications (NT DA)

This section lists the NT DA document that contains information on converting to TOPS MPX.

| Document | Title |
|---|---|
| 203-3111-900 | *KDT-to-TOPS MPX Conversion Guide* |

# Introduction to TOPS MPX

The Traffic Operator Position System MPX (TOPS MPX) is an advanced workstation-based application that provides not only traditional operator services but also a platform on which new revenue-generating services can be built. It uses the TOPS message switch (TMS) and provides directory assistance (DA) service, intercept service, and customer name and address (CNA) search. Using TOPS MPX, operators obtain information for directory assistance and intercept calls by accessing Northern Telecom's (NT) Directory Assistance System (DAS). An integrated access for directory assistance and toll and assist service is planned for release in the near future.

TOPS MPX uses the existing DMS-200 with TMS hardware and specially configured OEM equipment. TOPS MPX development includes:

- software residing in the DMS-200 central control (CC)
- a digital audio card that plugs into the operator position
- integration of the OEM equipment

## 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.

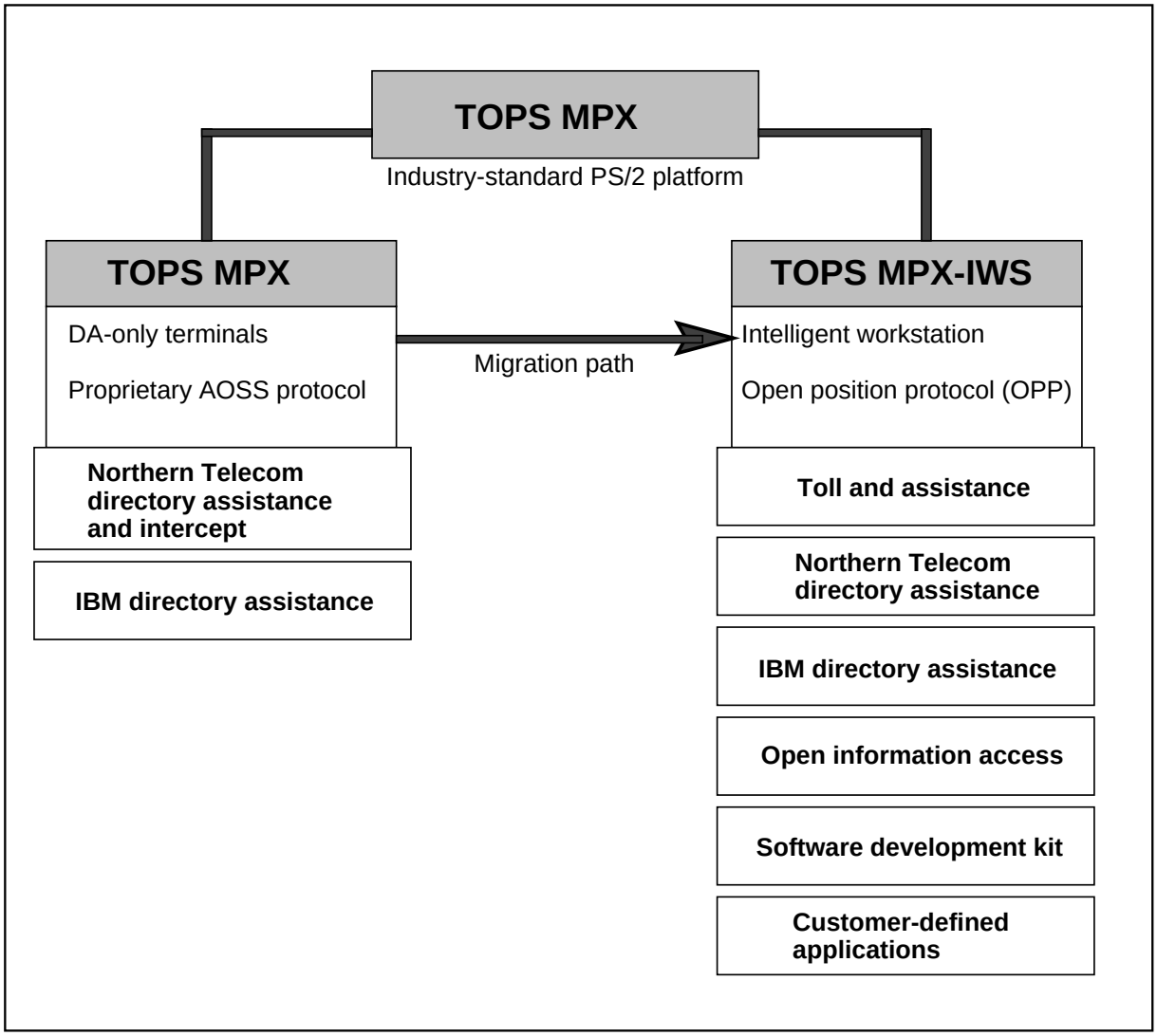
Now TOPS MPX also supports directory assistance functions using Northern Telecom's NT DA database. In addition to traditional DA service, this system includes two other applications: customer name and address (CNA) search, and intercept. Communications over the LAN use Transmission Control Protocol/Internet Protocol (TCP/IP).

An upcoming release will introduce the TOPS Intelligent Workstation System (IWS), which 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 System (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.

Figure 1-1 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).

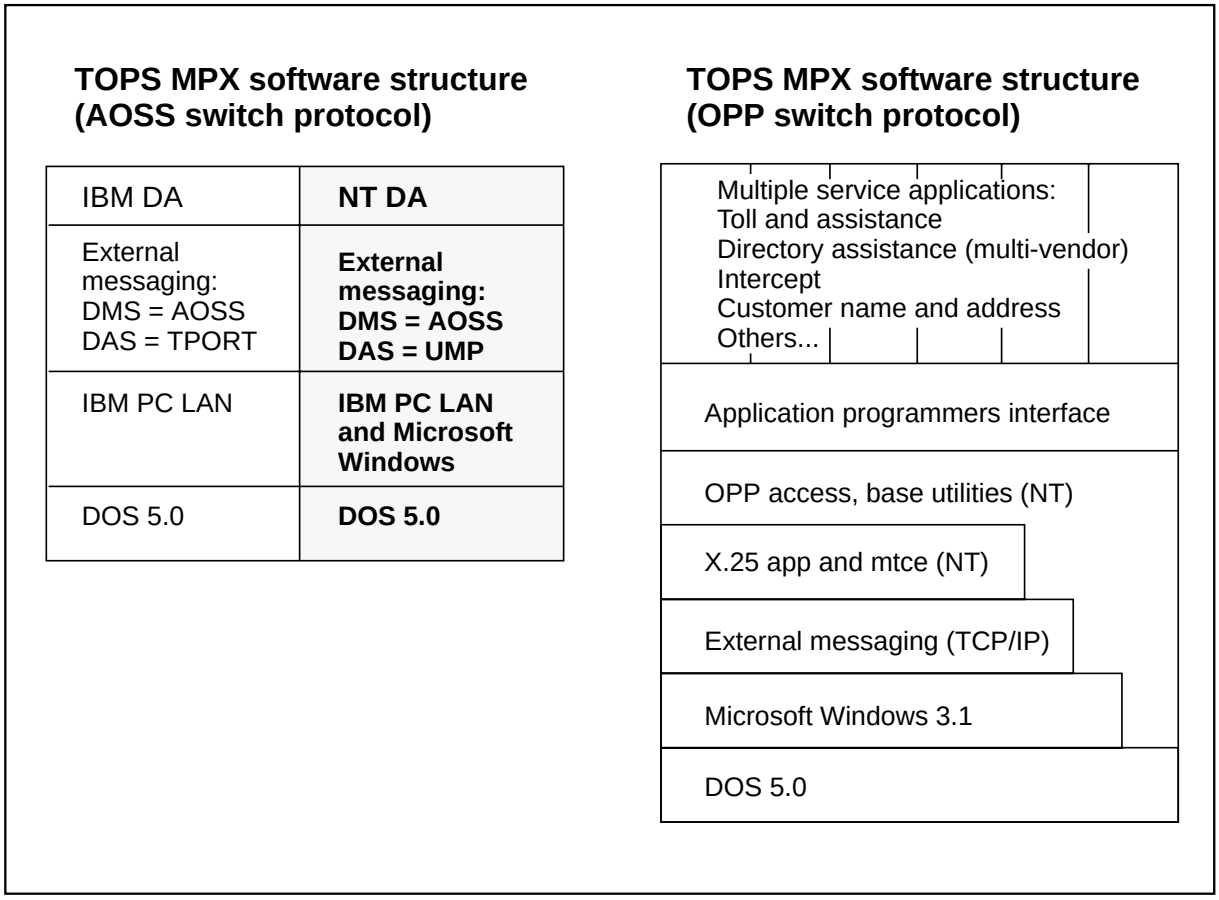
**Figure 1-1xxx**
**TOPS MPX evolution**



## 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. Figure 1-2 shows the software structure of TOPS MPX in its AOSS version and in its IWS-OPP version.

**Figure 1-2xxx**
**TOPS MPX software architecture**




This document addresses TOPS MPX with the AOSS switch protocol and the NT DA application (shown shaded in figure 1-2). This version of TOPS MPX provides traditional DA service using the new software architecture of DOS, MS-Windows, and TCP/IP. Because the hardware architecture is similar to that of the TOPS MPX-IWS base, future migration becomes easy to accomplish.

# TOPS MPX configurations

This chapter describes the system architecture of TOPS MPX and its possible configurations, including configuration with the TOPS message switch (TMS). 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-200 central control (CC) and in the TOPS MPX operator positions.

TOPS MPX software operates in a hardware environment that includes a DMS-200 CC, TMS, and TOPS MPX operator positions.

> ***Note:*** In this specification, the Directory Assistance System (DAS) is not regarded as part of the TOPS MPX system.

Figure 2-1 shows the TOPS MPX system architecture.

### Modularity

The modularity of 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), which is the DMS gateway position (formerly known as the Type 2 position).

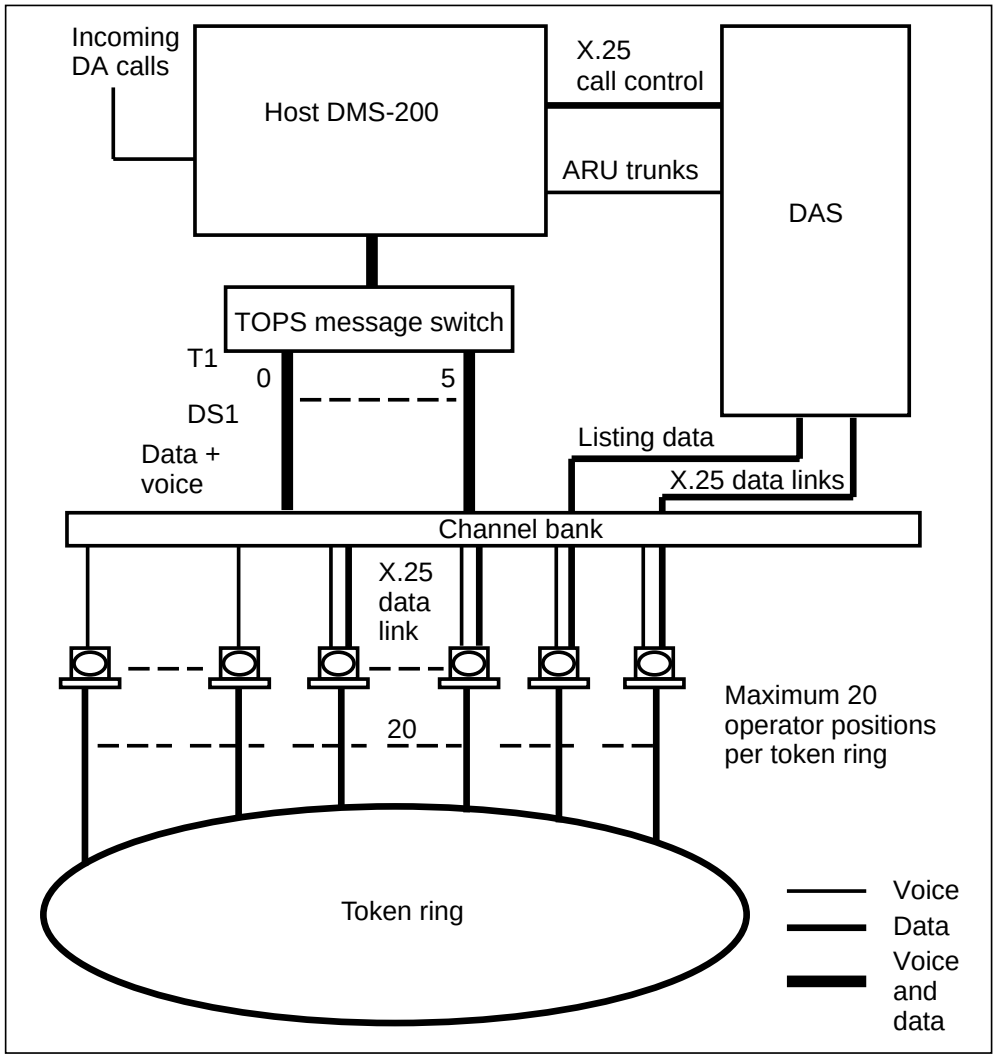
Token-ring local area networks (LANs) are supplied based on the total number of directory assistance (DA) operator positions required, divided by the maximum number of operators per token ring. The maximum number of positions per LAN is 20. Clusters should be balanced across token rings, with equal numbers of clusters on each token ring to the extent possible. For more information on configuration, refer to *TOPS MPX NT DA Planning and Engineering Guide*, 297-2291-154.

***Note:*** In an optional alternative configuration, two database gateway positions may be used solely as routers to the DAS, with no operator functionality. In this case, the maximum number of positions per LAN is 20 plus two router positions. The routers are dedicated to the task of routing messages between the NT database and the other positions on the token ring. These routers are not part of any cluster.

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; therefore, two database gateway positions are always required on each token-ring LAN.

**Figure 2-1xxx**
**TOPS MPX system**



## Operator position serving limits

The following paragraphs define the serving limits of operator positions.

### Operators per TMS

The maximum number of operators per TMS is 96.

### Operators per token ring

Up to 20 positions can be equipped on each token ring, assuming 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. For other restrictions on adding positions to the token ring, refer to “Modularity” on page 2-1.

### TMSs per DMS switch

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

### Operators per DMS switch

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

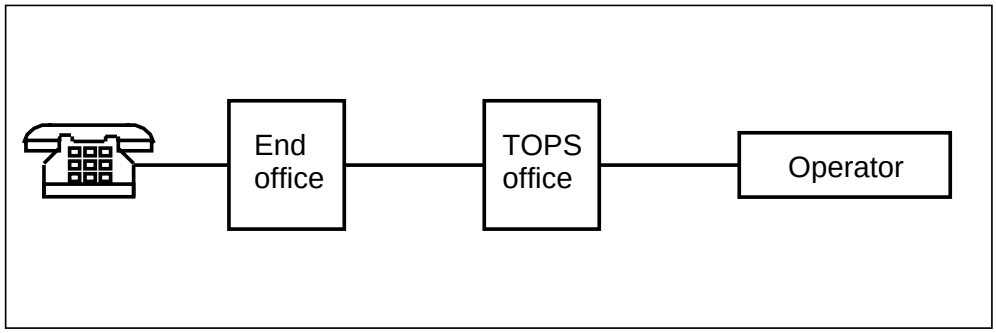
> ***Note:*** In this specification, limitations imposed by the DAS are not considered.

Table 3-9 on page 3-35 provides estimates 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.

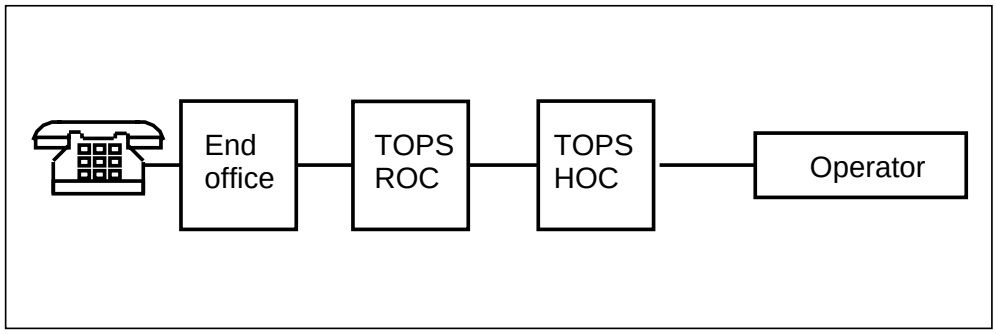
**SA configuration** For an SA system, shown in figure 2-2, the estimates given in table 3-9 on page 3-35 refer to the DMS TOPS switch only, not to the intervening end office.

**Figure 2-2xxx**
**SA configuration**




**HOC/ROC configuration** For a HOC/ROC system, shown in figure 2-3, the estimates given in table 3-9 on page 3-35 refer to the DMS TOPS switch only, not to the intervening end office.

**Figure 2-3xxx**
**HOC/ROC configuration**




## TOPS MPX NT DA software architecture

This section describes the effects of NT DA on the TOPS MPX system architecture. Figure 2-4 shows TOPS MPX architecture with NT DA.

The NT DA base application is responsible for DA, customer name and address (CNA), and intercept searches, and it provides the user interface for the search function. The NT DA application and position maintenance tasks are handled by separate software packages. The AOSS protocol provides the DMS interface.

The gateway positions send messages between the positions and the DMS switch or the positions and the DA Fault Tolerant (FT) Gateway in the DAS.

### DA base

TOPS MPX NT DA uses the Universal Gateway/Position Message Protocol (UMP) for communication with the FT Gateway, in accordance with NT 355-0012600007 *Universal Gateway/Position Message Interface Specification*, 18 Oct 91. The following interactions are included:

- logging in, with table downloads
- logging out
- performing jack-in and jack-out
- establishing permissions
- requesting services
- accessing databases or functions
- creating and transmitting statistics packages

### AOSS

The AOSS protocol provides the call-processing actions and displays needed by general operators, service assistants, and in-charge managers. Each position has a number unique to the DMS switch and is addressed by that number over the X.25 data links with the DMS switch. The AOSS protocol is specified in BNR document Q104-1, *Auxiliary Operator Service System Protocol*.

### Position maintenance

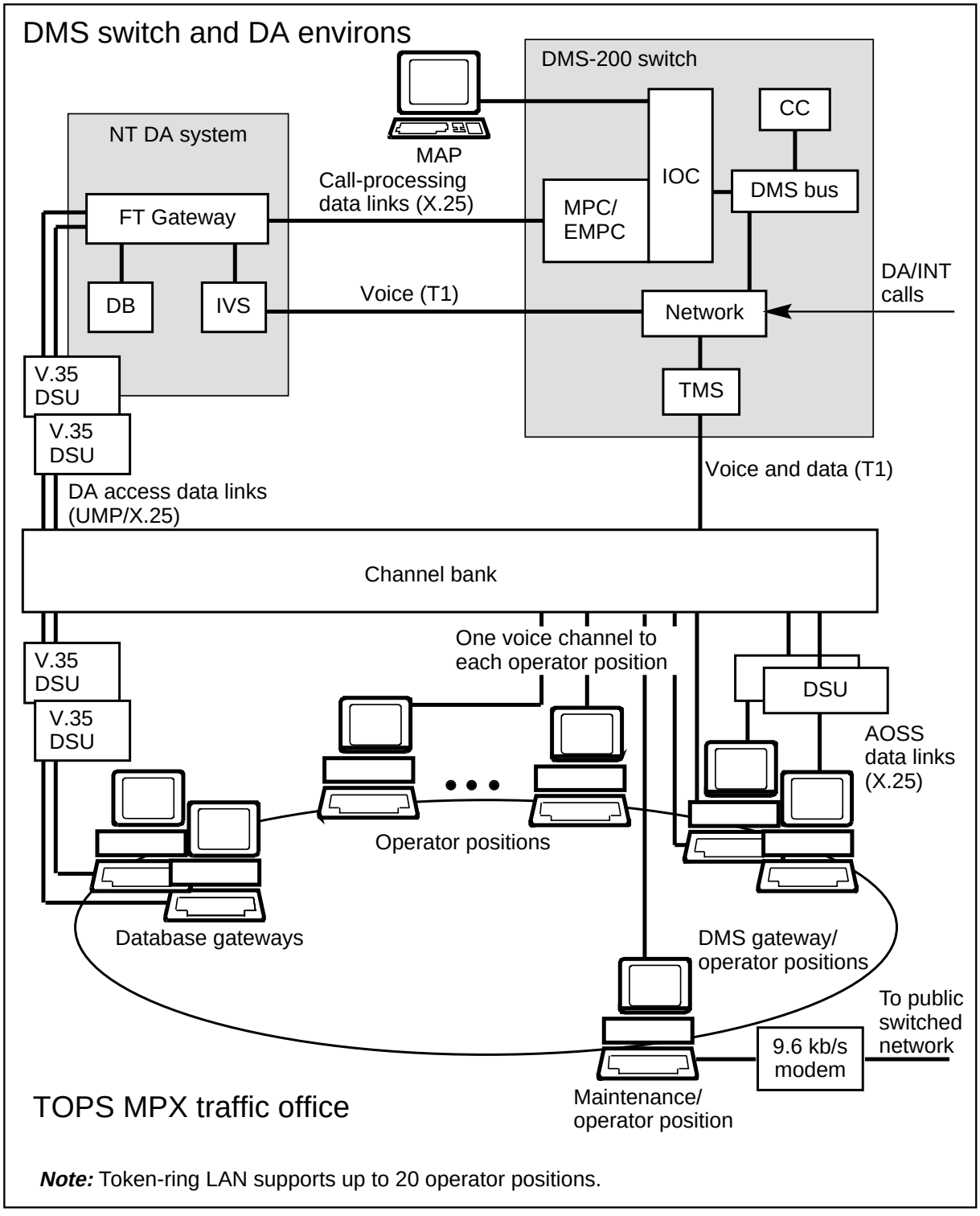
This task handles headset status and position maintenance. For additional information on maintenance, refer to Chapter 9, "TOPS MPX maintenance," in this book and to the TOPS MPX maintenance manuals listed in the "About this document" section of this book.

### Routers and communications maintenance

The router task resides only on the gateway positions. It performs both a standard routing function, moving messages to and from positions on the LAN, and also a protocol conversion, between TCP/IP and X.25. Each position is a permanent virtual circuit (PVC) addressed over the X.25 data links between the token-ring LAN and both the DMS switch and the FT Gateway.

The virtual position controllers (VPC) balance loads for the links with the DMS switch. Half of the positions are serviced by each VPC while both are operating normally. This load balancing is static; half of the positions are configured to use one VPC, and the other half to use the other VPC.

**Figure 2-4xxx**
**TOPS MPX NT DA**




***Note:*** Token-ring LAN supports up to 20 operator positions.

During a link or VPC outage all traffic is handled over one link. Normal load balancing is restored when the positions reconnect with their normal VPC, which they periodically try to do.

With respect to maintenance messages from the DMS, one VPC is primary and the other secondary; the DMS switch sends maintenance messages to the primary one.

Call traffic on links to the DA FT Gateway is driven by the FT Gateway, based on how the DMS switch balances call traffic. Both links receive an even distribution of calls. Positions normally send messages through the router at which the current call was begun.

During a link or database gateway outage, all traffic is handled over one link. Normal load balancing is restored when the positions reconnect with the previously failed router. Some UMP messages may be lost while the failure is being detected, but subsequent messages are rerouted.

### FT Gateway connection

Access to the DA system is not made through the TMS. The X.25 data link between the FT Gateway and the TOPS MPX position is supported by a V.35 DTE interface. This is a dedicated connection, operating at 56 kb/s, requiring network timing. This data is brought directly to the Power 6/40 FT Gateway as described in the following paragraphs.

> ***Note:*** The Power 6/40 Fault Tolerant (FT) Gateway is part of the DAS, not part of the TOPS MPX system. It should not be confused with database gateway or DMS gateway positions.

In the traffic offices, each DSU must be located within 2.74 m (9 ft) of its associated database gateway, because the RTIC card transmission is limited to that distance. An NTNX36DM cable connects the RTIC card to the DSU.

The traffic office DSUs are connected to an operating company-supplied distribution frame by an NTNX36DP cable connected to the BIX block.

## 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

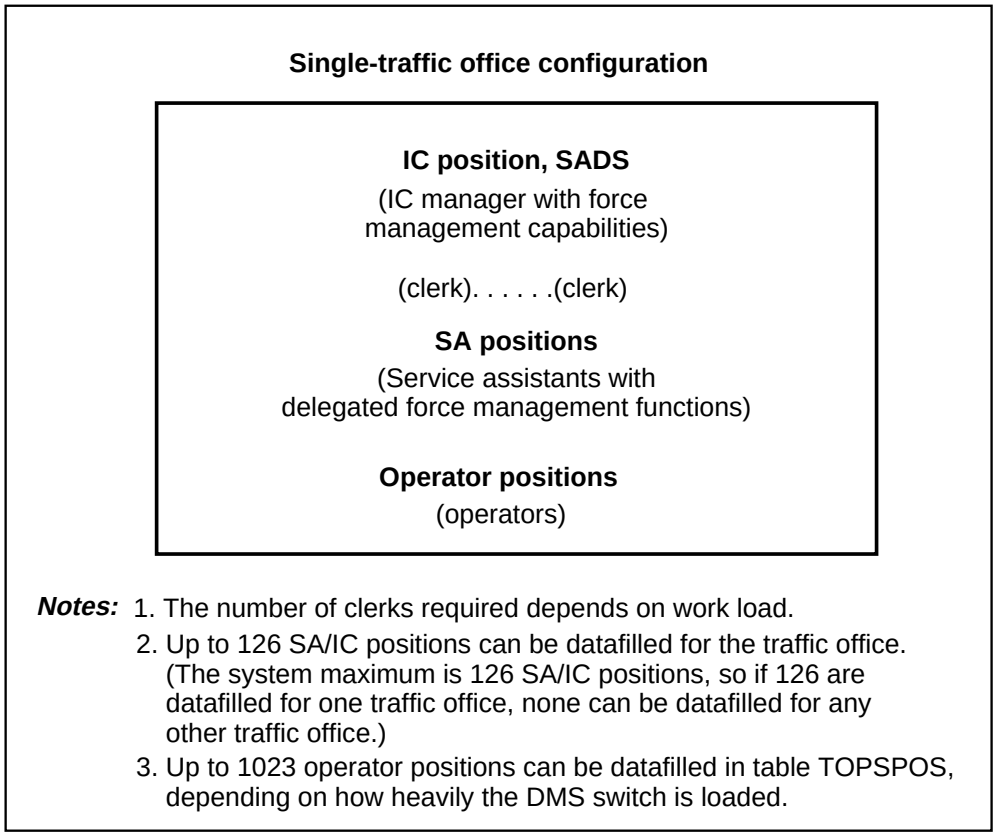
In a single-traffic office configuration, operators and force administration personnel are all located in the same group or office. Refer to figure 2-5 for an illustration.

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 table 3-13 on page 3-46.

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

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

**Figure 2-5xxx**
**Sample single-traffic office configuration**




***Notes:*** 1. The number of clerks required depends on work load.
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.)
3. Up to 1023 operator positions can be datafilled in table TOPSPOS, depending on how heavily the DMS switch is loaded.

### Multitraffic office

For administrative purposes, the operator work force in a multitraffic office configuration is divided 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. Figure 2-6 illustrates a sample configuration for a multitraffic office.

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

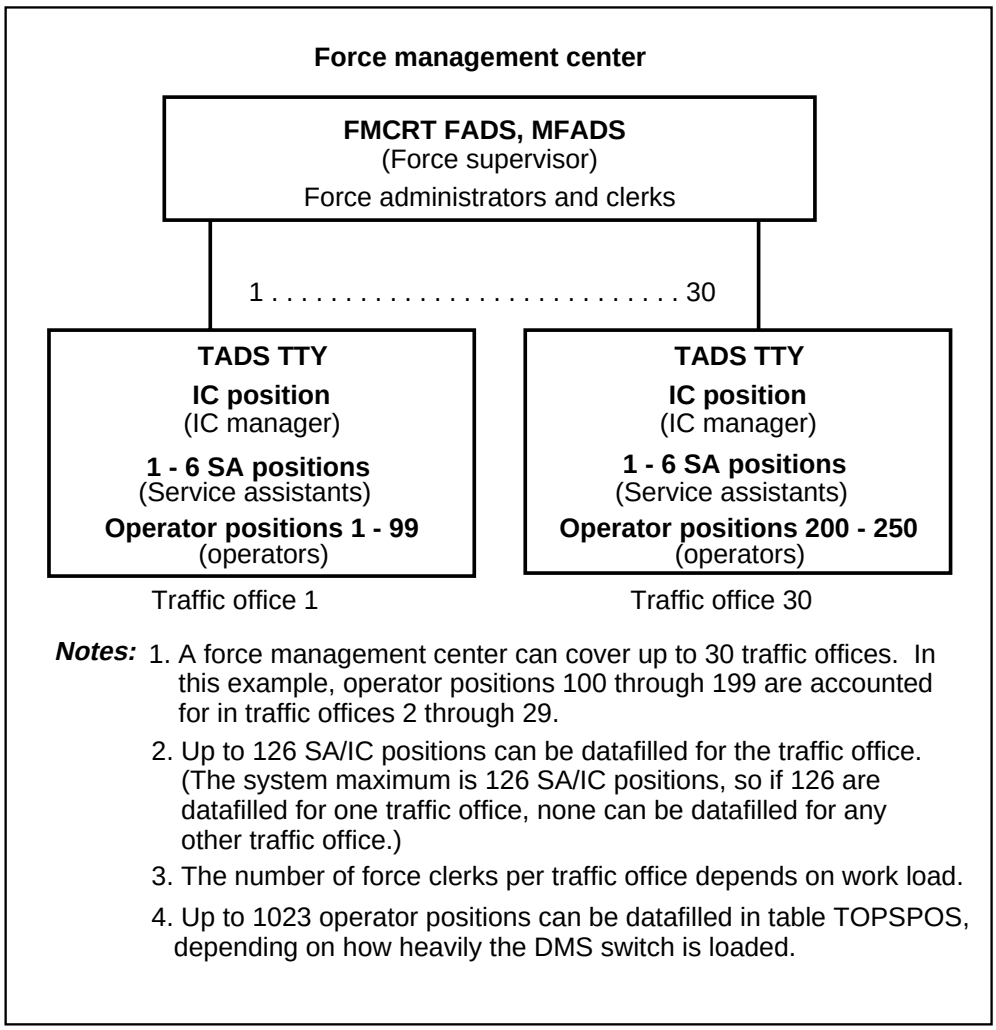
- force management cathode-ray tube (FMCRT)
- IC position
- SA positions
- operator positions
- force administration data system teletypewriter (FADS TTY)
- traffic administration data system teletypewriter (TADS TTY)

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

> ***Note:*** Currently, a TOPS 04 or TOPS MP position must be 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).

**Figure 2-6**
**Sample configuration of a multitraffic office**




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 NT DA configurations

TOPS MPX NT DA requires 486-based operator positions. For redundant configurations, each cluster must have two DMS gateway positions. 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 maximum number of positions in a cluster is four.

The other two or three positions in each cluster (depending on whether it has a redundant configuration) are operator positions. One operator position on each token ring is equipped with a dial-up modem and additional software, enabling it to function as a combined operator/maintenance position. The optional combined operator/maintenance position can be located in any cluster.

### Standard 20-position configuration

Table 2-1 shows the position/cluster/MAU assignments for the standard 20-position configuration. This table uses the following abbreviations:

- D = database gateway position
- G = DMS gateway position
- O = operator position
- M = combined operator/maintenance position

**Table 2-1xxx**
**Position/cluster/MAU assignments**

| **Cluster** | 1 | 4 | 2 | 5 | 3 |
|---|---|---|---|---|---|
| **MAU #** | 0120 | 0120 | 1201 | 1201 | 2012 |
| **MAU connection #** | 1112 | 5556 | 2233 | 6677 | 3444 |
| **Position type** | GGDO | GGOO | GGDM | GGOO | GGOO |

### Optional 20 + 2 configuration

In the optional alternative 20 + 2 configuration, the database gateway positions are dedicated to the task of routing messages between other positions on the token-ring LAN and the DA database. These routers are not part of any cluster, and they provide no operator functionality.

Table 2-2 shows the configuration of position/cluster/MAU assignments. This table uses the following abbreviations:

- R = router
- G = DMS gateway position
- O = operator position
- M = combined operator/maintenance position

| **Table 2-2xxx Position/cluster/MAU assignments** | | | | | | |
|---|---|---|---|---|---|---|
| **Cluster** | 1 | 4 | 2 | 5 | 3 | N/A |
| **MAU #** | 0120 | 0120 | 1201 | 1201 | 2012 | 20 |
| **MAU connection #** | 1112 | 5556 | 2233 | 6677 | 3444 | 78 |
| **Position type** | GGMO | GGOO | GGOO | GGOO | GGOO | RR |

## TOPS MPX 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. Two of the 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 communications functionality:

- database gateway (formerly known as Type 1) - Contains the software functionality and interface card for one 56 kb/s, X.25 data link connecting the position to the 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. A modem may be added to one general operator position to define it as an operator/maintenance position.

Operator positions serve one of the three following functions:

- general operator position
- in-charge position
- assistance position

### General operator position functions

The general operator can perform the following functions using TOPS MPX NT DA:

- log in and log out
- perform DA, CNA, and intercept searches
- transfer a call to SA position
- verbally quote the search result

- release the call to an Interactive Voice Subsystem (IVS)
- enter the calling number for ONI and ANIF calls
- complete the call manually
- create charges for additional search requests
- release the position
- transfer a call to an SA/IC position
- perform administrative searches
- use the AOSS display and call-processing keypad

When the position is not being used for searches, the following functions are available:

- install/change router IP address
- use the ping utility to check communication lines between positions
- check for installation of software
- check on the release level of installed software

The operator/maintenance position also provides maintenance/administrative functions, including remote access through a modem.

### Optional router position functions

In the optional alternative configuration of 20 operator positions plus two routers, the router positions provide no operator position functions.

When the position is not being used for searches, the following functions are available:

- update router tables
- copy router tables to floppy disk
- load router tables from floppy disk

### Service assistance position functions

TOPS MPX provides the following functions for the SA position:

- all general operator position functions *except* for the following:
  - releasing the call to an IVS
  - completing the call manually
  - performing any searches other than administrative
  - billing
- ability to monitor an operator or position
- ability to page an operator or position
- ability to accept transferred call for assistance
- stop bell

- SA AOSS display

### In-charge position functions

TOPS MPX provides the following functions for the IC position:

- all assistance position functionality
- IC AOSS display

## 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 DAS - An X.25 link provides the physical interface for call control. The number of links provided is based on the amount of traffic in the DMS host switch.
- ARU trunks on T1 facilities between the DMS-200 and the DAS - For automated DA and intercept call responses in the NT DA system, TOPS MPX uses Interactive Voice Subsystems (IVS). The IVSs communicate with the calling subscriber through the DMS network and dedicated ARU trunks.
- Listing services data transfer between the DAS and designated TOPS MPX database gateway positions - Redundant 56 kbp/s X.25 links connect two TOPS MPX database gateway positions on each token-ring LAN to the 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.

### Central control 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 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 IVSs.

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 X.25 link is used to communicate call-control messages between the CC and the DAS. Performance 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 protocol.

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

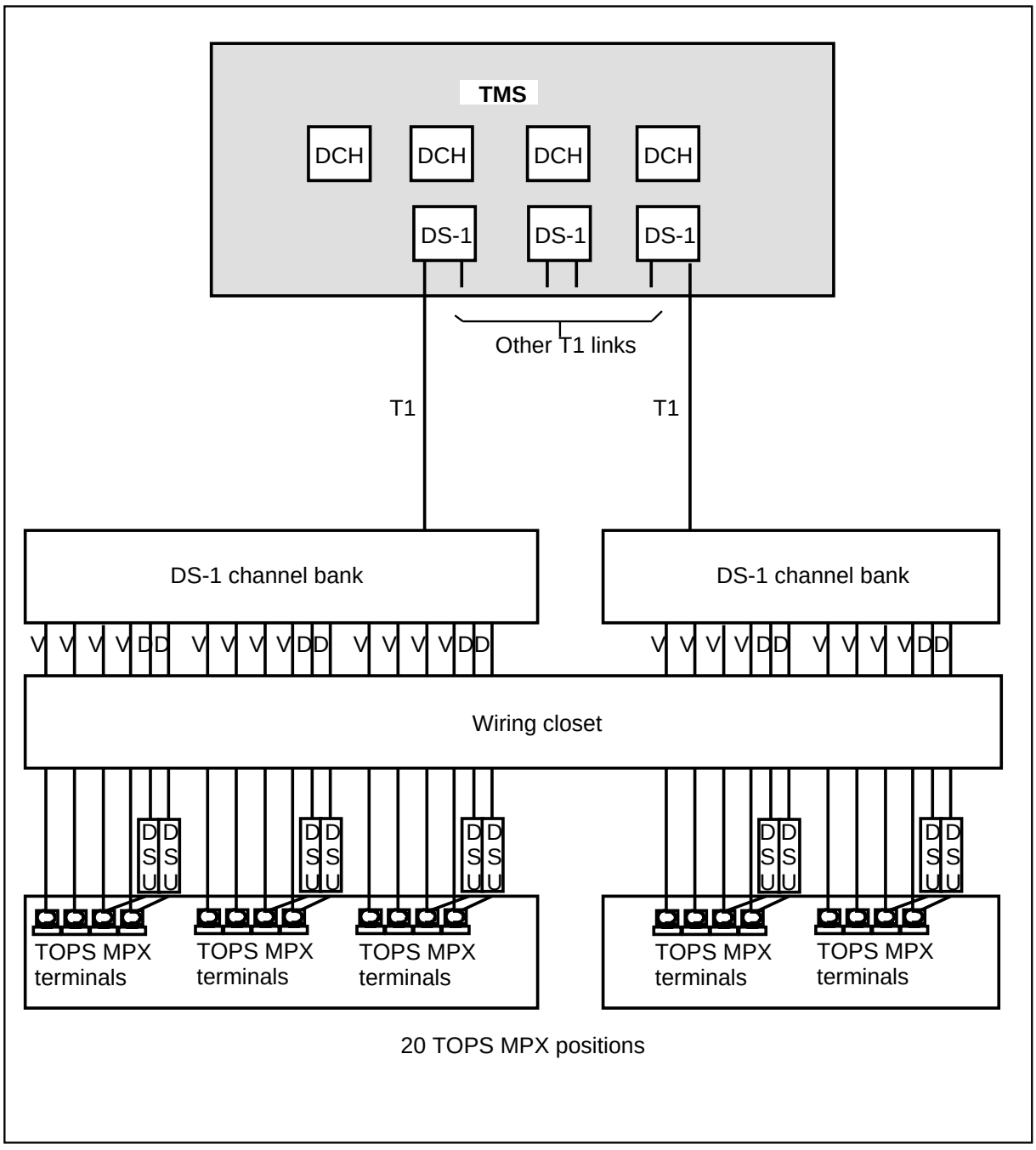
TOPS MPX requires the TMS. The basic configuration of the TOPS MPX system with a TMS connection to the DMS switch is shown in figure 2-7. The TMS must be located in a host DMS central office, and the TMS cable connection to the DMS network must be within 228.7 m (750 ft). Since T1 transmission links 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 1980 (Yellow Book) specifications for PVCs over one or more 56 kb/s DS-0 channels.

As shown in figure 2-7, 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.

**Figure 2-7xxx**
**TMS and TOPS MPX interface**



## Token ring

Clusters are groups of positions associated with a virtual position controller (VPC), which is the DMS gateway position. The VPC provides the CC/TOPS MPX data-link connectivity for all positions within the cluster, including the VPC itself. Clusters may contain from one to four positions. When the data link is duplicated for increased reliability, each cluster must contain an active and an inactive VPC (two DMS gateway positions), unless the entire cluster contains only a single position.

The database gateway positions provide 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.

***Note:*** In the optional alternative configuration of 20 positions plus two routers, the database gateway positions (the routers) are not part of any cluster.

The 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 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.
- 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 redundant TOPS MPX/CC data-link configuration is strongly recommended to ensure reliability, 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

- For most efficient transmission, the recommended maximum number of positions equipped on a single token ring is 20.
- For reasons of economy, the number of token rings in an OSC should be minimized by filling each token ring to 20 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.
- Redundant MPX/CC data links are recommended for all applications.

### Standard 20-position configuration

Typical recommended token-ring configurations are shown in Table 2-4, where digits represent position type as follows:

- D = database gateway position
- G = DMS gateway position
- O = 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.

**Table 2-3xxx**
**Recommended token ring configuration**

| Fully equipped | Minimally equipped |
|---|---|
| GGDO GGDO GGOO GGOO | GGD GGD |

### Optional 20 + 2 configuration

Table 2-4 shows typical recommended token-ring configurations in the optional alternative configuration of 20 operator positions plus two routers. This table uses the following abbreviations:

- G = DMS gateway position (VPC)
- O = operator position
- R = router (database gateway position)
- M = combined operator/maintenance position

For example "GGOO" represents four positions, of which two are DMS gateway and two are general operator positions. The underlined positions

are required in each cluster of four if the cluster is equipped. Other positions are equipped as needed. Blanks separate the clusters.

**Table 2-4xxx**
**Recommended token ring configuration**

| Fully equipped | Minimally equipped |
|---|---|
| GGOO GGOO GGOM GGOO GGOO RR | G RR |

## 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).

The PS/2 standard keyboard is replaced by a TOPS MPX keyboard developed to BNR specifications.

Call control data links are handled by enhanced multi-protocol controllers (EMPC) and run at 9.6 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.

IBM provides the following OEM equipment:

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

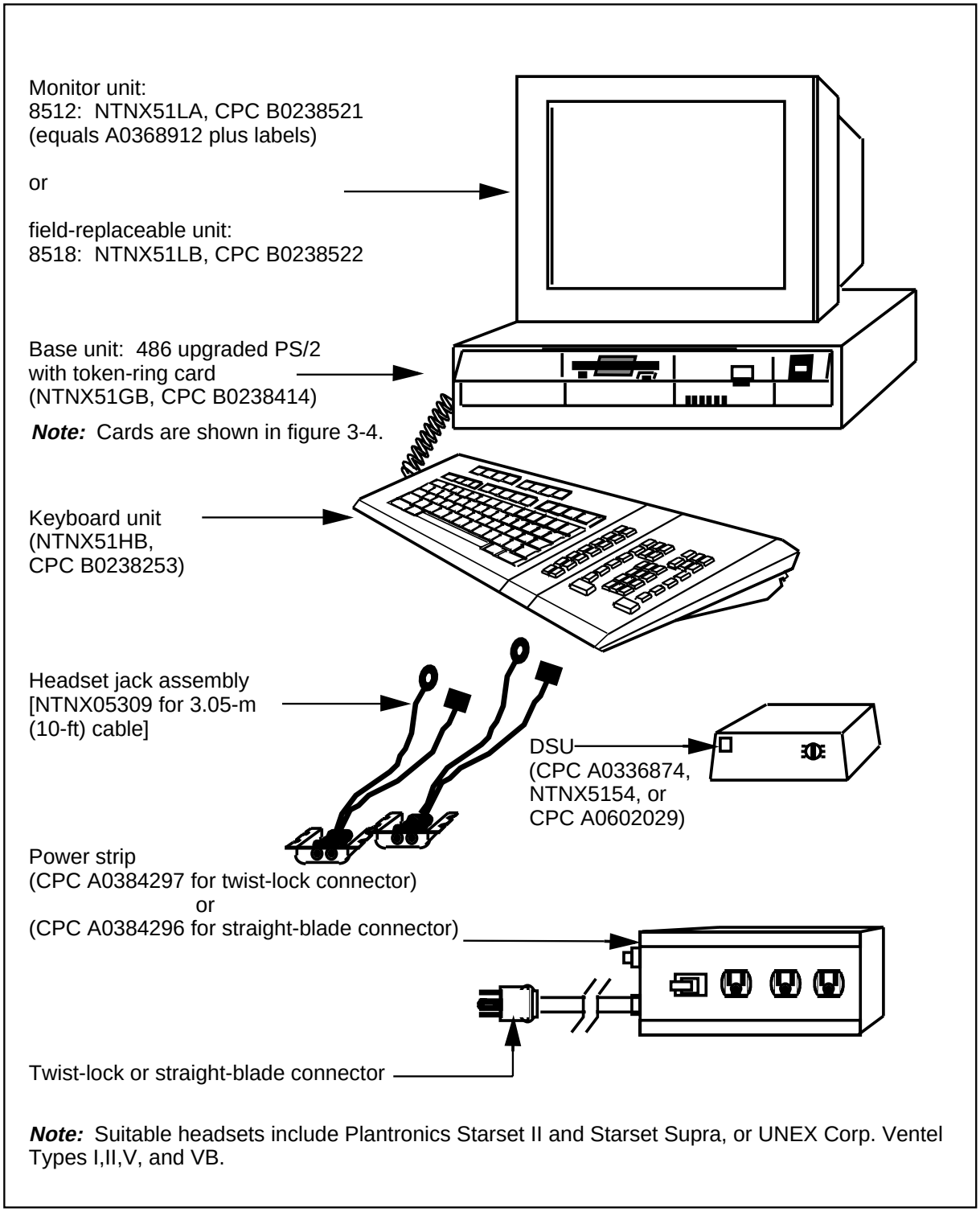
The channel-bank and TSG equipment required by TOPS MPX is provided by the operating company.

## Equipment diagrams

With the introduction of multiple applications choices on TOPS MPX workstations, position software is now separately provisionable. Depending on how software packages and circuit cards are provisioned, a workstation can become a database gateway or, in the 20 + 2 configuration, a router (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).

Figures 3-1 through 3-5 show the workstation equipment for NTNX51GB. Figures 3-6 through 3-10 show the workstation equipment for NTNX51FB. Figures 3-11 through 3-14 apply to both series.

**Figure 3-1xxx**
**TOPS MPX workstation (GB series)**




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

**Figure 3-2xxx**
**Monitor cable connection to base unit (GB series)**

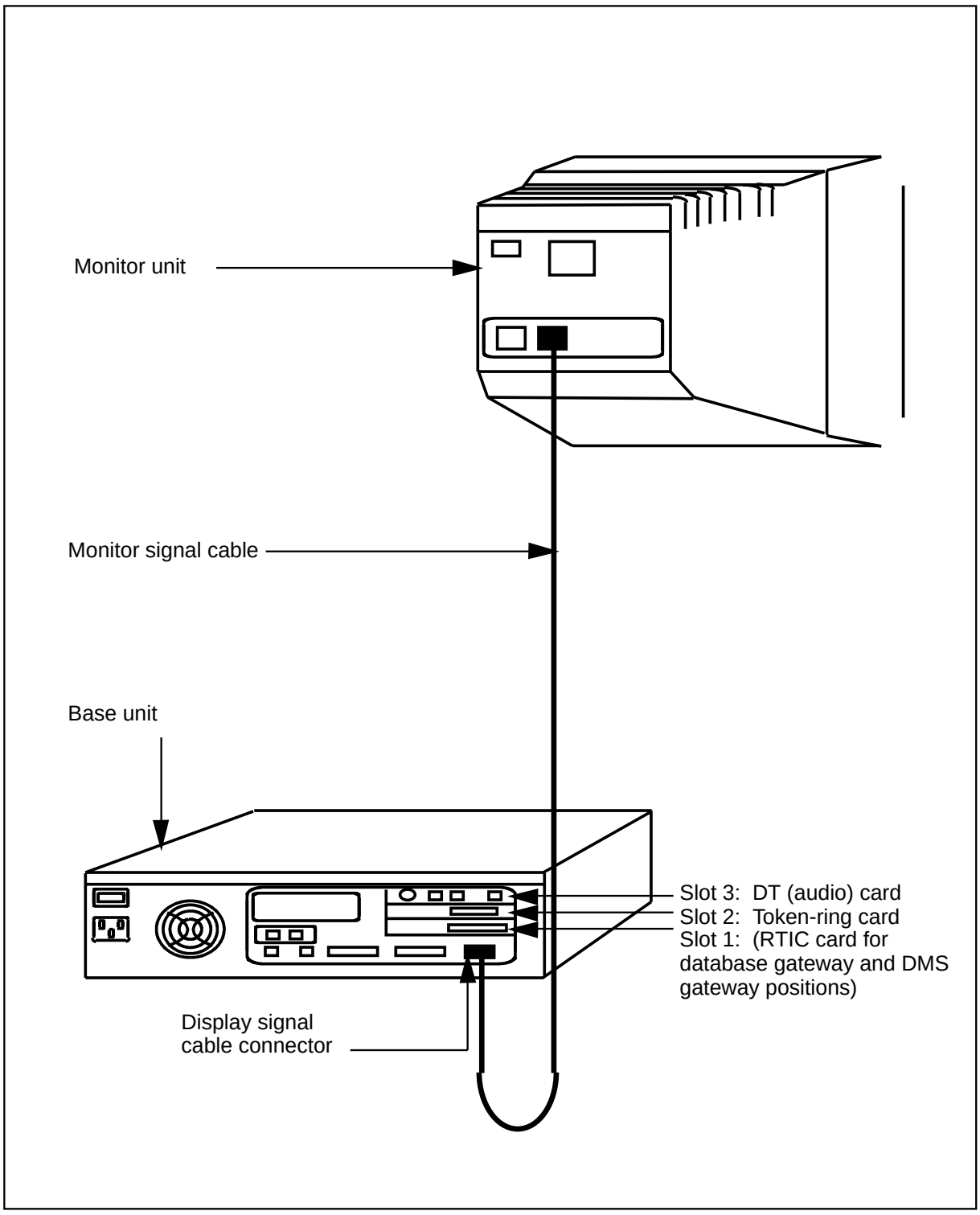


**Figure 3-3xxx**
**Keyboard cable connection to base unit (GB series)**

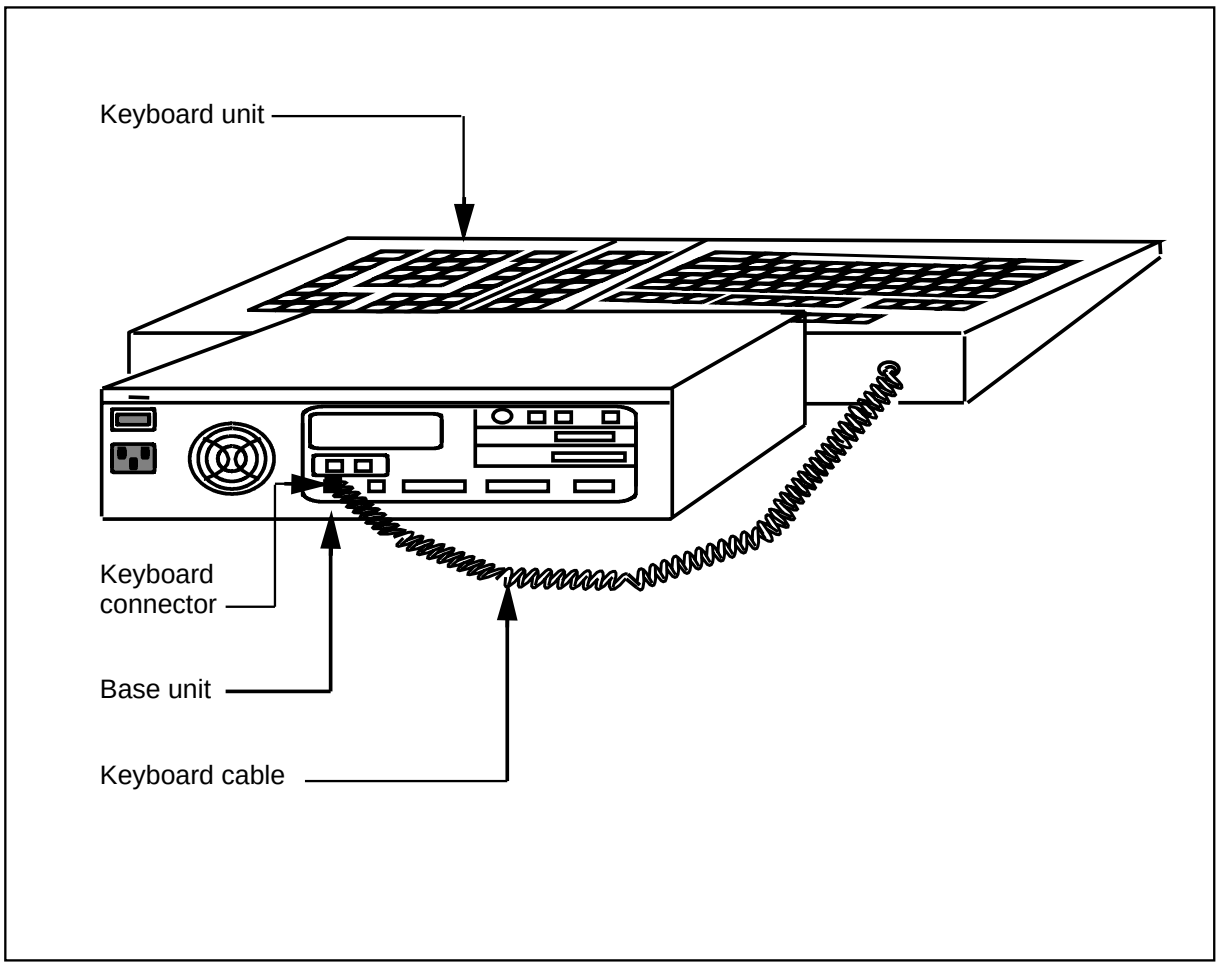


**Figure 3-4xxx**
**Base unit circuit cards (GB series)**

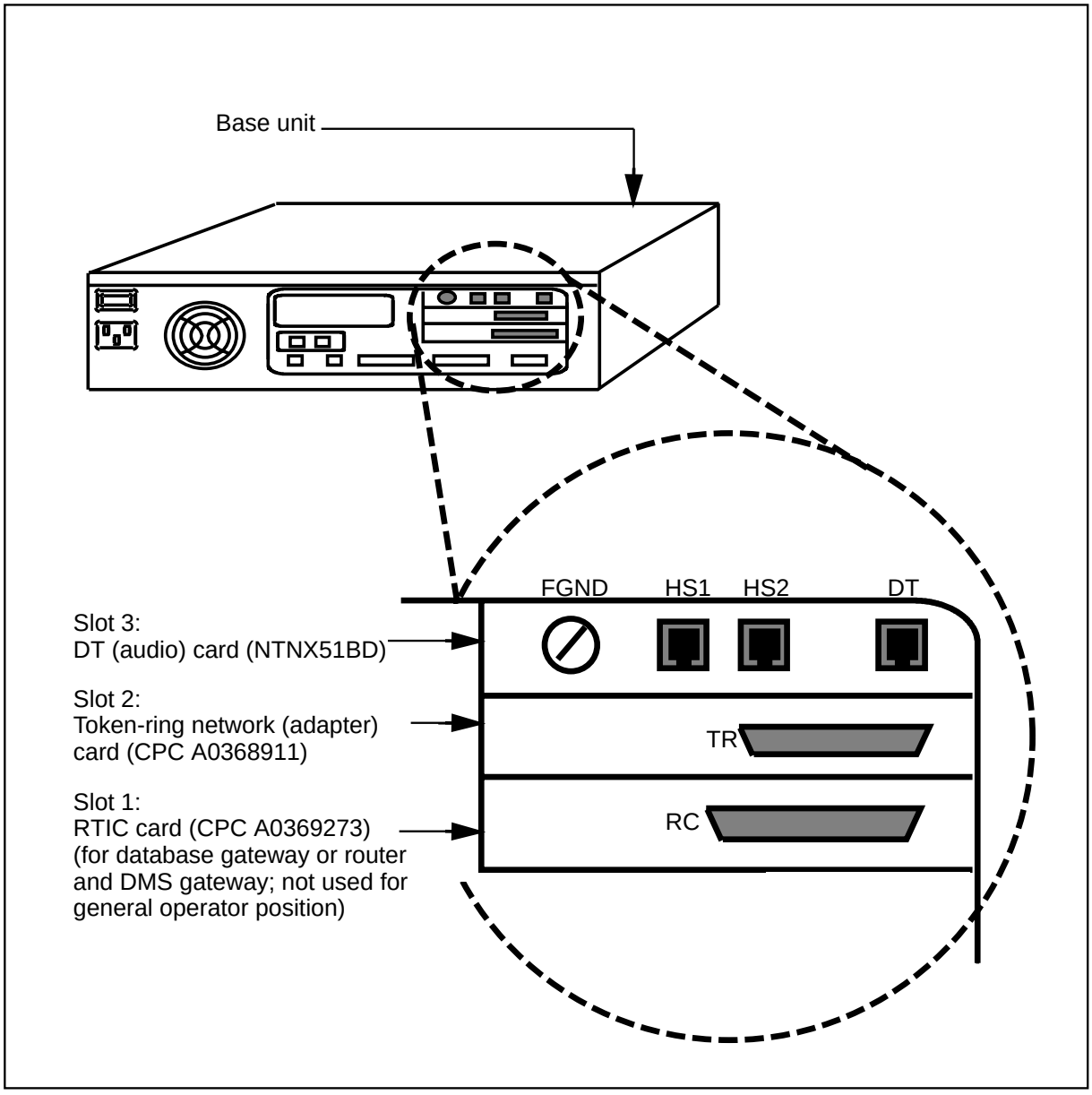


**Figure 3-5xxx**
**Workstation power (GB series)**

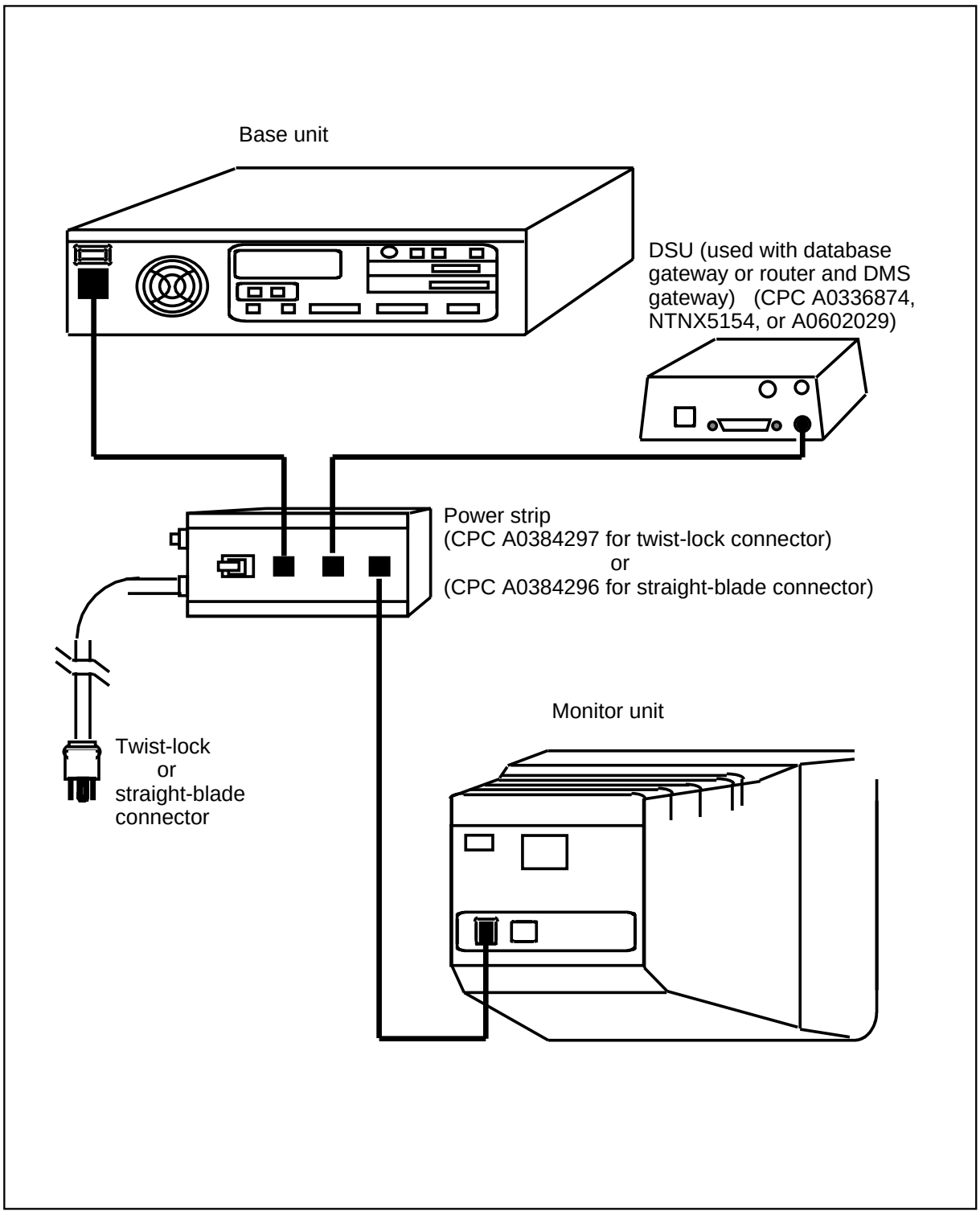
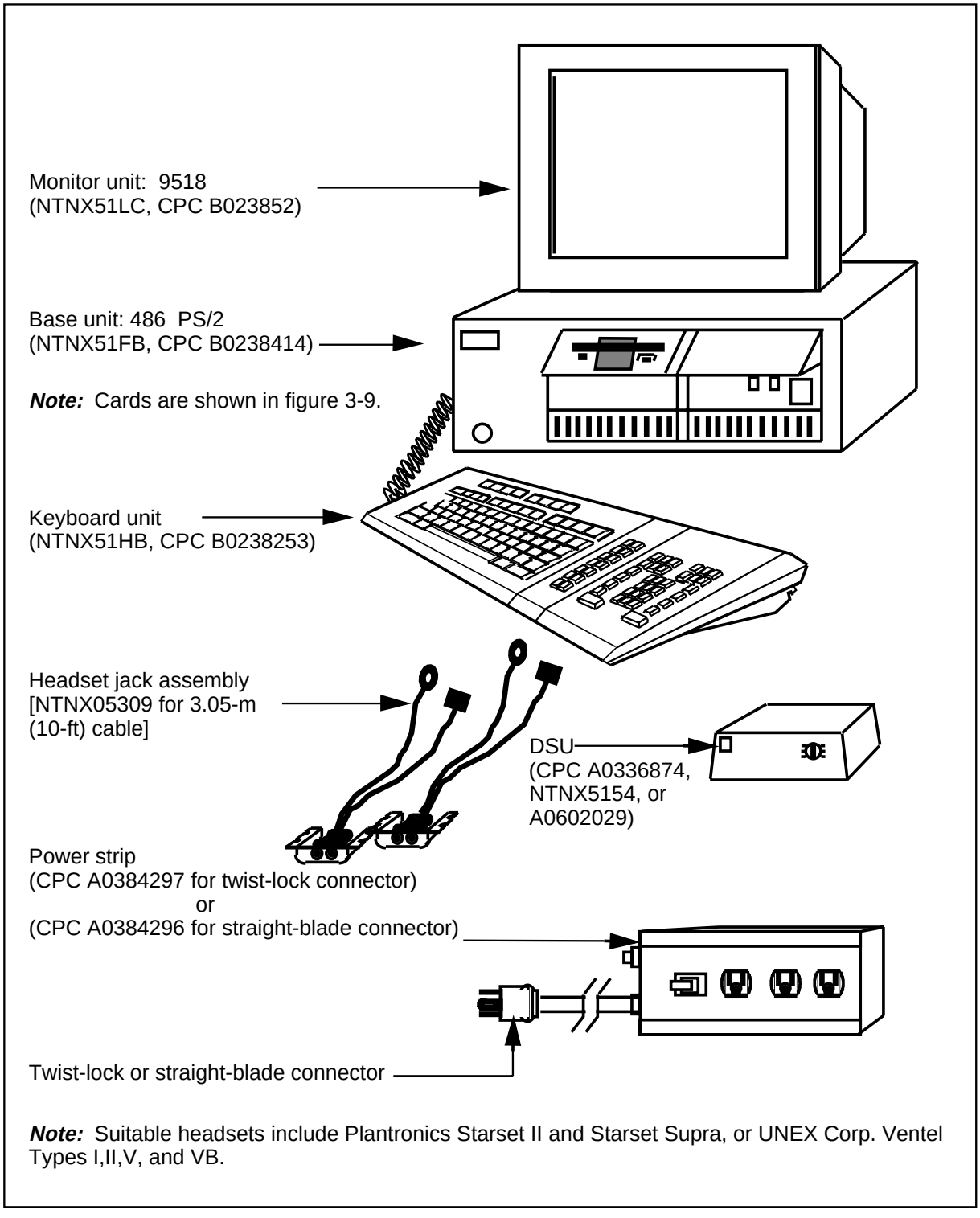


**Figure 3-6xxx**
**TOPS MPX workstation (FB series)**




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

**Figure 3-7xxx**
**Monitor cable connection to base unit (FB series)**

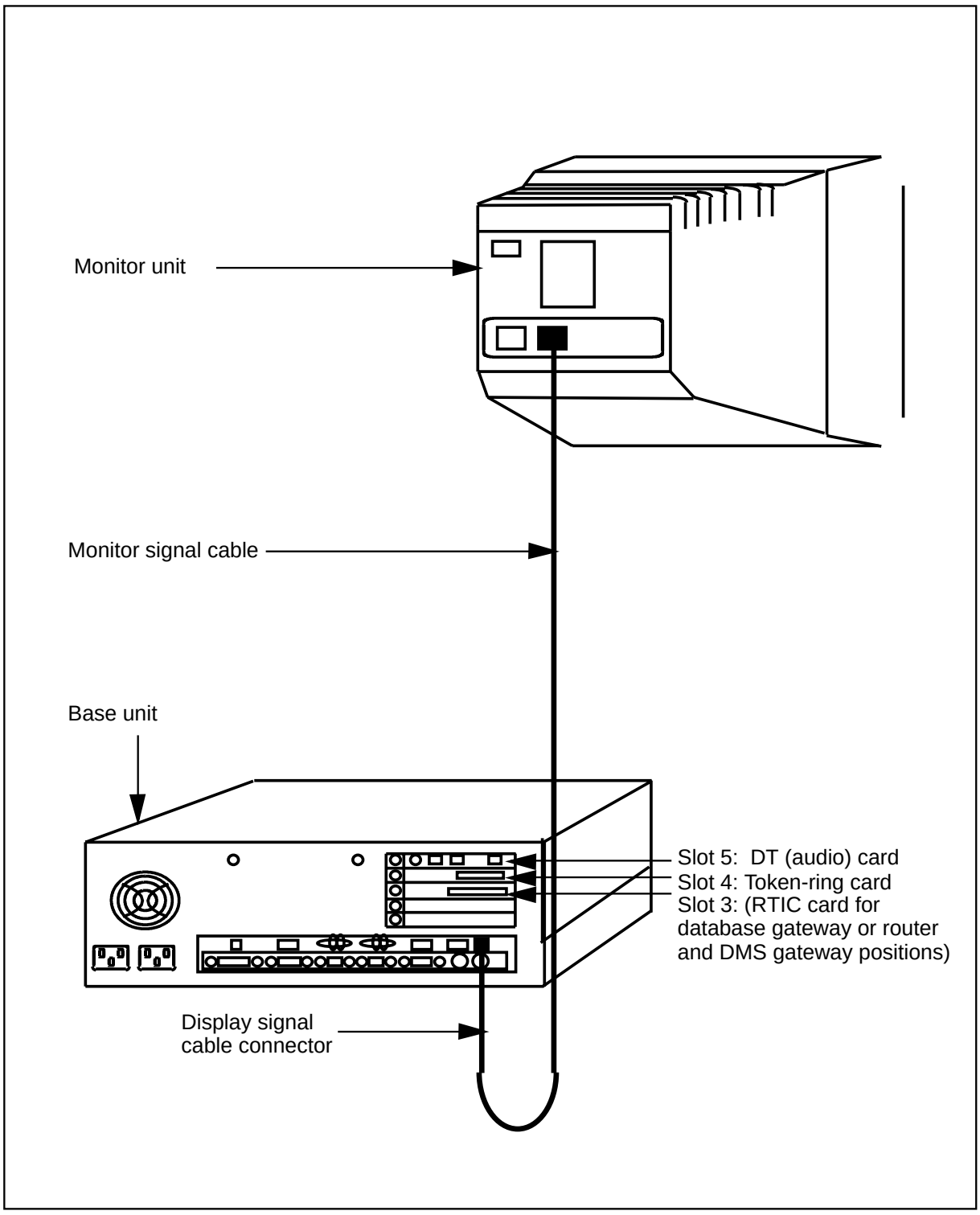


**Figure 3-8xxx**
**Keyboard cable connection to base unit (FB series)**

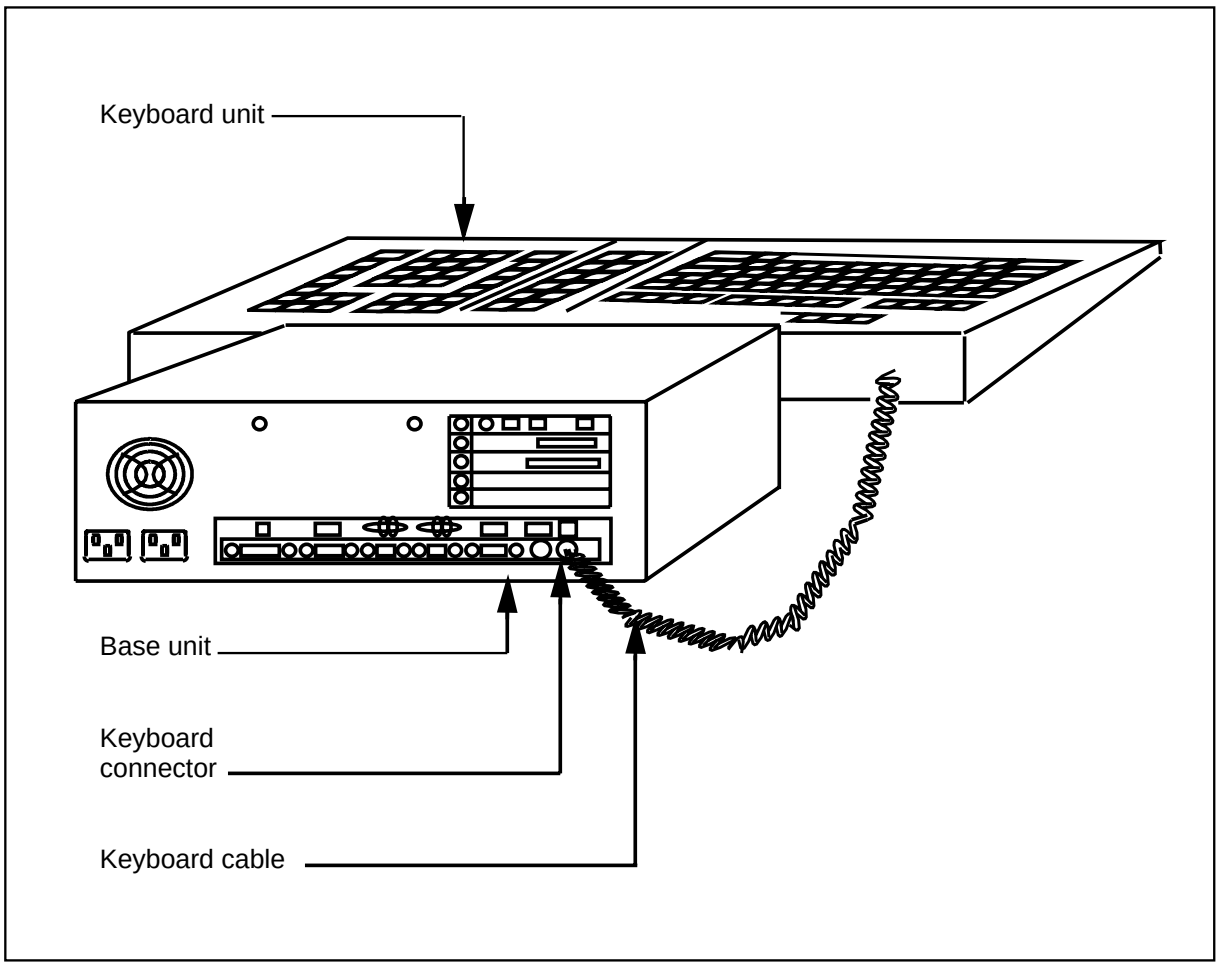


**Figure 3-9xxx**
**Base unit circuit cards (FB series)**

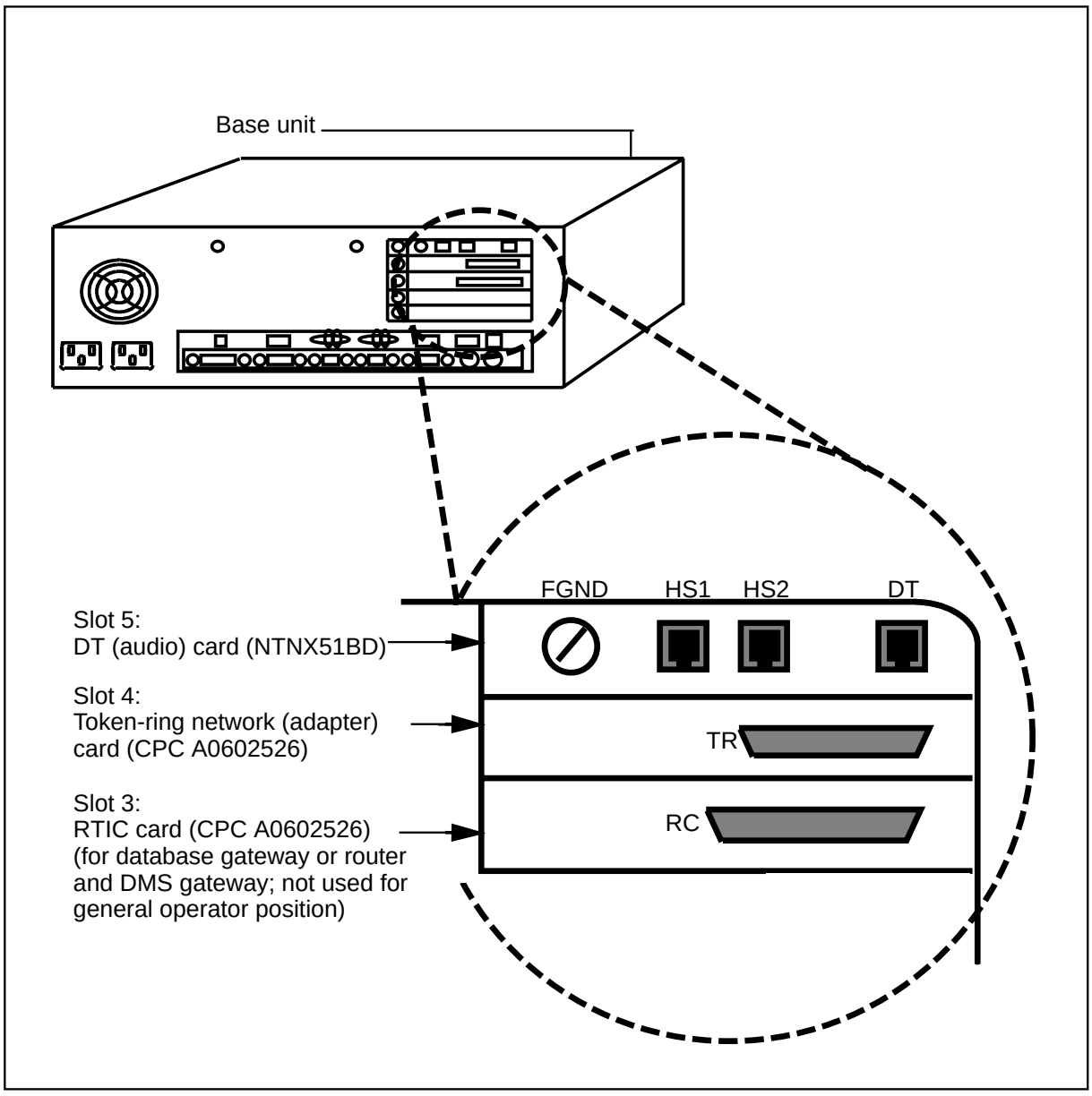


**Figure 3-10xxx**
**Workstation power (FB series)**

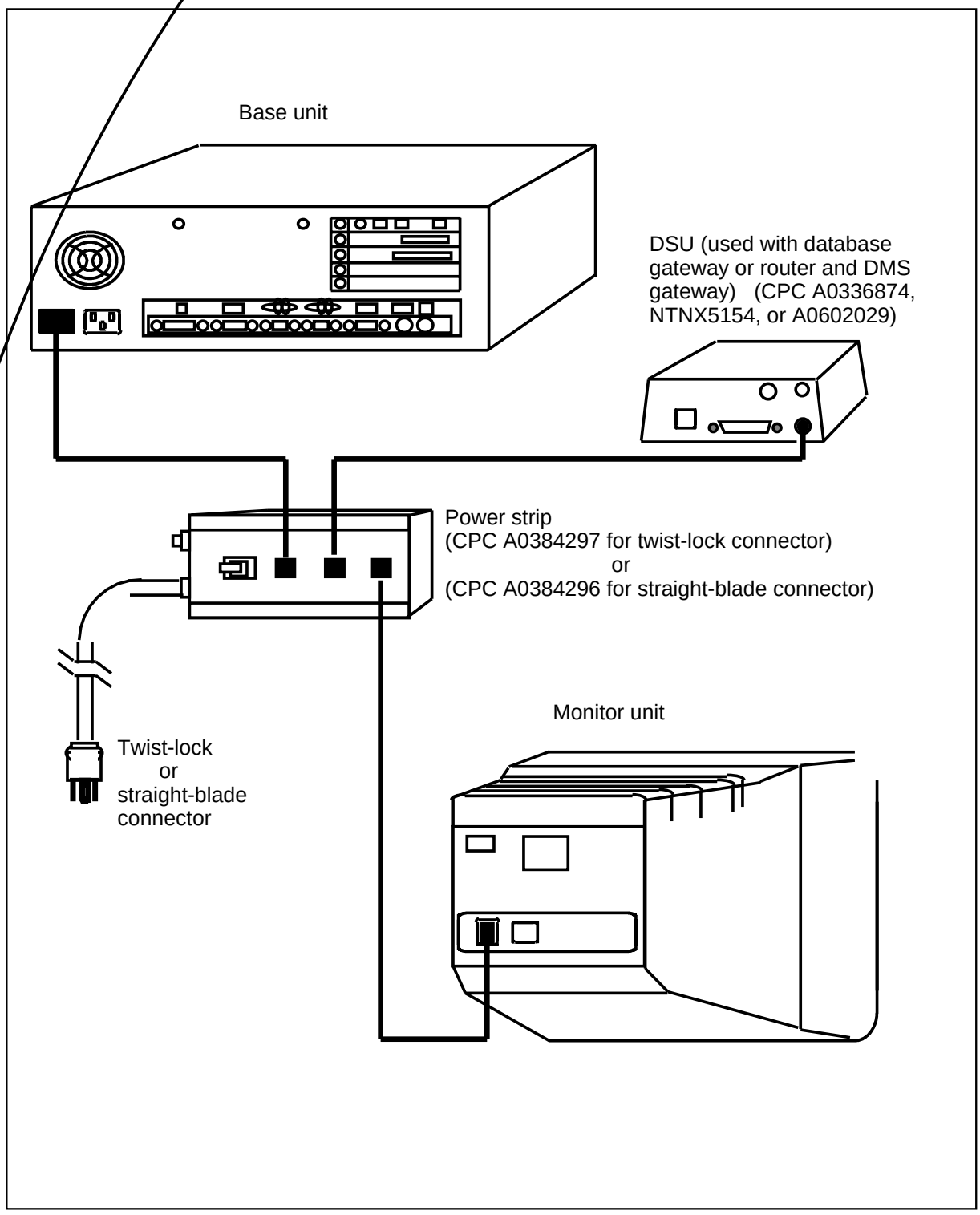


**Figure 3-11xxx**
**DT and TR card connections to equipment frame**

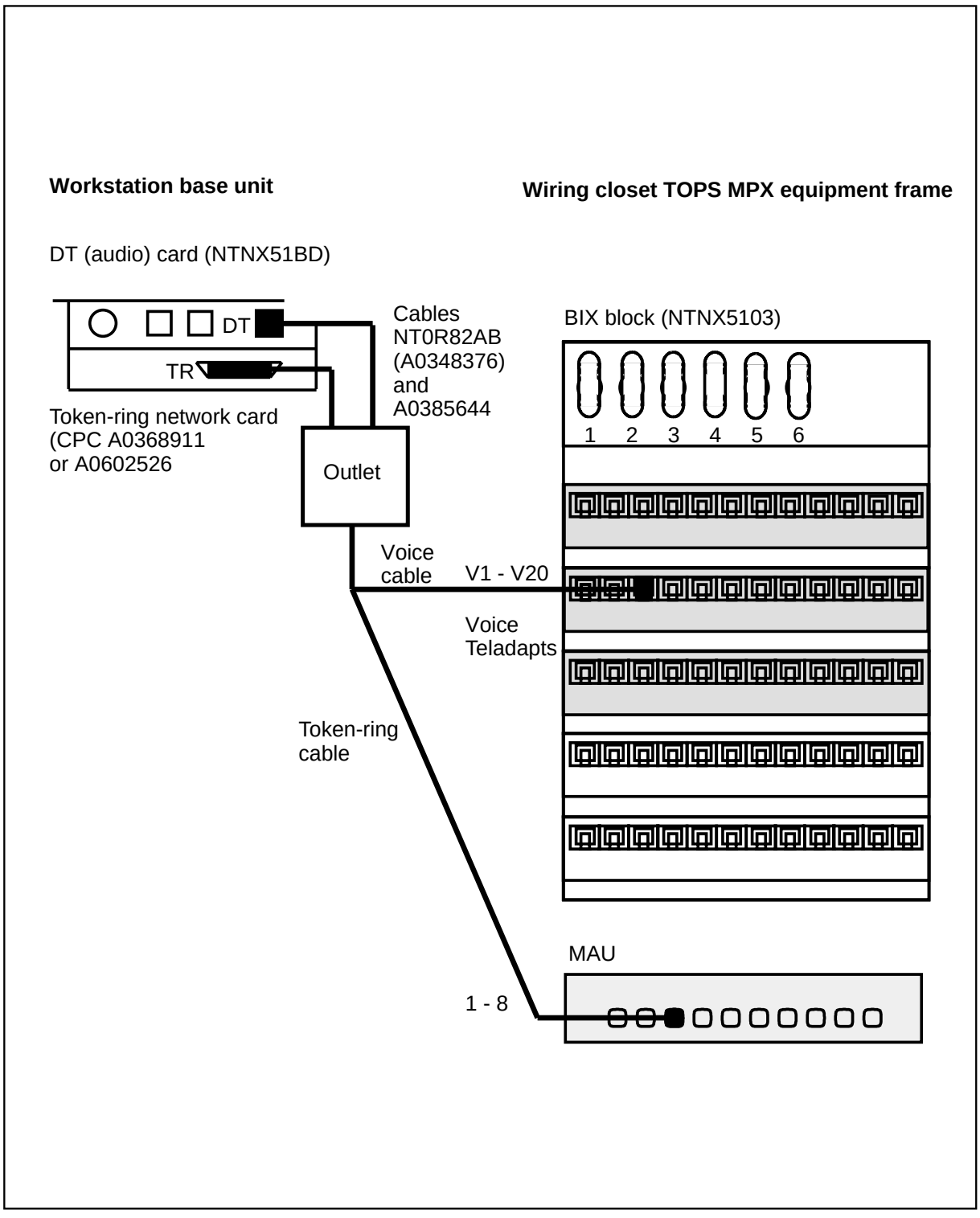


**Figure 3-12**
**RTIC card and DSU connections to equipment frame**

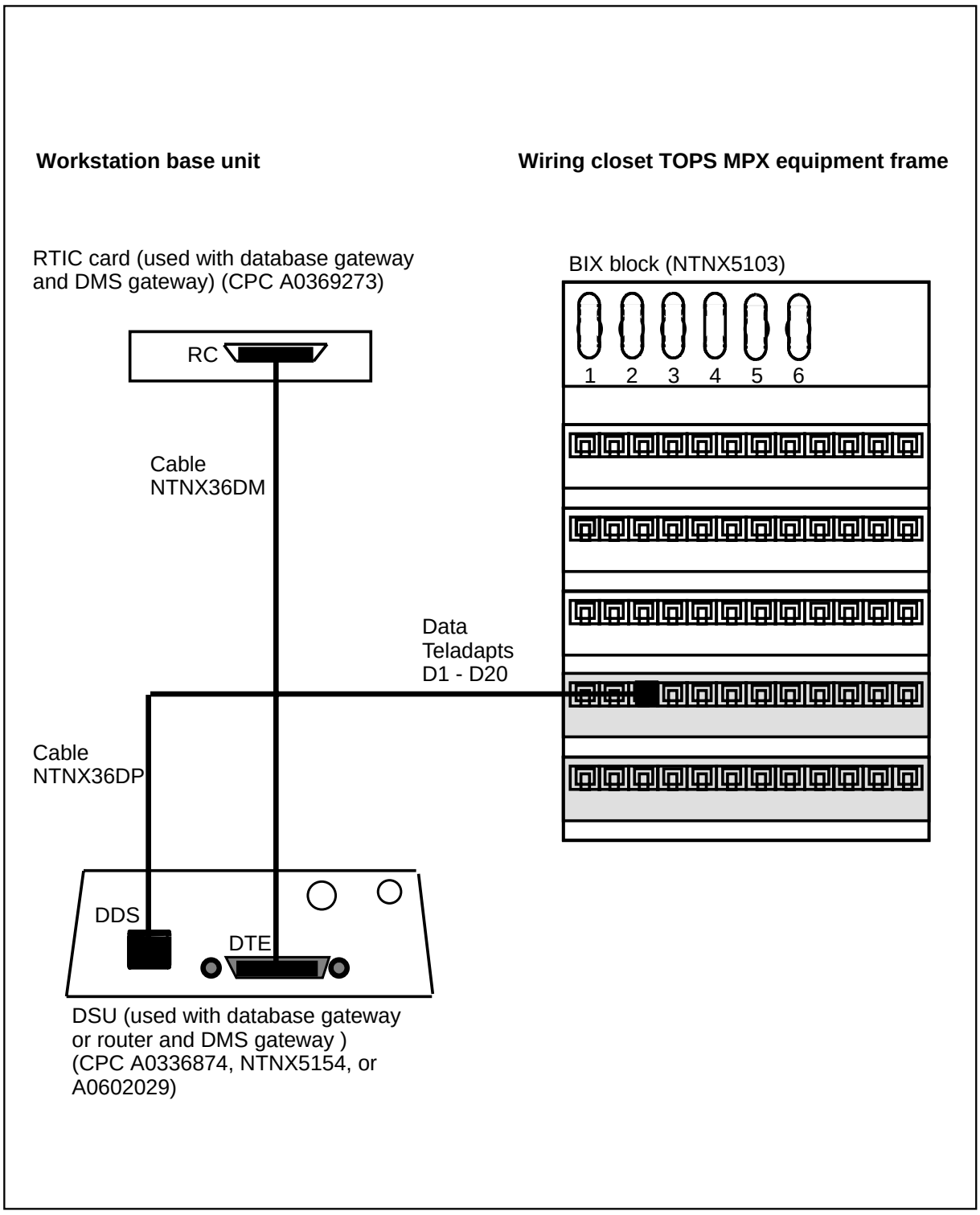


**Figure 3-13**
**TOPS MPX equipment cables**

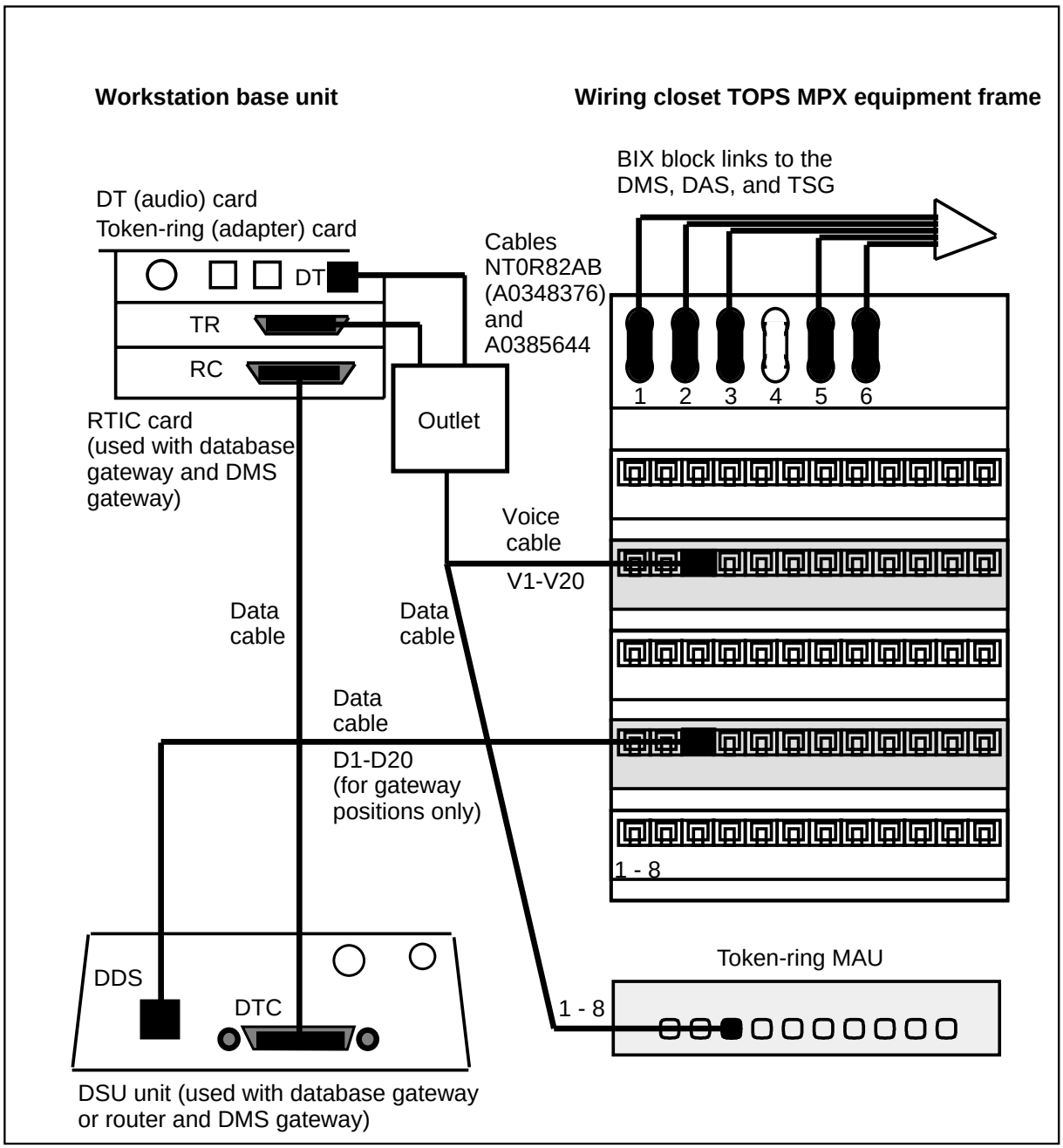
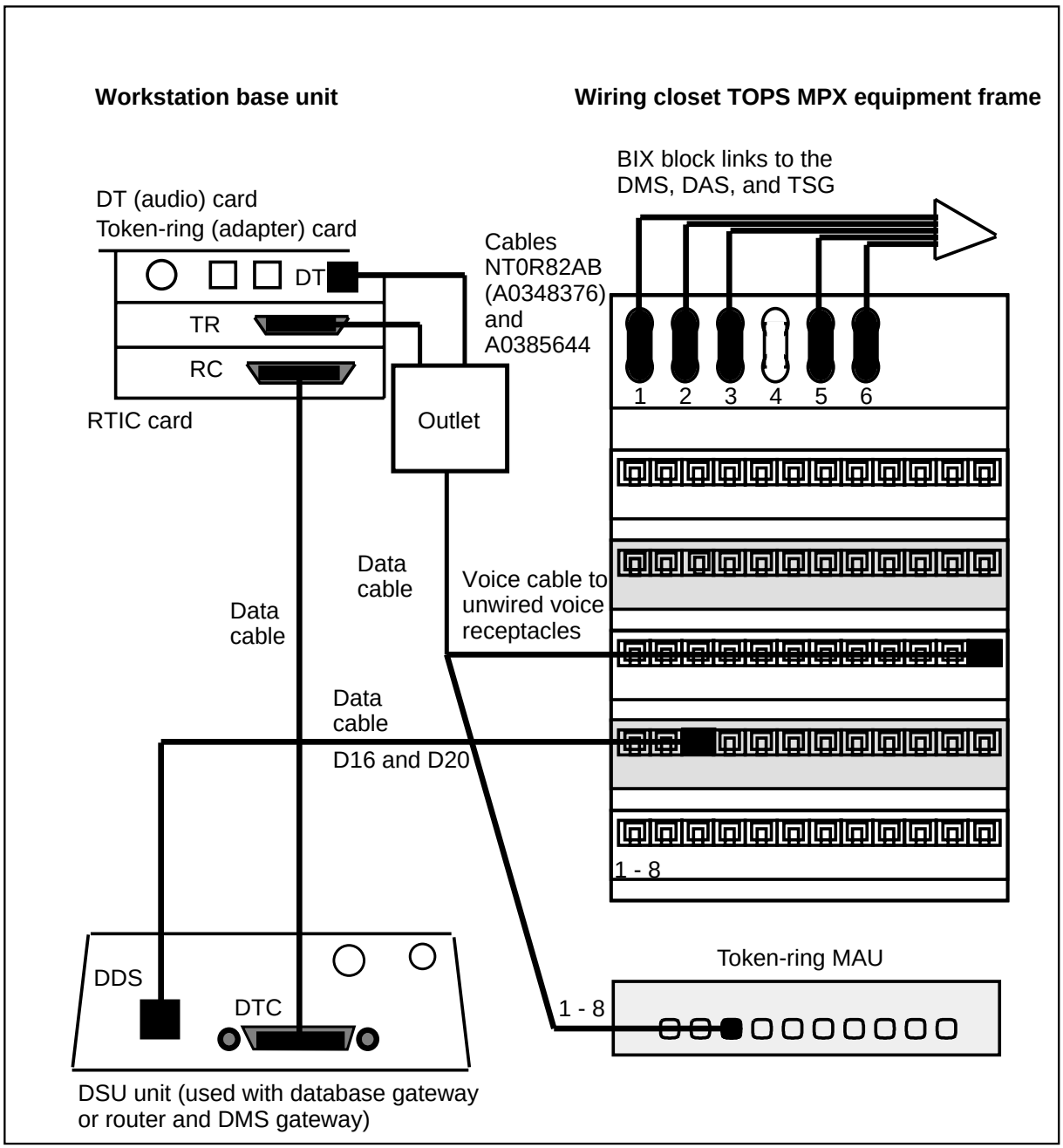


**Figure 3-14**
**TOPS MPX equipment cables for routers in optional 20 + 2 configuration**



## The TOPS MPX position

The TOPS MPX hardware platform is based on the IBM PS/2. To create TOPS MPX, Northern Telecom combines IBM and Honeywell hardware products with custom hardware developed by NT and other commercial vendors.

With this platform, TOPS MPX is designed to operate within the ambient temperature, relative humidity, and atmospheric pressure ranges listed in table 3-1.

**Table 3-1**
**Position equipment environmental considerations**

| | Normal | Short Term |
|---|---|---|
| Ambient temperature: | 50°F-86° F<br>10°C-30° C | 41°F-120° F<br>5°C-49° C |
| Relative humidity: (noncondensing) | 20%-55% | 20%-80% |
| 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 position 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 table 3-2. 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.

**Table 3-2**
**TOPS MPX position equipment**

| Description | Product Engineering Code (PEC) (See note 1) | Common Product Code (CPC) |
|---|---|---|
| ***Either*** **GB series workstations (no longer available after 3rd quarter 1993):** | | |
| Upgraded PS/2 base with token-ring card | NTNX51GB | B0238414 |
| Cable management bracket | NTNX5153 | B0235141 |
| Color monitor:<br>8512<br>or field-replaceable monitor:<br>8518 | <br>NTNX51LA<br><br>NTNX51LB | <br>B0238521<br><br>B0238522 |
| ***Or*** **FB series workstations (available 4th quarter 1993):** | | |
| PS/2 base | NTNX51FB | B0236832 |
| Cable management bracket | NTNX5122 | B0237579 |
| Color monitor (9518) | NTNX51LC | B0238522 |
| **With *both* series:** | | |
| TOPS MPX keyboard, combined English | NTNX51HB | B0238253 |
| Keyboard template (one per TOPS MPX position) | N/A | P0714192 |
| DSU, UDS D56 | N/A | A0336874 |
| DSU (GDC 56K) | NTNX5154 | B0235487 |
| DSU ( GDC DC500N) | N/A | A0602029 |
| 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<br>(provisioned for database gateway or router and DMS gateway base) | N/A | A0369273 |

**-continued-**

**Table 3-2**
**TOPS MPX position equipment** (continued)

| Description | Product Engineering Code (PEC) (See note 1) | Common Product Code (CPC) |
|---|---|---|
| FC 1133 token-ring card (provisioned for all positions) | N/A | A0602526 (See note 3) |

***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.
***Note 3:*** The token-ring card is part of NTNX51GB (as A0368911) and need not be provisioned separately.

**End**

## 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.

In the 20 positions plus two routers configuration of TOPS MPX NT DA, the router is connected to the wiring closet by the same dual cable used for other positions. The data cable connects to the MAU as usual, but the voice cable terminates to an unwired voice receptacle on the BIX.

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 multistation 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

positions on four token rings. Figure 3-15 on page 3-22 shows the front and rear views of the frame: each side serves two token rings. Three MAUs are provided for each token ring. Four MAU connections are unused in the 20-position configuration. Two MAU connections are unused in the 20 + 2 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.

Modems for the database gateway positions are connected to the BIX block in the miscellaneous frame. The modem for the operator/maintenance position is not connected to the BIX block in the miscellaneous frame.

## 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.

**Table 3-3**
**TOPS MPX MAU equipment**

| Description | Common product code (CPC) |
|---|---|
| MAU (8228) | A0368910 |
| MAU mounting extender | P0709734 |

## BIX block interface

The operator service center (OSC) TOPS MPX BIX block interface is shown in figure 3-16. 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.

The BIX block is mounted in the TOPS MPX equipment frame using one mounting panel for two BIX blocks. These parts are identified in table 3-4.

**Table 3-4**
**TOPS MPX BIX block equipment**

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

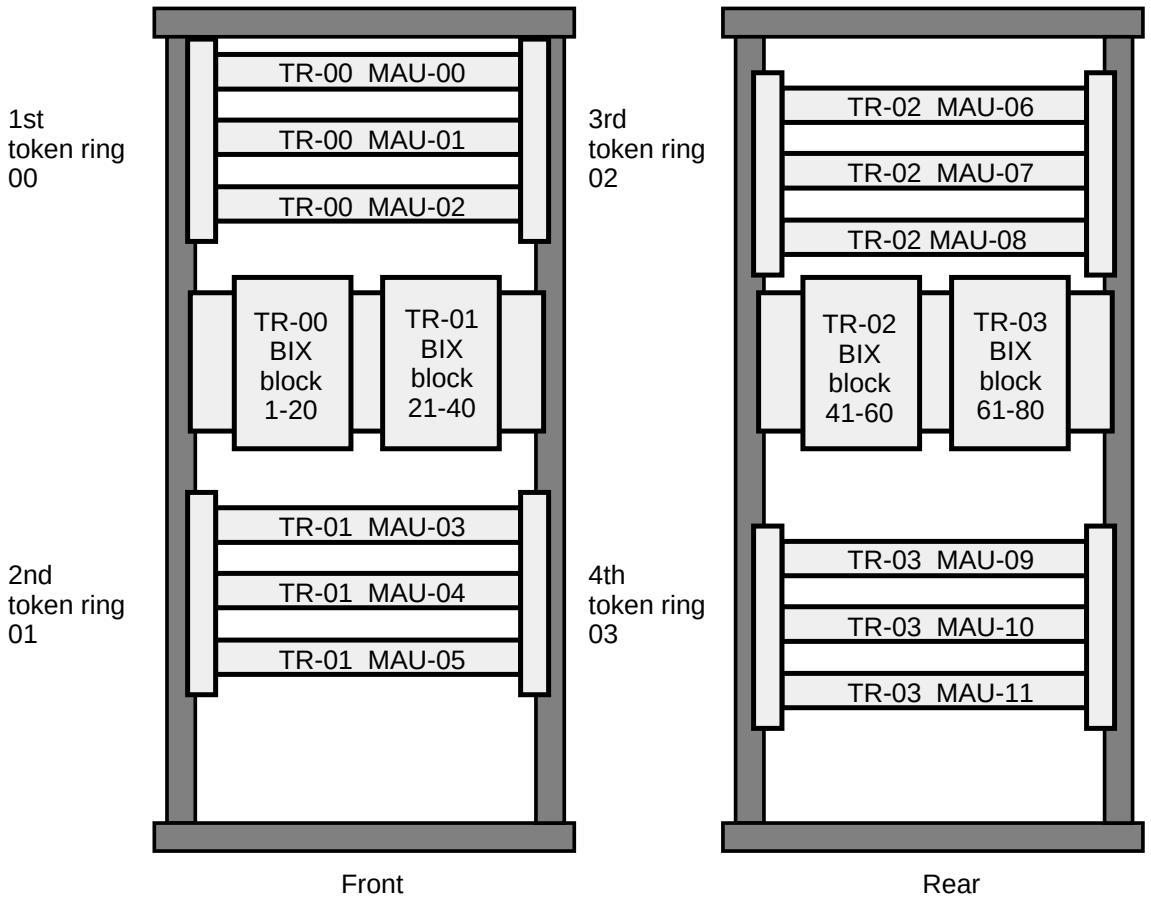
## TOPS MPX equipment frame hardware kit

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 table 3-5, labeled miscellaneous (MIS) frame hardware kit.

**Table 3-5**
**TOPS MPX frame hardware kit equipment**

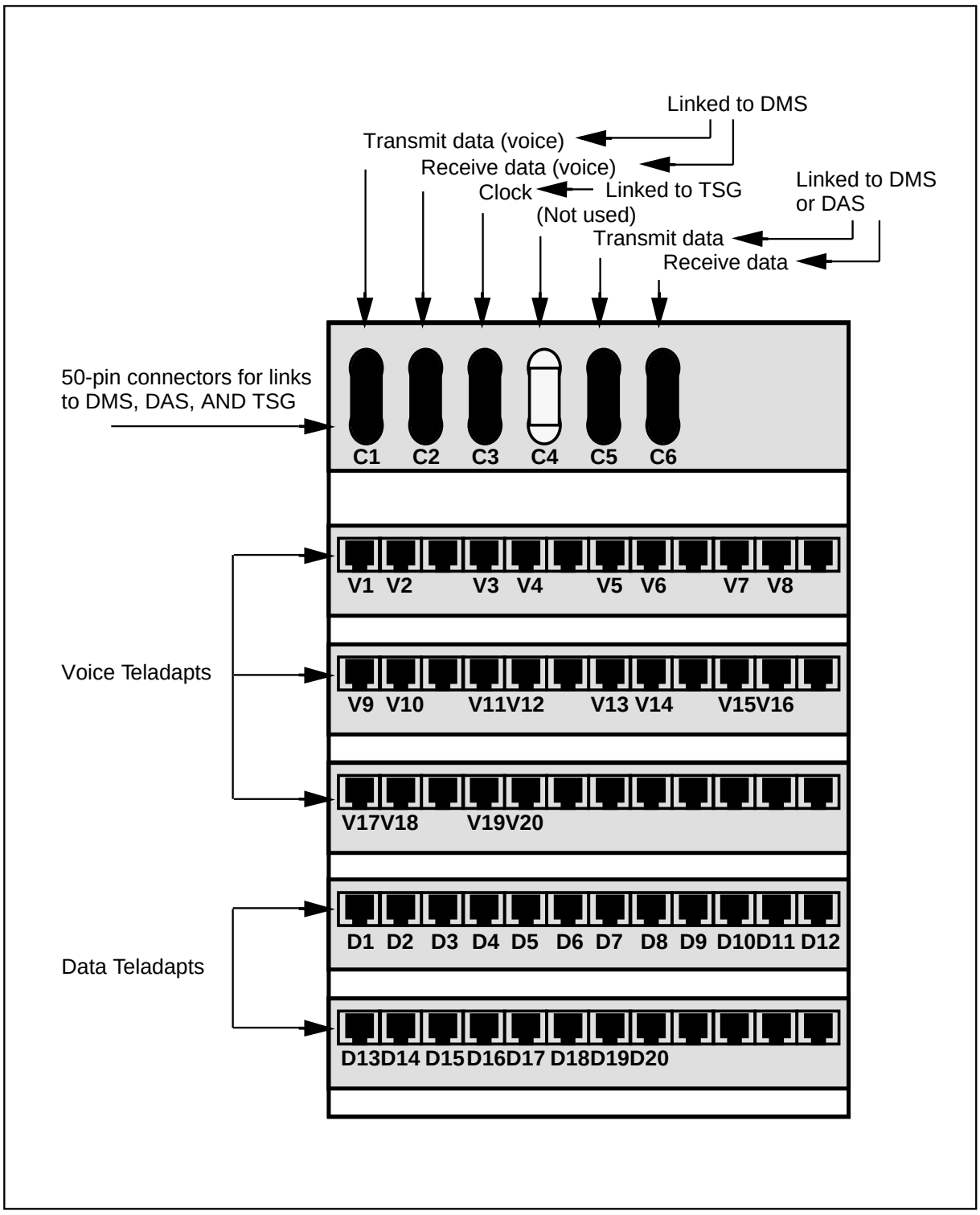
| Description | Part number | Common product code (CPC) |
|---|---|---|
| MIS frame hardware kit | NTNX5109 | B0231602 |

**Figure 3-15xxx**
**TOPS MPX wiring closet equipment**




***Note:*** Each MAU has eight ports.

**Figure 3-16xxx**
**BIX block**



## 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)
- MAU to MAU (NTNX36DK)
- RTIC card to DSU (NTNX36DM)
- BIX block to distributing frame (NTNX36DN)
- DSU to BIX block (NTNX36DP)
- BIX block to TSG (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 switch, the DAS, and the 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. Figure 3-17 shows cables NT0R82AB and A0385644 connecting the DT (audio) card and the token-ring network (adapter) card through cable NTNX36QU to the equipment frame.

### Cable NTNX36DK

Three NTNX36DK cables are used to interconnect the MAUs of a token ring. Figure 3-18 shows cable NTNX36DK.

### Cable NTNX36DM

This cable connects the base unit of a TOPS MPX gateway position or router to a DSU. Figure 3-17 shows cable NTNX36DM.

### 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. Figure 3-18 shows cable NTNX36DN.

### 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. Figure 3-17 shows cable NTNX36DP.

### 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.) Figure 3-18 shows cable NTNX36DQ.

**Figure 3-17**
**Workstation cables**

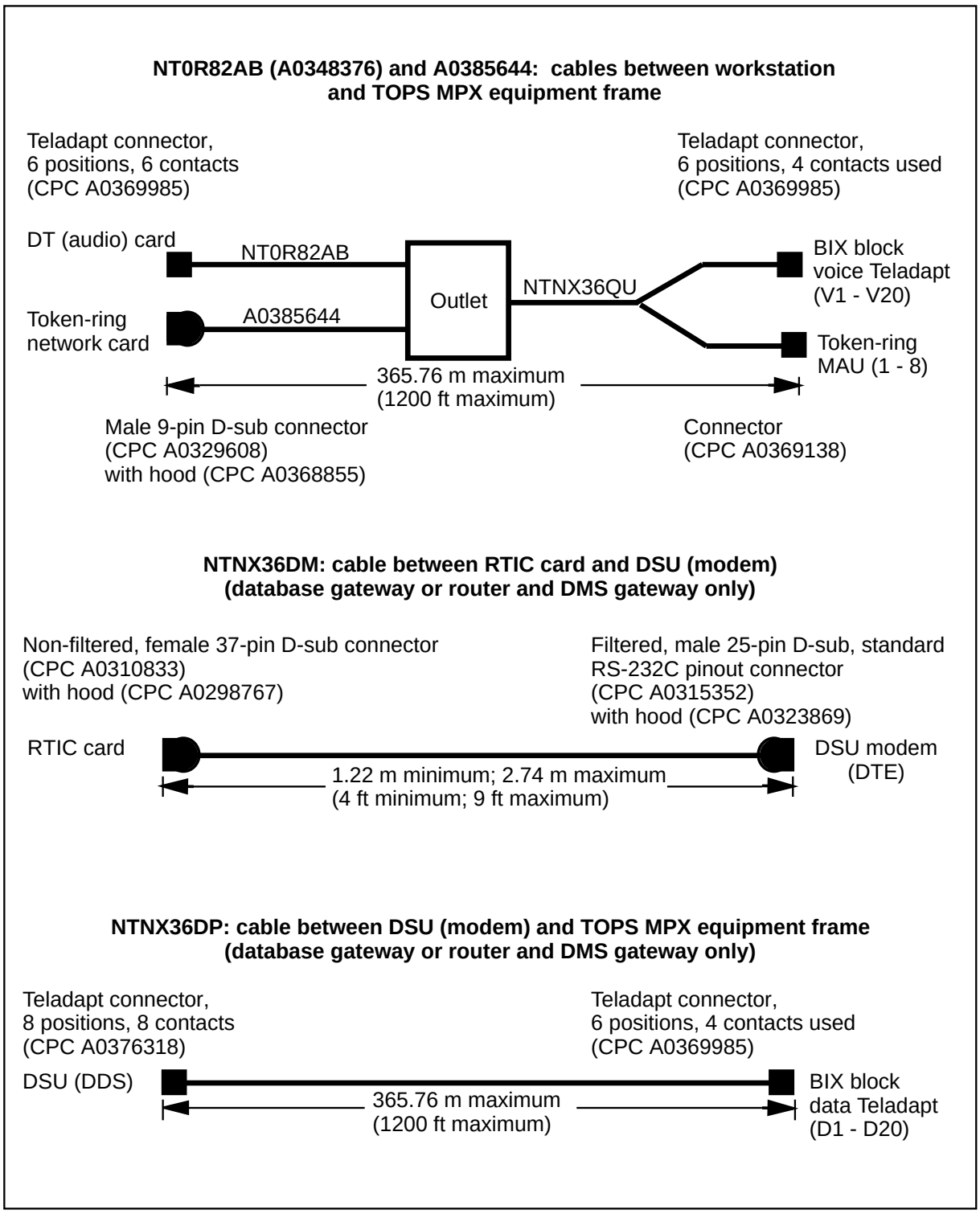
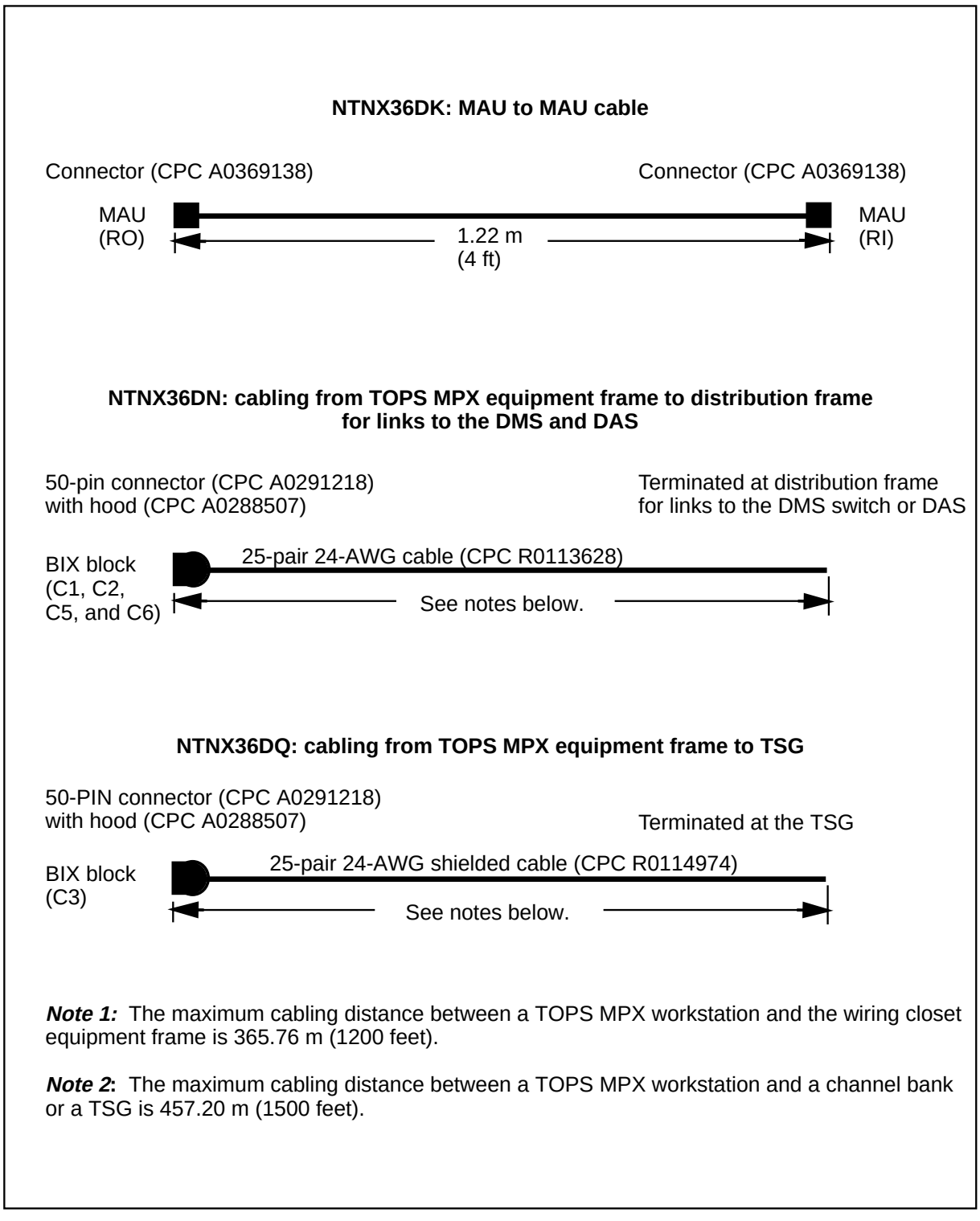


**Figure 3-18**
**TOPS MPX equipment frame cables**




***Note 1:*** The maximum cabling distance between a TOPS MPX workstation and the wiring closet equipment frame is 365.76 m (1200 feet).

***Note 2*:** The maximum cabling distance between a TOPS MPX workstation and a channel bank or a TSG is 457.20 m (1500 feet).

Table 3-6 lists the TOPS MPX cable types.

**Table 3-6**
**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 m (7 ft) | NT0R82AB | A0348376 |
| Position to outlet box on NTNX36QU cable | Type 6 office cable 1.82 m (6 ft) | N/A | A0385644 |
| Outlet to wiring closet | Type 2 plenum cable 0-365.76 m (0-1200 ft) | 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 |
| BIX block to distribution frame | 25 pair, 24 AWG, NT non-plenum cable (See Note 1) | NTNX36DN | B0230862 |
| BIX block to TSG | 25 pair, 24 AWG, NT non-plenum shielded cable (See Note 2) | NTN36DQ | B0231996 |
| Modem to maintenance/ operator position (with NTNX51GB) | 25P male - 25P female | N/A | A0600741 |

**-continued-**

**Table 3-6**
**TOPS MPX cable types** (continued)

| Cable | Description | Product engineering code (PEC) | Common product code (CPC) |
|---|---|---|---|
| Modem to maintenance/ operator position (with NTNX51FB) | 25P male - 9P female | N/A | A0601464 |

***Note 1:*** 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 2:*** 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

On the NTNX51GB base unit, a cable-management bracket (NTNX5153, CPC B0235141) placed under the unit relieves strain on cables attached to the TOPS MPX position. Figure 3-19 shows a top and side view of the cable-management bracket. Figure 3-20 shows a side view of the bracket attached to a TOPS MPX position. The TOPS MPX cables must be properly dressed and secured to the bracket separately with Tywrap.

The design of the cable management bracket differs for the NTNX51FB position base. That bracket is NTNX5122, CPC B0237579.

**Figure 3-19**
**Cable-management bracket NTNX5153 (for NTNX51GB)**

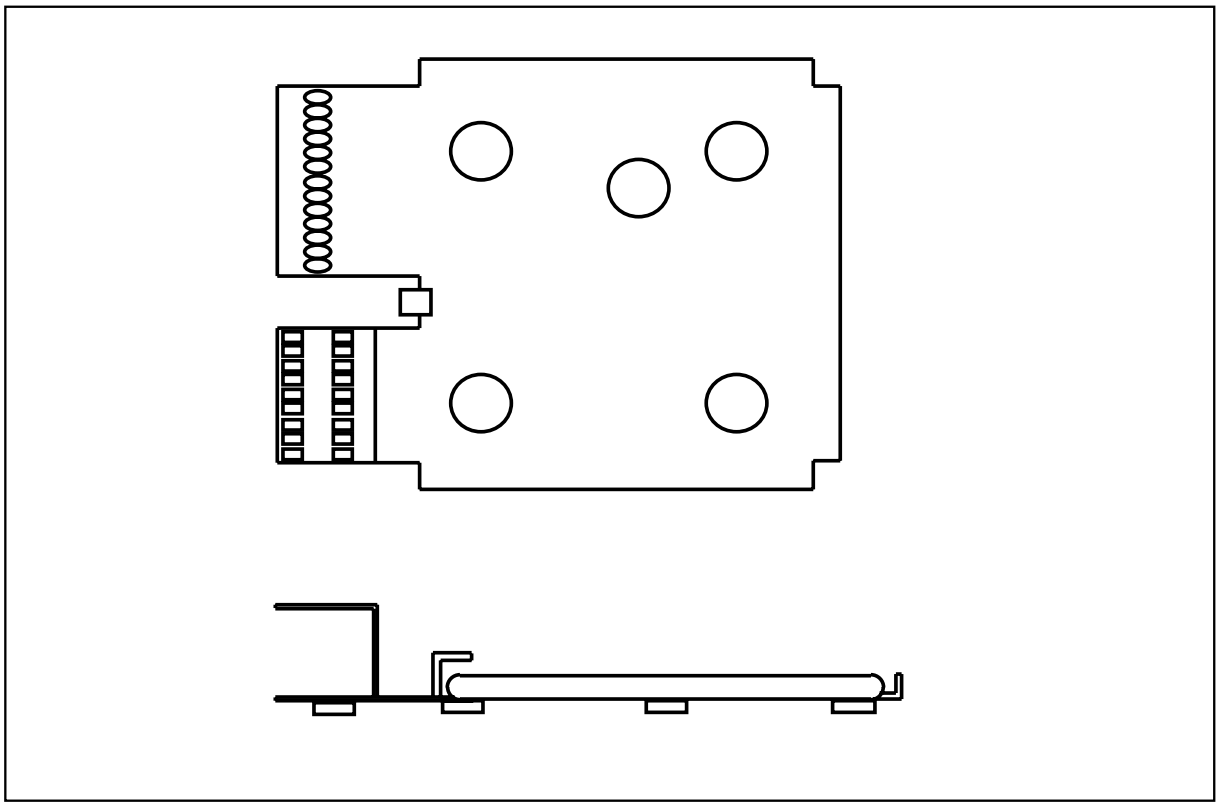
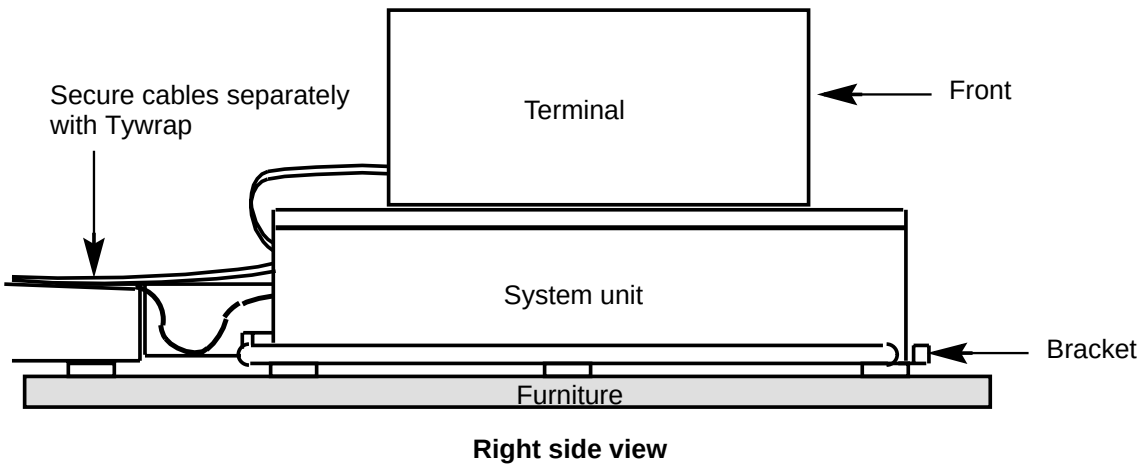


**Figure 3-20**
**Cable-management bracket - right side view**




## 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 environmental limits listed in table 3-7.

**Table 3-7**
**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-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 (audio) card, RTIC card, and token-ring card. The general operator position PS/2 base units include two plug-in cards: the DT (audio) card and the token-ring card.

The TOPS MPX cabling system components can be shipped and stored within the following environmental limits shown in table 3-8.

**Table 3-8**
**Cabling system components shipping and storage environmental limits**

| Description | Temperature | Relative humidity | Max. wet bulb |
|---|---|---|---|
| Accessories | -40° C-60° C | 5%-95% | 29.4°C |
| Cable | -40° C-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. Table 3-13 on page 3-46 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 influenced by the average work time (AWT) of the operator and the average processing time (APT) of the DMS switch for the predominant call type.

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:

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

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

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

***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.

Table 3-9 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.

**Table 3-9**
**Operator serving limits**

The values in this 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%

| 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* |
| | ROC | 20 | 171 | 101,205 | 24.9 | 562 |

* 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.

***Note 1***: The estimates above refer only to the TOPS office, not to an intervening end office as shown in the SA configuration of figure 2-2 on page 2-5.

***Note 2:*** The estimates above refer only to the TOPS office, not to the intervening end office as shown in the HOC configuration of figure 2-3 on page 2-5.

## Distribution and expansion of operator workstations

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

The maximum technical limitation for a token ring is 20 workstations. Northern Telecom recommends that redundant DMS gateway stations be used in each cluster, and that expansion be based on a growth of clusters.

### Provisioning the operator positions

The database gateway and DMS gateway positions use the same hardware, including the RTIC card. The general operator position 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.

### Database gateway position or router position

The database gateway position routes messages between the DAS and the other positions on the token ring. In the standard 20-position configuration, the database gateway positions are part of a cluster, and they provide operator functionality as well.

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.

> ***Note:*** In the optional alternative 20 + 2 configuration, there is no database gateway. Instead, two positions called routers are dedicated to the task of routing messages between the DAS and the other positions on the token ring. The routers are not part of any cluster, and they provide no operator functionality.

### DMS gateway position (VPC)

The 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 positions in the same cluster, a data link to

the TMS for communication with the DMS-200 CC. This is a 56 kb/s data link using the X.25 protocol. The link is connected from the position to a local DSU, to the TOPS MPX equipment frame, 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.

### General operator position

The 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 two plug-in cards:

- the DT (audio) card
- the token-ring card

### Maintenance/operator position

One operator position on each token ring may be equipped with a dial-up modem and additional software, enabling it to function as a combined operator/maintenance position. This optional combined position may be located in any cluster. For additional information on maintenance, refer to Chapter 9, “TOPS MPX maintenance,” in this book and to the TOPS MPX maintenance manuals listed in the “About this document” section of this book.

A General DataComm (GDC) model DC596 9.6 kb/s dial-up modem allows the maintenance position to perform remote maintenance or administrative access. The connecting cable on the modem is RS-232C cable (CPC A0600741 for position NTNX51GB, and CPC A0601464 for position NTNX51FB). Supplied with the modem is a 7-ft, 6-pin to 6-pin cable that connects the modem to an operating company-provided line.

The maintenance/operator position uses standard Teladapt connectors. The operating company is expected to provide a separate outside line and wall jack that are not part of the operator services facilities.

### 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.

Figure 3-21 shows how the DT (audio) card connects to both the DMS switch and the operator headsets.

**Figure 3-21**
**DT (audio) card links to DMS switch and headsets**

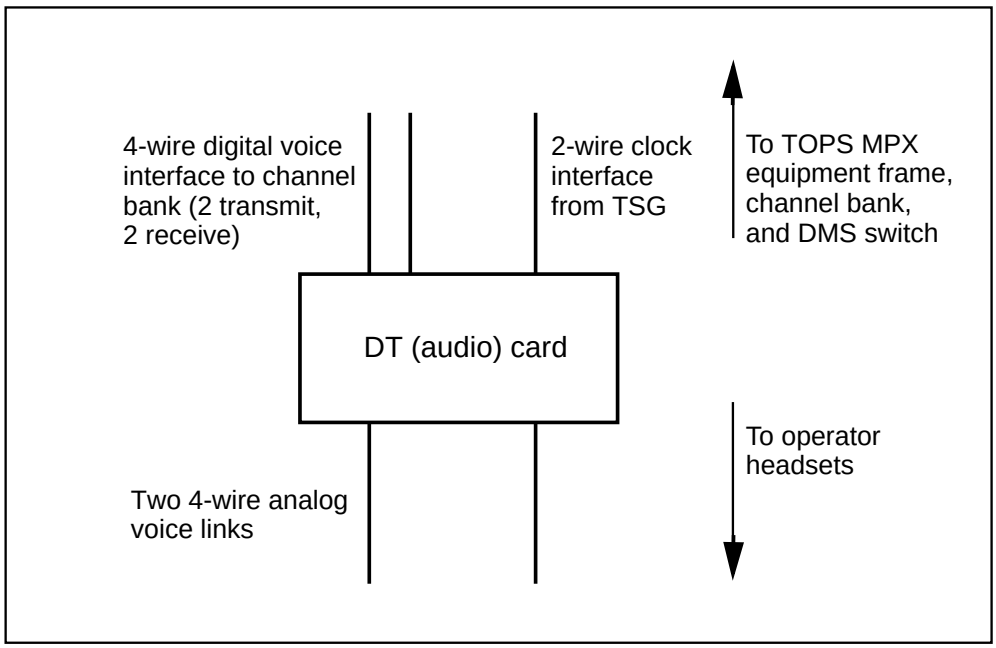
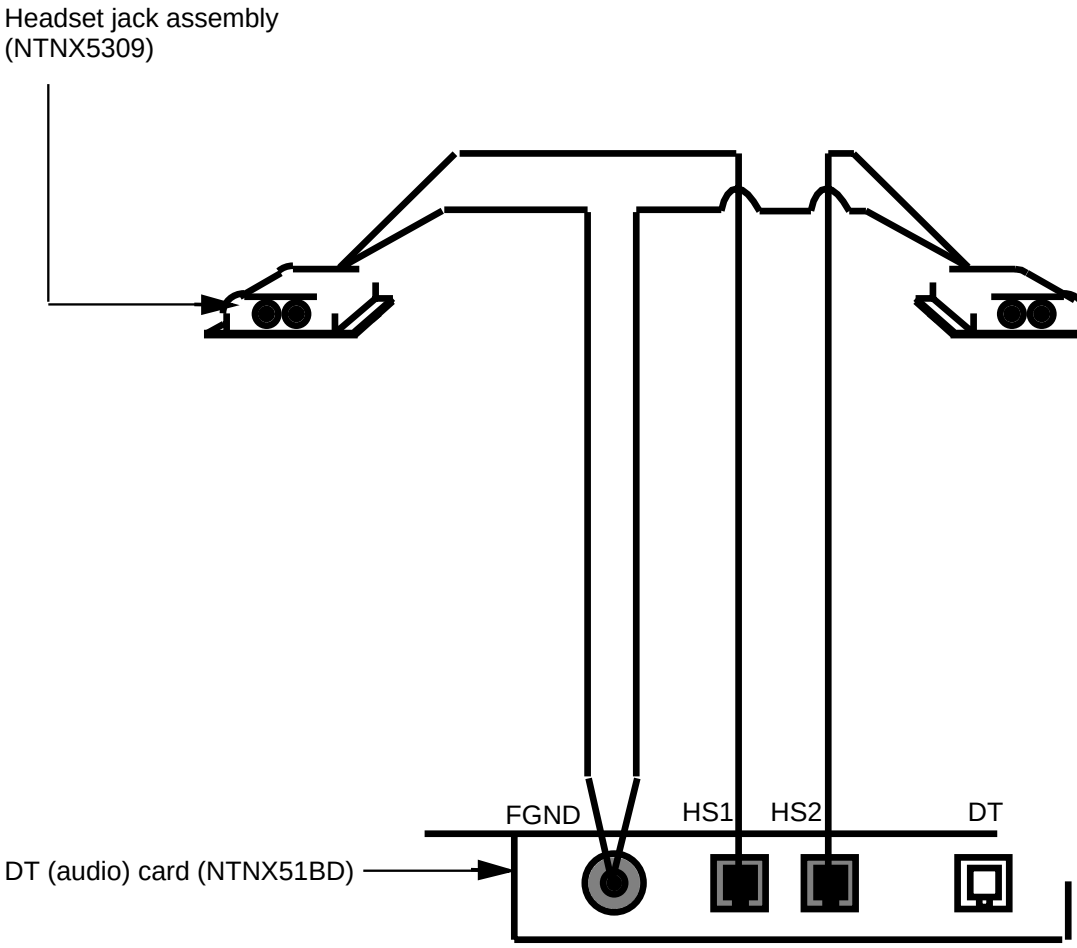



Figure 3-22 shows the headset cable connections to the DT (audio) card. Figure 3-4 on page 3-6 shows the location of the DT (audio) card.

**Figure 3-22xxx**
**Headset cable connections to DT (audio) card**




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

## Keyboard

Some TOPS MPX keys, designated as user programmable, have clear plastic keycaps. Labels are provided with the keyboard. Permanent TOPS MPX captions are printed on the fixed function keys. For an illustration of the keyboard, refer to figures 6-25 and 6-26.

### Power strip

Power strips are used to distribute ac power to TOPS MPX operator position equipment. The power cords of the power strips may have a straight-blade or a 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 UDS standalone D56 modem (CPC A0336874), a GDC 56K DSU (NTNX5154, CPC B0235487), or a GDC DC500N DSU (A0602029).

### Channel-bank units

Channel-bank equipment is provided by the operating company. The following 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.

Tables 3-10 and 3-11 describe the switch settings for the QPP684A.

**Table 3-10**
**Switch settings on the QPP684A**

| Switch | Settings |
|---|---|
| SW1 | 0 (no error correction) |
| SW2 | ZS = DIS (zero code suppression turned OFF)<br>LLB = DIS (disable latching loopback option) |
| 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) |

**Table 3-11**
**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 (TSG)

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.

**Table 3-12**
**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-200 TOPS with TMS uses the TOPS MPX provisioning guidelines. For provisioning information about the TOPS MPX positions, refer to “Position equipment packaging” on page 3-17.

### 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.

### TOPS message switch

TOPS MPX requires the TOPS message switch (TMS). The number of TMSs needed is based on 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 in the DMS switch.

### DMS conference circuits

Each TOPS MPX workstation (or operator position) requires one three-way conference circuit in the host DMS office.

### Fault Tolerant (FT) Gateway data links

The data links to the power 6/40 FT Gateway are provisioned not on the basis of TOPS MPX traffic, but according to the number of token rings. Two data links are always provided for each token ring.

### DMS call control links

The DMS CC performs call-processing and call-control functions. Redundant RS-232 data links (operating at 9.6 kb/s with X.25 protocol) are used as the interface between the DAS and the DMS switch. At the DMS switch, each data link is connected through a synchronous modem to the DAS gateway. Each modem link is connected to a multi-protocol controller (MPC) or enhanced MPC (EMPC) card in the DMS switch. The number of links is influenced by the amount of traffic in the operator service center (OSC). A maximum of 16 control links, including redundant spares, is used for each DMS switch.

***Note:*** A single DAS may support multiple DMS switches.

Although an MPC/EMPC has multiple ports, only one port is used for each card. The unused links on an MPC/EMPC may not be used for other applications. Although MPC/EMPC hardware can support data rates up to 19.2/56 kb/s, only 9.6 kb/s is used for this application of call control links to the NT DA system. Maximum throughput of an MPC for DA/INT calls is 9000/hr; maximum throughput for an EMPC is 19,000/hr.

When possible, the recommended number of MPC cards is computed as follows. A preliminary number of required MPCs is calculated by dividing 9000 into the total busy hour calls (BHC) requiring access to the DAS. The preliminary number of MPCs is doubled to provide the necessary redundancy. As shown in the following formula, this calculation indicates the total number of required MPCs:

$$\text{number of MPC cards} = 2 \left[ \frac{\text{(total BHC requiring DAS access)}}{9000} \right]$$

In situations requiring more than the limit of 16 MPC cards for each DMS switch, sparing is done to prevent a single-point failure from degrading system capacity. The MPC cards are spread over as many input/output controllers (IOCs) as possible, and spares are based on the number of MPC links that would be lost if the most heavily loaded IOC failed. For example, in an office with four IOCs and 16 MPCs, four MPCs are assigned to an IOC, so that the loss of one IOC still leaves 12 MPCs to carry the traffic.

The recommended number of EMPC cards is calculated in the same way, except that the divisor is 19,000 calls per hour.

### Delays

The influence on average work time (AWT) of the delay incurred in a 9.6 kb/s 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.

## DMS audio response trunks

Interactive Voice Subsystems (IVS) are used for automated DA and intercept call responses. Like the FT Gateway, the IVS is part of the complete Directory Assistance System (DAS). The DMS switch identifies an appropriate IVS channel and establishes a connection between the IVS and the calling party. The IVS sends the requested number over a dedicated audio response unit (ARU) trunk on standard T1 facilities between the DMS switch and the DAS. Trunks to IVSs should be provisioned based on the number of IVSs, which are provisioned based on traffic, grade of service, and redundancy requirements.

## Office provisioning

Table 3-13 lists the equipment that can be found in each office type.

**Table 3-13**
**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) |
| √ | √ | 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 |

## 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 describes the packaging and provisioning of TOPS MPX software.

## Communications base

The following software components provide for communications among the positions, the DMS switch, and the Fault Tolerant (FT) Gateway:

- Routers - The router software directs messages to and from positions on the local area network (LAN) over the X.25 datalinks with the DMS switch and the FT Gateway.
- TCP/IP - The TOPS MPX NT DA application communicates on the token-ring LAN by means of Transmission Control Protocol/Internet Protocol (TCP/IP) and User Datagram Protocol/Internet Protocol (UCP/IP) services.
- AOSS - The system software of TOPS MPX NT DA interfaces with a DMS switch by means of the Auxiliary Operator Services System (AOSS) protocol over X.25 datalinks and the token-ring LAN.
- UMP - The TOPS MPX positions interface with the DAS by means of the Universal Gateway/Position Message Protocol (UMP) over X.25 datalinks and the token-ring LAN.

## Search application software

The TOPS MPX NT DA application, running on the TOPS MPX platform, provides the same DA, customer name and address (CNA), and intercept search functionality provided by the TOPS MP terminal when accessing the same databases. This functionality is limited by the UMP messages currently used.

Using an FT Gateway front end insulates the position software from the version of the NT database running behind it. Therefore, all of the following operator assistance systems are supported:

- DAS/C V2
- DAS/C V3
- DDA
- BT DAS

- SAINT (intercept)

Future offerings will include the following databases:

- LION
- Directory One

## Feature packaging

This section identifies the software packages required for TOPS MPX NT DA. Position software packages are listed separately from switch software packages.

### Switch software

The following package is needed for each standalone DMS switch supporting TOPS MPX NT DA:

- NTXC38AA TOPS MPX STD DA Terminal (Standalone/Host)

These packages are needed for each host DMS switch supporting TOPS MPX NT DA:

- NTXC38AA TOPS MPX STD DA Terminal (Standalone/Host)
- NTX039AA Host OC Data Link Handling
- NTX873AA Host TOPS MP OC Data Link Handling

The following package is needed for each remote DMS switch supporting TOPS MPX NT DA:

- NTXC39AA TOPS MPX STD DA Terminal (Remote)

Table 4-1 provides a detailed breakdown of these software packages. Optional ADAS packages are listed separately following table 4-1.

**Table 4-1xxx**
**TOPS MPX software packages**

| PACKAGE | DESCRIPTION |
|---|---|
| NTXC38AA | TOPS MPX STD DA Terminal (Standalone/Host): The master package for the host office includes the software needed for the TOPS MPX operator positions:<br>NTX030BA: TOPS ACD Features<br>NTX030CC: TOPS Call Processing Features<br>NTX273AA: Multi-Protocol Converter BX.25<br>NTX645AA: TOPS - Service Billing<br>NTX892AA: MPC Multilink Management<br>NTXA28AA: TOPS AWT Enhancements<br>NTXA62AA: TOPS MP - DA Audio Response Call Handling<br>NTXA63AA: Directory Assistance/Intercept CC Messaging<br>NTXA83AA: TOPS Message Switch<br>NTXE00AA: TOPS Operator Password<br>NTXE70AA: TOPS Two Terminal Directory Assistance/Intercept<br>NTXJ67AA: TOPS DA Subtending TMS |
| NTXC39AA | TOPS MPX STD DA Terminal (Remote): The master package for the remote office includes the following software feature packages:<br>NTX030CC: TOPS Call Processing Features<br>NTX134BA: Remote Operator Centralization Data Link Handling<br>NTX273AA: Multi-Protocol Converter BX.25<br>NTX645AA: TOPS - Service Billing<br>NTX871AA: Remote TOPS MP O.C. Data Link Handling<br>NTX892AA: MPC Multilink Management<br>NTXA28AA: TOPS AWT Enhancements<br>NTXA62AA: TOPS MP - DA Audio Response Call Handling<br>NTXA63AA: Directory Assistance/Intercept CC Messaging<br>NTXE70AA: TOPS Two Terminal Directory Assistance/Intercept |
| NTX039AA | Host OC Data Link Handling |
| NTX873AA | Host TOPS MP O.C. - Data Link Handling |

**-continued-**

**Table 4-1xxx**
**TOPS MPX software packages** (continued)

| PACKAGE | DESCRIPTION |
|---|---|
| NTX801AA: | Toll Features I |
| The following optional feature packages are also available: | |
| NTX270AA: | New Peripheral Maintenance Package |
| NTXE34AA: | TOPS E911 |
| NTXJ37AA: | TOPS External Personal Audio Response System (PARS) |
| NTXJ96AA: | Enhanced MFADS |
| NTXN04AA: | PARS Remote |
| NTXN49AA: | Automated Intercept Call Completion |
| NTXN52AA: | Two-Digit ANI ID - TOPS Office |
| NTXN54AA: | Host/Remote Networking via Call Type |
| NTXP41AA: | TOPS Host Queue Management System |
| NTXP42AA: | TOPS Remote Queue Management System |
| NTXR48AA: | QMS: Call and Agent Manager |
| NTXQ40AA: | SSP 800 Overflow Call Routing |
| NTXR50AA: | QMS External Management Information System (MIS) Interface |
| **End** | |

### ADAS software packaging

ADAS APU, NTG320AA, requires the following software packages (subsets of prerequisite packages are listed below each prerequisite package):

- NTXQ23AA - TOPS ADAS
  - NTXA62AA - TOPS DA Audio Response Call Handling
  - NTXH77AA - Channelized Access on LPP/LIS
  - NTG310AA - EIU Peripheral Load for SuperNode OPC
  - NTXF20AA - LMS on LPP
- NTXS31AA - Enhanced Service Resource Management
  - NTXS11AA - File Transfer Protocol (DARPA)
  - NTXS30AA - UAE/UNIX Conversant Software
- NTXS30AA - UAE/UNIX Conversant Software
- NTXS29AA - APU Maintenance
  - NTXF19AA - TCP/IP Protocols
  - NTXF05AA - EIU
  - NTXN18AA - LIU Base
- NTXS32AA - APU SOS, UNIX Base

- NTG322AA - VPU
- NTG321AA - OA&M Position
- NTXE71AA - TOPS Directory Assistance/Toll Branding (optional)

## Position software

The position software for TOPS MPX NT DA is delivered on 3.5-inch diskettes for the IBM PS/2 1.44 MByte drive.

A version number on the load diskette set indicates the revision level. Each software package on the diskettes is also assigned a version number. When any software package version is changed, the revision level of the diskette set is increased.

For each operator position, provide the packages listed in table 4-2.

**Table 4-2xxx**
**Software packages for each operator position**

| Package ID | Description |
|---|---|
| NTG384AA | Operating System Module |
| NTG383AA | Task Manager Module |
| NTG325AA | LAN Manager Module |
| NTG329AA | Network Communication Module |
| NTG326AA | NAS DA Application and Base |

For each combined operator/maintenance position, provide the packages listed in table 4-3.

**Table 4-3xxx**
**Software packages for each combined operator/maintenance position**

| Package ID | Description |
|---|---|
| NTG384AA | Operating System Module |
| NTG383AA | Task Manager Module |
| NTG325AA | LAN Manager Module |
| NTG329AA | Network Communication Module |
| NTG326AA | NAS DA Application and Base |
| NTG328AA | LAN Access Module (maintenance position only) |

For each gateway position, provide the packages listed in table 4-4.

**Table 4-4xxx**
**Software packages for each gateway position**

| Package ID | Description |
|---|---|
| NTG384AA | Operating System Module |
| NTG383AA | Task Manager Module |
| NTG325AA | LAN Manager Module |
| NTG329AA | Network Communication Module |
| NTG326AA | NAS DA Application and Base |
| NTG327AA | Gateway Communication Module |

# TOPS MPX capacity and performance

The DMS-100 Family architecture provides distributed processing over three switching stages, of which the core 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 nondeferable 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. Figure 5-1 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 table 3-9 on page 3-35.

- 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% or 612,000 ms per hour.

- MPC/EMPC messaging

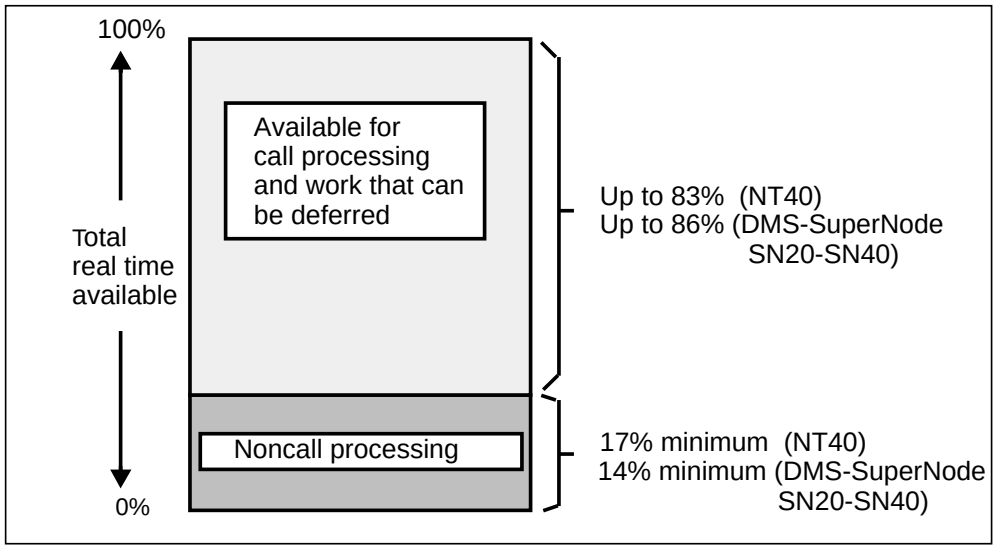
  The total MPC/EMPC messages per second affects the overall performance of TOPS MPX. If the total messages per second is too high, the MPC discards messages, thus degrading TOPS MPX grade of service (GOS).

- 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.

For additional information on TOPS MPX capacity and performance factors, refer to *TOPS MPX Planning and Engineering Guide*, 297-2291-155, chapter 4, "Determining service requirements."

**Figure 5-1xxx**
**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

Because TOPS MPX utilizes commercial hardware, mean time between failures (MTBF) for the TOPS MPX terminal is five years, assuming the system is used 40 hours a week and powered down after use. If system power is constantly on, the 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 table 5-1.

**Table 5-1xxx**
**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 table 5-2.

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

**Table 5-2xxx**
**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 |

# TOPS MPX features

This chapter describes the screens and keyboards of TOPS MPX NT DA, 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.

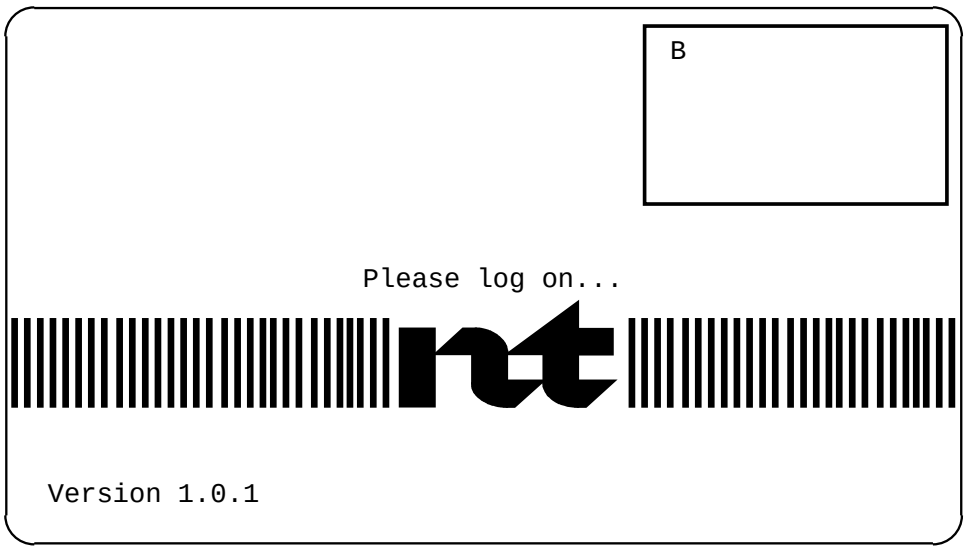
### TOPS MPX general operator screens

TOPS MPX NT DA has three screens: the logon screen, the options menu screen, and the directory assistance (DA) service screen.

#### Logon screen

Initially, the logon screen displays only the Northern Telecom (NT) logo and a TOPS MPX system message, as shown in figure 6-1. There is also a separate logon window.

**Figure 6-1xxx**
**NT DA logon screen**



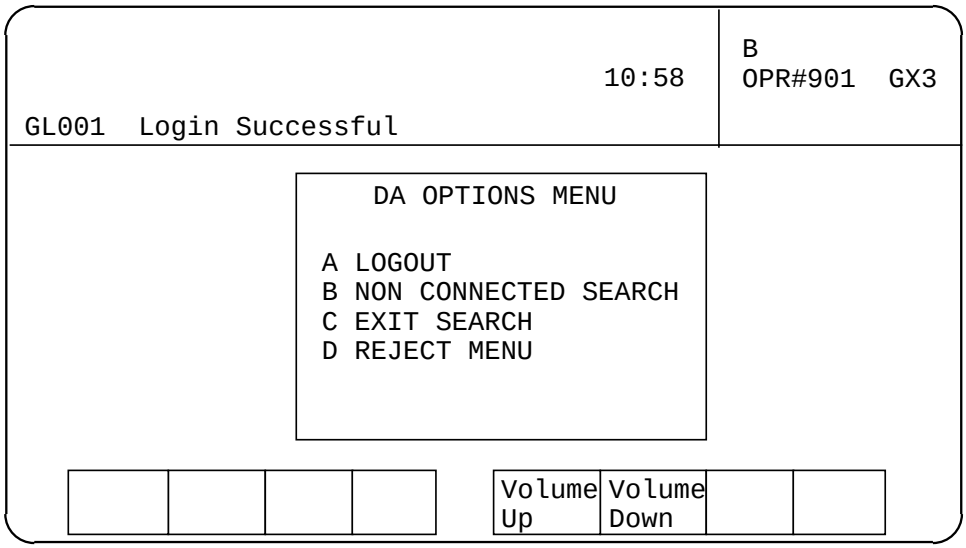
The message on this screen changes as the position is connected with the switch and as the operator seats the headset. The NT logo is replaced by a window for entering the operator's ID and password.

## Options menu screen

When the operator has logged in, the options menu screen appears, as shown in figure 6-2. This screen displays soft keys, a message/status area, and a blank listings area. Soft function keys at the bottom of the screen allow the operator to adjust the headset volume.

This background or idle screen appears when the operator either logs on or accesses the options menu by pressing the **Opts** key. It also appears when no call has been presented to the position or when the operator is doing other administrative tasks.

**Figure 6-2xxx**
**Options menu screen**




When the operator presses the **Make Busy** key, the search screen displays and the position is ready to begin answering calls from customers and conducting searches.

## Service screen

All DA, CNA, and intercept searches are performed from the NT DA service screen. This section describes the distinguishing characteristics of the NT DA service screen.

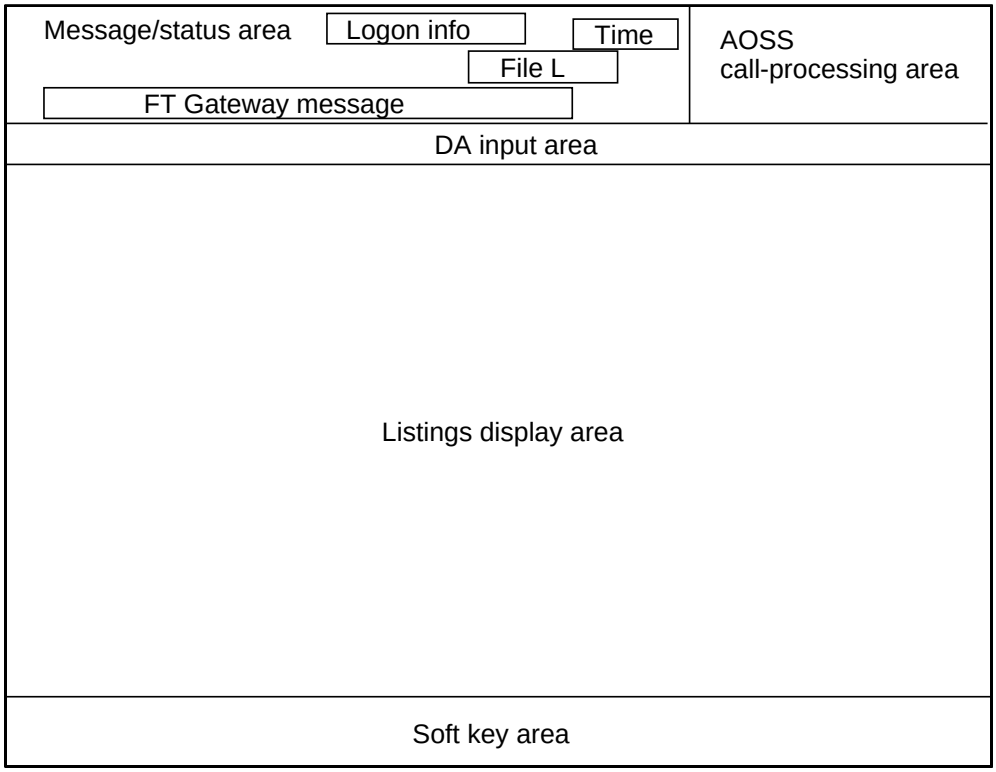
The DA service screen is organized into five separate areas:

- message/status area
- AOSS call-processing area

- DA input area
- listings display area
- soft key area

Figure 6-3 shows the layout of the NT DA service screen.

**Figure 6-3xxx**
**NT DA service screen layout**




The following paragraphs describe the screen areas shown in figure 6-3.

**Message/status area** The message/status area consists of the top four lines of the screen. In this area the DA application has access to various output fields. It uses these fields to present informational messages to the operator. A seven-character field on the third line is used to indicate the search file (or type). This is followed by a one-character language indicator, a 44-character field on the fourth line used for displaying Fault Tolerant (FT) Gateway status messages (including call ID and reconnect count), and a pair of 10-character fields on the first line used for logon information.

The files (or search types) available depend on the particular application in use. These may be datafilled. The following datafill examples are typical:

- RES - residential

- BUS - business
- GOV - government
- SPE - special

Each search type may be supplemented with secondary searches in the following ways:

- P - phonetic
- K - keyword
- X - expanded location
- F - full set

Typical language indicators are E (English), F (French), and S (Spanish). The language indicator shows the language for automatic announcement for the current call if the position is datafilled for language selection. Pressing the **Alt Lang** key toggles the selection between the primary and secondary languages. The indicator shows which is currently selected.

The FT Gateway status messages begin with a call ID in columns 1-7 and end with a reconnect count in column 44. Status messages located between them are described in the FT Gateway documentation.

As long as logon to the DMS switch is incomplete, the message `No AOSS` is displayed in the logon information area. When logon to the DA FT Gateway is incomplete, the message `No DA` is displayed.

**AOSS call-processing area** The AOSS call-processing display is a four-line by sixteen-column character display located in the upper right-hand corner of the screen. These character displays are described in this chapter.

**DA input area** Under the message/status area is the input line, line 6 on the TOPS MPX screen. The input line contains the fields for entering DA, intercept, and CNA search information. There are eight fields: the first six are nine characters long, and the last two are four characters long. Locality may be entered by pressing a locality soft key, or it may be keyed in manually.

**Listings display area** The various NT databases each implement the listings display area in slightly different ways. The presentation of the listings display area is determined by the DA system, not by the TOPS MPX position.

**Soft key area** At the bottom of the screen are eight soft key labels corresponding to the eight unlabeled keys in the top row of the main keyboard. Both shifted and unshifted values are supported. Initially the soft key labels are blank. When a DA search is to be made, the soft key labels

indicate the localities available. When the options menu is selected, the soft key labels indicate volume up and volume down for headset volume control.

### Messages displayed in the AOSS call-processing area

The AOSS call-processing area is divided into four groups, each 16 characters long, in which call-processing information is displayed. Figure 6-4 shows the location and layout of these groups on the screen. Each group is shown in figures 6-5 through 6-8 and described in tables 6-1 through 6-4. The following sections illustrate and explain what appears in each group.

Brackets (<>) enclosing a display indicate that the display appears in flashing mode. Lowercase letters serve 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.

**Figure 6-4**
**Groups in the AOSS call-processing area**

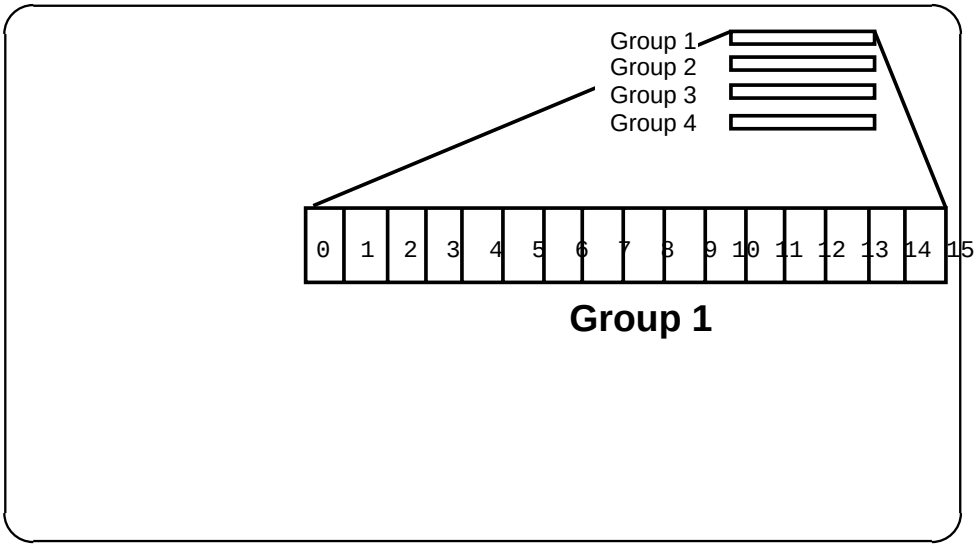


**Figure 6-5xxx**
**Call-processing messages displayed in group 1**

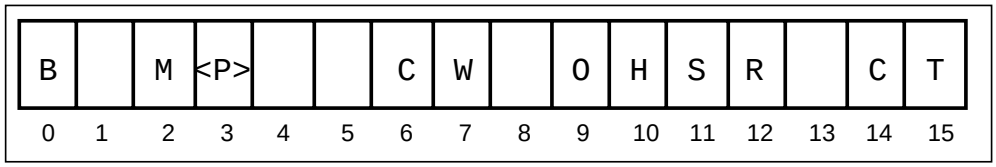



**Table 6-1**
**Call-processing messages displayed in group 1**

| 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. |
| M | 2 | Position is being monitored by a service assistant or in-charge (IC) manager. 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 IC manager. 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 assistance (SA) or IC 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 switch 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 | No Interactive Voice Subsystem (IVS) is available, and the operator must verbally quote the requested number to the calling party. |

**-continued-**

**Table 6-1**
**Call-processing 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. For details on the study register system, refer to *TOPS MPX Force Management Guide,* 297-2291-310. |
| **End** | | |

**Figure 6-6**
**Call-processing messages displayed in group 2**

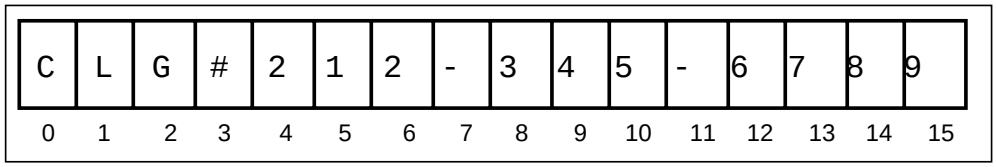



**Table 6-2**
**Call-processing messages displayed in group 2**

| 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 IC manager who paged the operator. |
| G | 11 | The operator logged on is a general operator and will receive calls from the general queue. |
| 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**. |

**-continued-**

**Table 6-2**
**Call-processing messages displayed in group 2** (continued)

| Display | Column number | Explanation |
|---|---|---|
| CLG#xxx-xxx-xxxx | 0-15 | A valid calling number was entered. |
| CLG#<xxxxxxxxxxxx> | 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#<xxxxxxxxxxxx> | 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 **Cld** + OGT trunk number + **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#<xxxxxxxxxxxx> | 0-15 | An invalid forward number was entered. The invalid number is displayed. |
| CLD#xx | 0-9<br>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<br>0-5 | An invalid two-digit OGT code was entered for the called number. |

**End**

**Figure 6-7**
**Call-processing messages displayed in group 3**

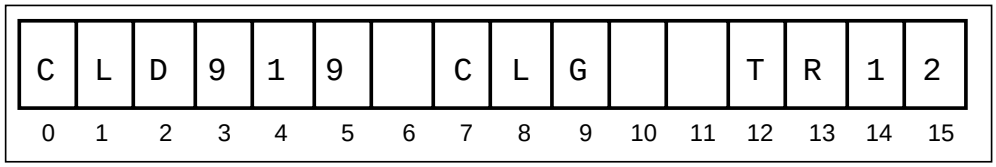



**Table 6-3**
**Call-processing messages displayed in group 3**

| Display | Column number | Explanation |
|---|---|---|
| RCL | 0-2 | The call is a recall (reconnect) 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 because of IVS 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. |
| 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 Rls**. |
| <CLG> | 7-9 | The subscriber is on hold (the operator has pressed the **Split/Join** key). The operator must press **Split/Join** to re-establish the subscriber voice connection. |

**-continued-**

**Table 6-3**
**Call-processing messages displayed in group 3** (continued)

| Display | Column number | Explanation |
|---|---|---|
| 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** | | |

**Figure 6-8xxx**
**Call-processing messages displayed in group 4**

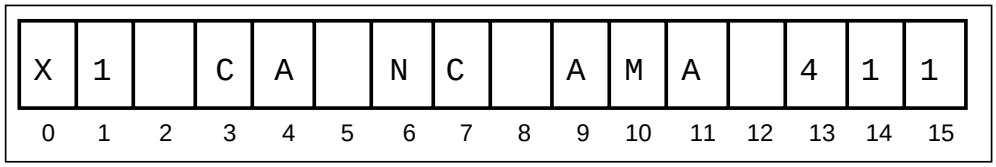



**Table 6-4**
**Call-processing messages displayed in group 4**

| 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 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. |

**-continued-**

**Table 6-4**
**Call-processing messages displayed in group 4** (continued)

| Display | Column number | Explanation |
|---|---|---|
| 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. |
| 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.<br><br>***Note***: Three-character customized screen displays can be used out of table TOPS. |
| **End** | | |

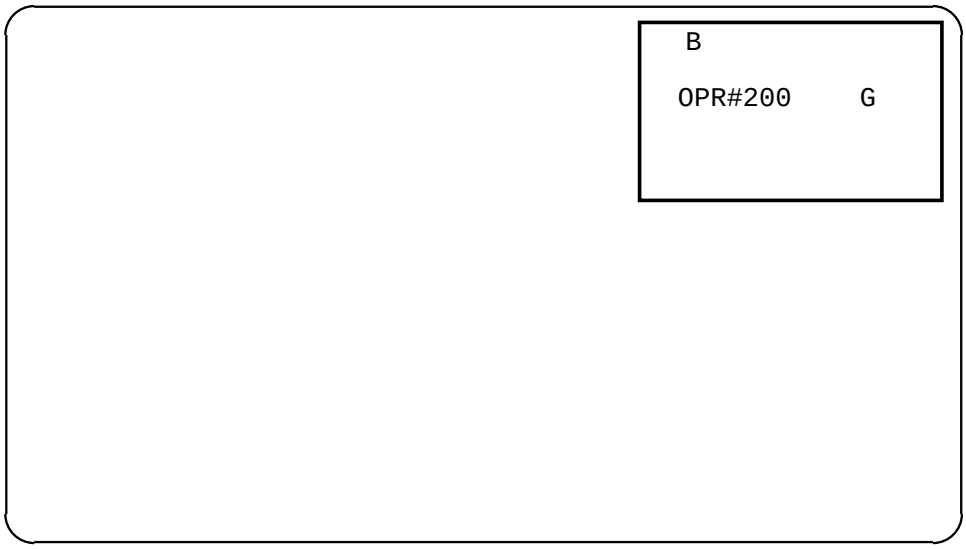
***Note:*** Severe ANI failure refers to a call arriving on an originating trunk group.

### Effects of QMS on the operator position screen

The following paragraphs describe the effects of QMS on the operator position screen.

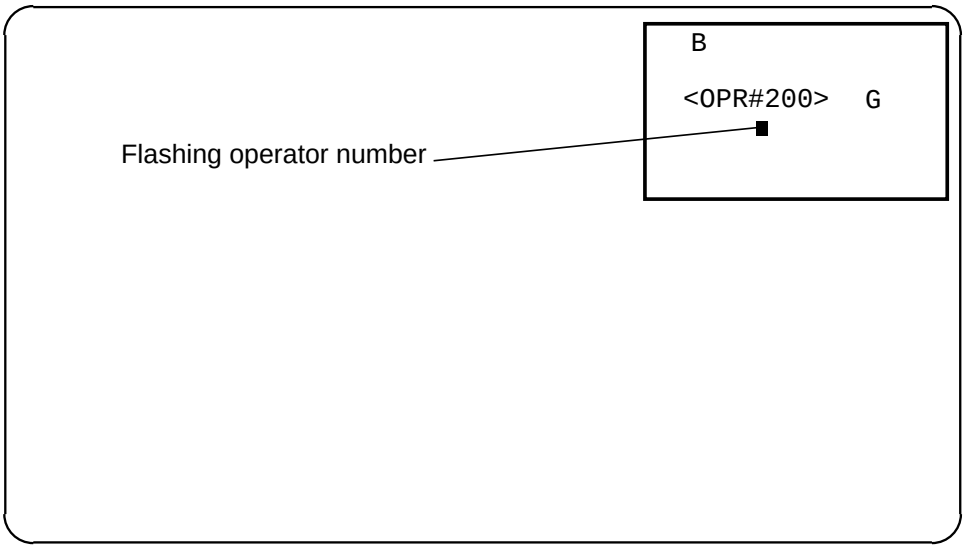
**Logging on to a position with QMS** A successful QMS logon screen (before pressing the **Make Busy** key to accept calls) is shown in figure 6-9. The letter `G` in this example refers to the classification of general operator.

**Figure 6-9xxx**
**Example of successful logon to QMS position**



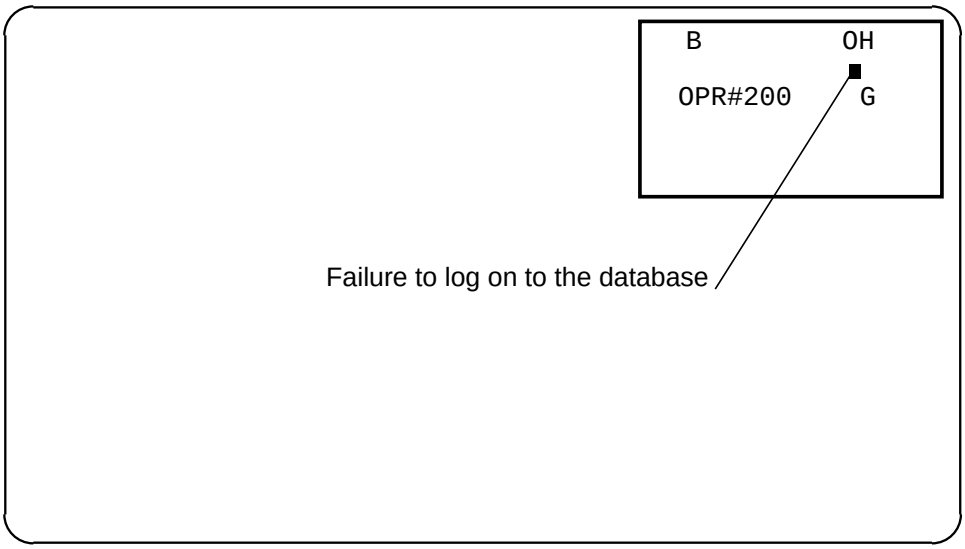

**Unsuccessful logon to the position** An unsuccessful logon can occur by entering wrong data or using an improper keying sequence. Figure 6-10 is an example of the position screen with an unsuccessful logon indication (flashing operator number).

**Figure 6-10xxx**
**Unsuccessful logon attempt**



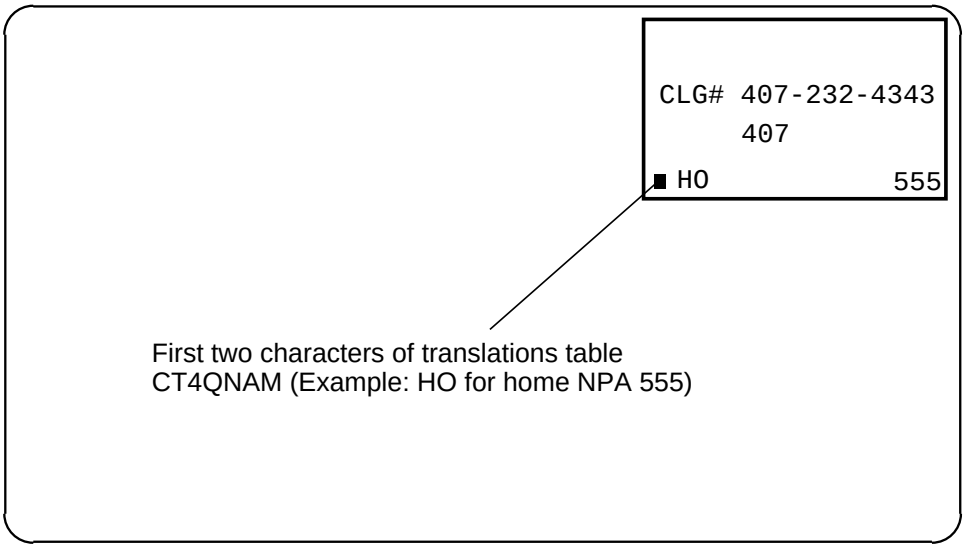

**Unsuccessful logon to the database** In the event of a failure to log on to the database (such as directory assistance), the indicator `OH` (operator handled) is shown on the screen (figure 6-11). The operator still receives calls for that service, but the calls have to be processed manually (as locally directed) or the subscriber is instructed to hang up and try the call again.

**Figure 6-11xxx**
**Failure to log on to the database**



**Receiving a call** When a call request is received at the switch, the TOPS call-processing program of the DMS switch searches for an idle position with a position profile that matches the requirements of the call. When the required position is found, the call is sent to the position. Figure 6-12 shows an example of a call at the operator position.

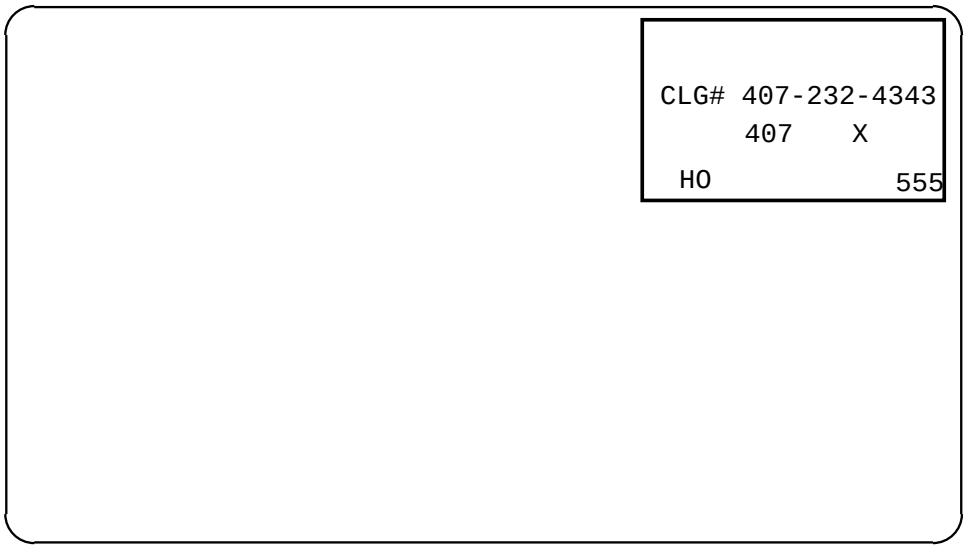
**Figure 6-12xxx**
**Screen display of 555 directory assistance call arrival**




**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 it to another operator who can complete it (through a change of CT4Q or language mark), or to mark the call for recall (reconnect). 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** Figure 6-13 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 (reconnect), the X does not appear, but the CT4Q display changes to the recall indicator.

**Figure 6-13xxx**
**Screen during call-transfer sequence before position release**




## TOPS MPX IC position screen

The IC 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.

In a TOPS MPX environment, the IC position has two types of displays. The first 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 IC position screen displays the following force management information:

- current status of operator positions
- miscellaneous system information

In addition, the IC position performs the following tasks:

- accepts assistance requests
- monitors an operator
- pages an operator
- connects a forward party
- performs administrative searches of the DAS

The TOPS MPX IC position screen (and the SA screen as well) is divided into two major areas, the DAS area and the AOSS call-processing area, as illustrated in figure 6-14. Call-processing displays are arranged in a stack at the top right of the screen, in four groups of sixteen characters.

The four groups contain statistics for four queues. For example, call-processing 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-processing area 1. Each group is shown in figures 6-15 through 6-18 and described in tables 6-5 through 6-8.

> ***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 "Effects of QMS on TOPS MPX SA and IC screens" on page 6-27.

**Figure 6-14xxx**
**AOSS call-processing area on TOPS MPX IC or SA screen**

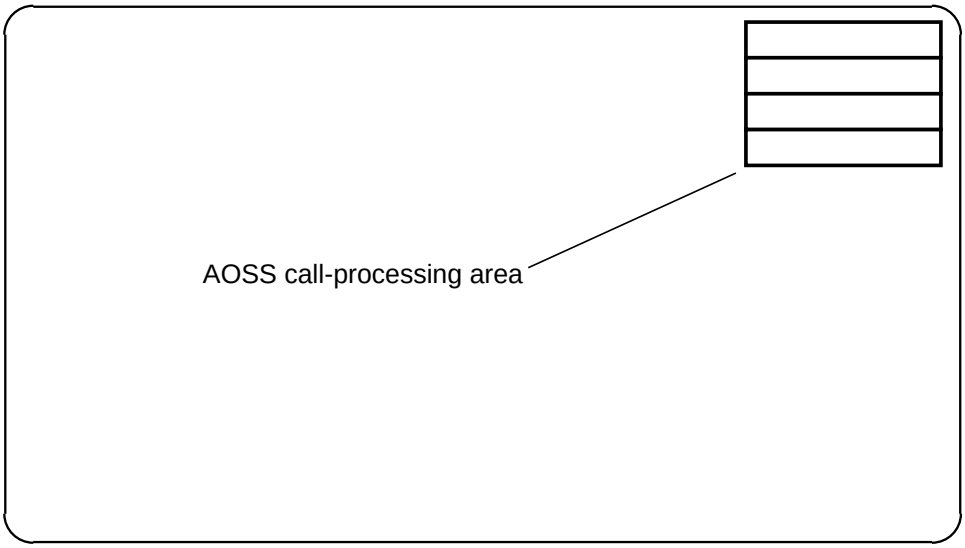


**Figure 6-15xxx**
**IC screen - messages displayed in group 1**

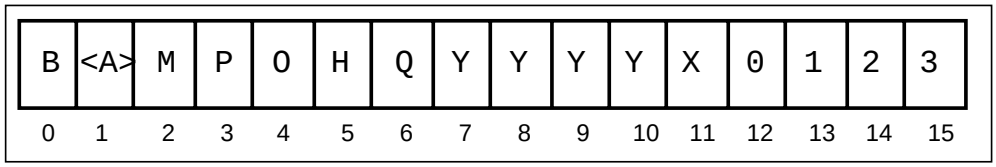



**Table 6-5**
**IC screen - messages displayed in group 1**

| Display | Column number | Explanation |
|---|---|---|
| B | 0 | Indicates that the IC position is in the busy state. Status displays appear even when the position is idle. |
| D | 0 | Indicates that the IC position is accepting directed assistance requests only. |
| <A> | 1 | Flashes to indicate that no assistance positions are available. |
| M | 2 | Indicates that the IC position is monitoring a general operator; this item also displays when any other SA position is monitoring. |
| P | 3 | Indicates that a general operator is being paged. |
| OH | 4-5 | Signifies an operator-handled traffic condition. The voice response data links are down, and operators must provide voice response on all queries. The Sonalert is sounded. |
| QYYYY | 6-10 | Indicates that a general assistance request in in queue; the Ys indicate the position of the operator making the request. |
| X0123 | 11-15 | Signifies that calls are either waiting (steady) or being deflected (flashing) and indicates the number of the queue (0, 1, 2, or 3). |

**Figure 6-16xxx**
**IC screen - messages displayed in group 2**

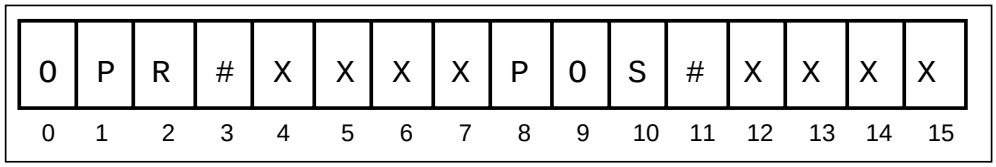



**Table 6-6**
**IC screen - messages displayed in group 2**

| Display | Column number | Explanation |
|---|---|---|
| REL BY | 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. |
| XXX-XXX-XXXX | 0-13 | Indicates a forward number entered by the IC manager. It 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 | 4-5 | Indicates that a two-digit OGT code was entered by the IC manager. |
| ACW XX | 0-7 | Indicates the number of general operator/service assistants in queue on loop 2; the XX represents the requests. If flashing, the queue is full. |
| POS#XXXX | 0-7 | Indicates the position number of the general operators requesting assistance; displays in this location for a general request arriving on loop 1. If flashing, loop 2 is on hold. |
| OPR#XXXX | 0-7 | Indicates the operator number of the general operator, service assistant, or IC manager requesting assistance. Displays in this location for a directed request arriving on loop 2. If flashing, loop 2 is on hold. Also displayed during SA logon and to indicate that paging of the operator number XXXX has been initiated. |
| ACW XX | 8-15 | Indicates the number of general operator/service assistants in queue on loop 1; the XX represents the requests. If flashing, the queue is full. |

**-continued-**

**Table 6-6**
**IC screen - messages displayed in group 2**(continued)

| Display | Column number | Explanation |
|---|---|---|
| POS#XXXX | 8-15 | Indicates the position number of the general operator, the service assistant, or IC manager requesting assistance and displays in this location for a general request arriving on loop 2. If flashing, loop 2 is on hold. |
| OPR#XXXX | 8-15 | Indicates the operator number of the general operator requesting assistance. Displays in this location for a general request arriving on loop 1. If flashing, loop 2 is on hold. |
| IMA | 8-10 | Displays at logon to indicate that the position is an IC position (I), with service assistant (A), and monitoring capabilities (M). |
| CLD | 13-15 | Specifies called supervision. |
| **End** | | |

**Figure 6-17xxx**
**IC screen - messages displayed in group 3**

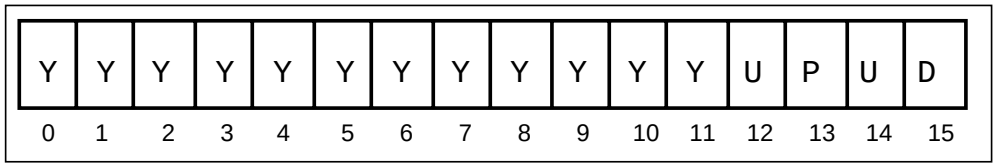



**Table 6-7**
**IC screen - messages displayed in group 3**

| Display | Column number | Explanation |
|---|---|---|
| YYY | 0-2 | Show the total number of general operator positions in this IC team currently occupied. If no positions are occupied, a zero flashes. |
| YYY | 3-5 | Show the total number of general operator positions in this IC team serving the XFR1 queue and currently occupied. If none are, a zero flashes. |
| YYY | 6-8 | Show the total number of general operator positions in this IC team serving the XFR2 queue and currently occupied. If none are, a zero flashes. |
| YYY | 9-11 | Show the total number of general operator positions in this IC team serving the XFR DA queue and currently occupied. If none are, a zero flashes. |
| UP | 12-13 | Indicates that an unsupervised call is in progress at a position that is not logged on. |
| UD | 14-15 | Indicates that an unsupervised call has disconnected. |

**Figure 6-18xxx**
**IC screen - messages displayed in group 4**

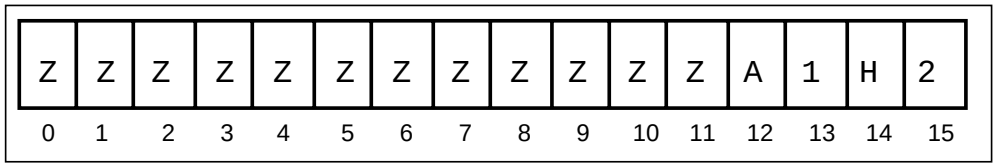



**Table 6-8**
**IC screen - messages displayed in group 4**

| Display | Column number | Explanation |
|---|---|---|
| ZZZ | 0-2 | Show the total number of general operator positions in this IC team currently in a made busy state. If none are, a zero displays. |
| ZZZ | 3-5 | Show the total number of general operator positions in this IC team serving the XFR1 queue and currently made busy. If none are, a zero displays. |
| ZZZ | 6-8 | Show the total number of general operator positions in this IC team serving the XFR2 queue and currently made busy. If none are, a zero displays. |
| ZZZ | 9-11 | Show the total number of general operator positions in this IC team serving the XFR DA queue and currently made busy. If none are, a zero displays. |
| A1 | 12-13 | Indicates that loop 1 has been accessed. |
| A2 | 12-13 | Indicates that loop 2 has been accessed. |
| H1 | 14-15 | Indicates that loop 1 is on hold. |
| H2 | 14-15 | Indicates that loop 2 is on hold. |

## IC ten-second scan displays

The TOPS MPX IC 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, data appears in character positions 0-11 of group 3.

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

### TOPS MPX SA position screen

SA positions are provided in the traffic office. They consist of a specially configured TOPS MPX keyboard and screen. The screen and keyboard are the same as for the IC position.

The service assistant performs the following functions at the SA position:

- receives assistance requests from operators
- monitors operators
- pages operators
- performs administrative searches

The main difference between the SA and IC position screens is in the data that appears in the four 16-character fields in the AOSS call-processing area. Each group is shown in figures 6-19 through 6-22 and described in tables 6-9 through 6-12.

**Figure 6-19xxx**
**SA screen - messages displayed in group 1**

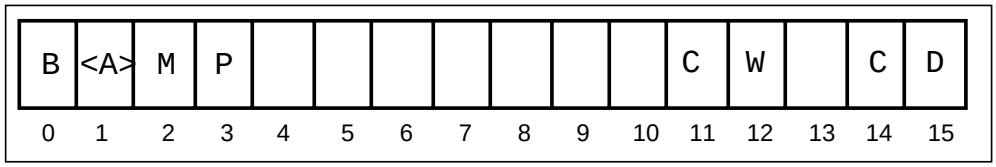



**Table 6-9**
**SA screen - messages displayed in group 1**

| Display | Column number | Explanation |
|---|---|---|
| B | 0 | Indicates that the SA position is busy, not accepting calls. |
| <A> | 1 | Flashes to indicate that no assistance positions are available. |
| M | 2 | Indicates that the SA position is monitoring a general operator. |
| P | 3 | Indicates that the position is paging a general operator. |
| CW | 11-12 | Indicates that the number of calls waiting to be handled is greater than the threshold value. |
| CD | 14-15 | Indicates that the number of calls waiting has reached a threshold at which calls have begun to deflect. |

**Figure 6-20xxx**
**SA screen - messages displayed in group 2**

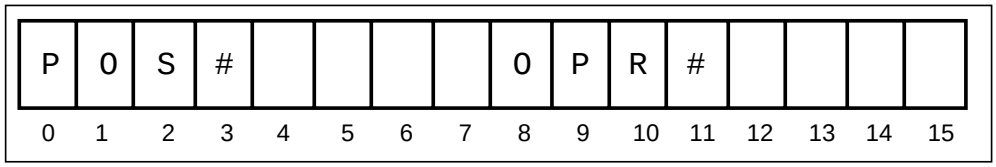



**Table 6-10**
**SA screen - messages displayed in group 2**

| Display | Column number | Explanation |
|---|---|---|
| CLD#XXX-XXX-XXXX | 0-15 | Displays the forward number entered by the service assistant. This number may be a one-or 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 | 0-9 | Indicates that a two-digit OGT code has been entered by the service assistant. |
| OPR#XXXX | 0-7 | Displays the operator number of the general operator, the service assistant, or the IC manager requesting assistance on loop 2; columns 8-15 are for requests on loop 1. |
| POS#XXXX | 0-7 | Displays the position number of the general operator requesting assistance on loop 1; if flashing, loop 1 is on hold. |
| POS#XXXX | 8-15 | Displays the position number of the general operator, the service assistant, or the IC manager requesting assistance on loop 2; if flashing, the loop is on hold. |
| MA | 9-10 | Indicates that the service assistant has monitoring abilities. |

**Figure 6-21xxx**
**SA screen - messages displayed in group 3**

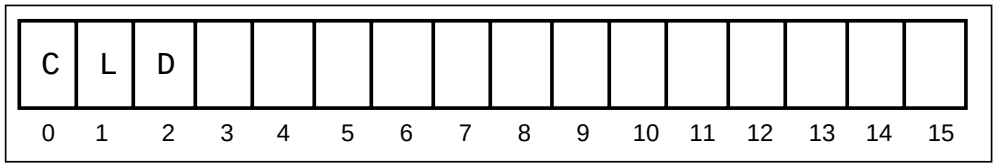



**Table 6-11**
**SA screen - messages displayed in group 3**

| Display | Column number | Explanation |
|---|---|---|
| CLD | 0-2 | Displays when the forward (called) party is on-hook. |

**Figure 6-22xxx**
**SA screen - messages displayed in group 4**

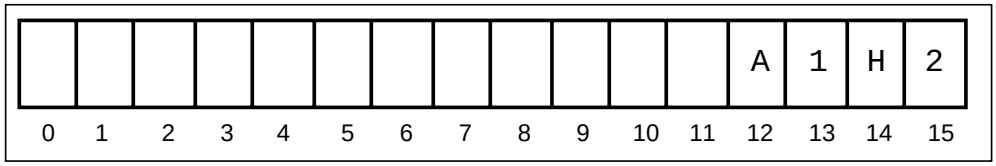



**Table 6-12**
**SA screen - messages displayed in group 4**

| Display | Column number | Explanation |
|---|---|---|
| A1 | 12-13 | Indicates that loop 1 has been accessed. |
| H1 | 12-13 | Indicates that loop 1 is on hold. |
| A2 | 14-15 | Indicates that loop 2 has been accessed. |
| H2 | 14-15 | Indicates that loop 2 is on hold. |

## Effects of QMS on 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. The 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 QMSCQDEF.)

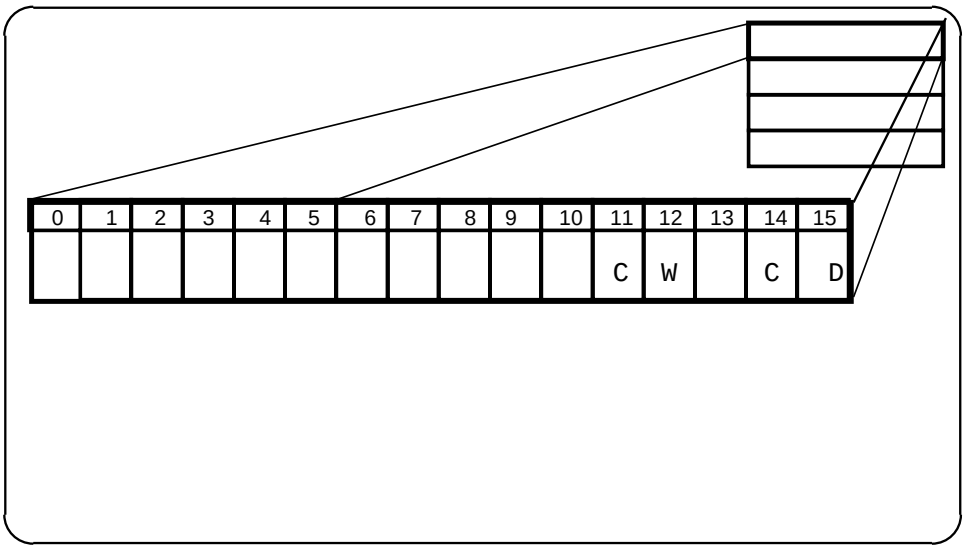
IC positions associated with QMS teams have real-time statistics displayed at their positions for back-up purposes. These indicate the total statistics for the positions in their respective teams. The statistics displayed include, for example, the number of positions on the team in made-busy state, the 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 figures 6-23 and 6-24. On SA and IC positions associated with QMS teams, the CW and CD statuses are not displayed for each queue.

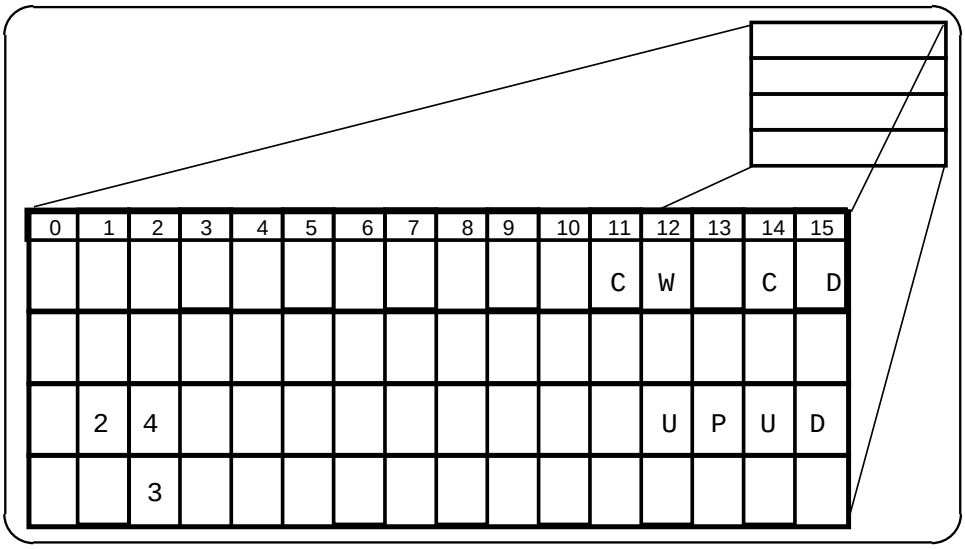
***Note:*** The QCQ display is not supported on TOPS MPX SA and IC screens. It does appear, however, on the FMCRT screen.

**Figure 6-23**
**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 figure 6-24. The IC positions associated with QMS teams do not display statistics for each queue.

**Figure 6-24xxx**
**TOPS MPX IC position screen with QMS**




In the third row of figure 6-24, 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.

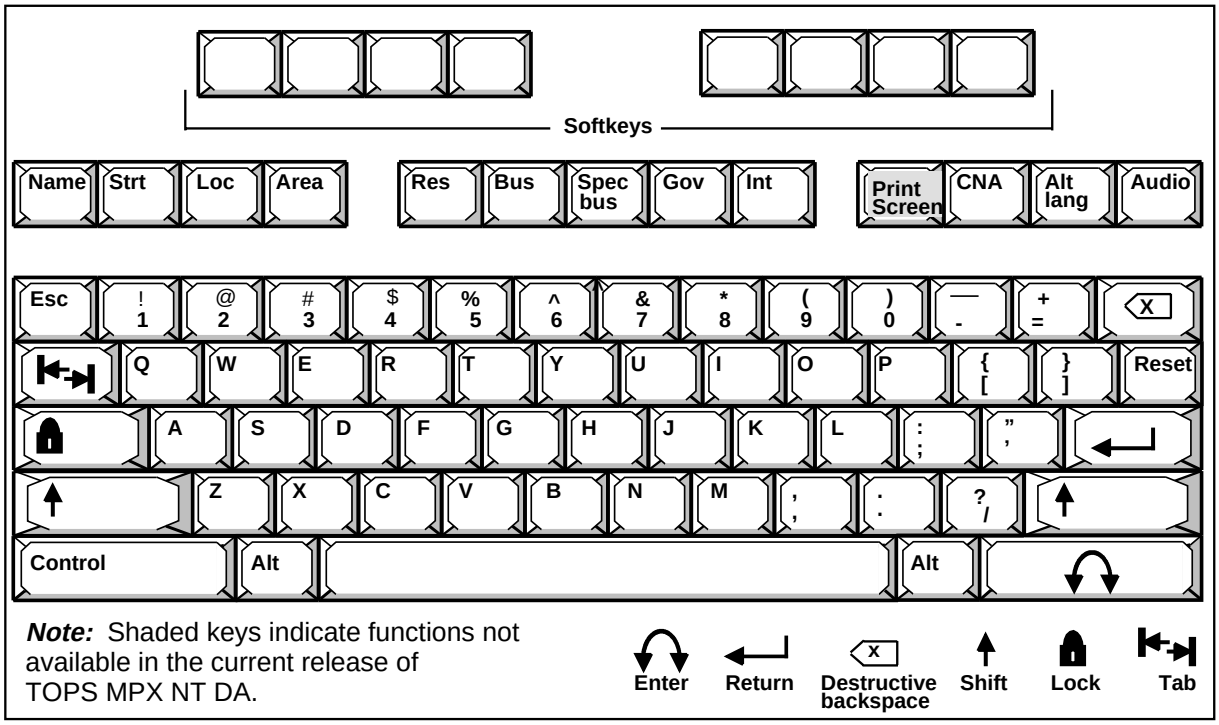
## TOPS MPX keyboard

The TOPS MPX keyboard includes a QWERTY keyboard and a cluster of call-processing keys. This keyboard accommodates combined services functions. Figures 6-25 and 6-26 illustrate the keyboard, including keys specific to the NT DA system. Softkeys are not available with the current version of DA software.

The various NT DA products implement differing keys and keying-search strategies. The keys illustrated here are for Digital Directory Assistance (DDA), which uses a superset of the defined keys. Therefore, this keyboard is suitable for all NT DA products. The second row of keys and the fourteen-key cluster on the right have clear keycaps with keycap designation label inserts. The keycap designation label inserts are supplied with the keyboard.

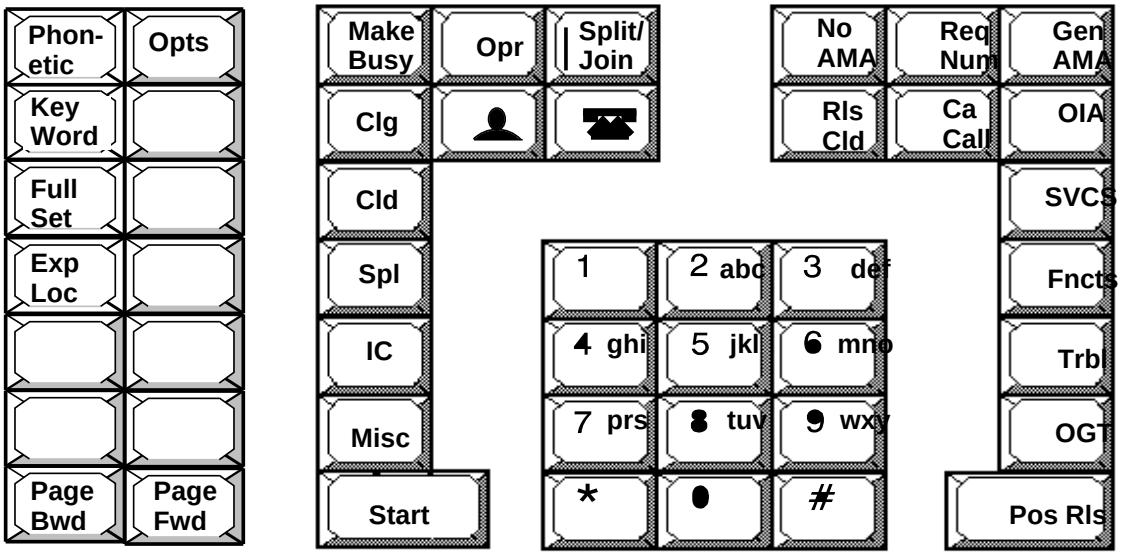
The V2, V3, and DDA databases support certain secondary search keys. The phonetic search key is supported by all three databases. The key word search key is supported only by DDA. The full set and expanded locality search keys are supported by V3 and DDA.

**Figure 6-25xxx**
**TOPS MPX keyboard: QWERTY and database keys**




***Note:*** Shaded keys indicate functions not available in the current release of TOPS MPX NT DA.

**Figure 6-26xxx**
**TOPS MPX keyboard: database and call-processing cluster keys**




***Note:*** Shaded keys indicate functions not available in the current release of TOPS MPX NT DA.

## QWERTY keys

Figure 6-27 shows the QWERTY section of the keyboard.

**Figure 6-27xxx**
**QWERTY keys**

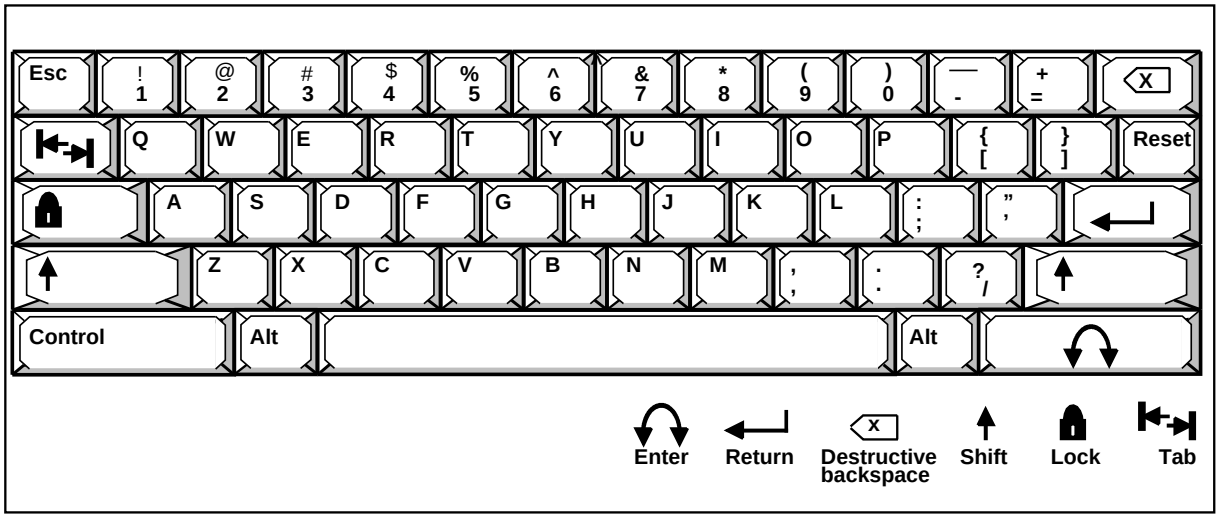



Table 6-13 describes the functions of keys in the QWERTY section of the keyboard.

**Table 6-13xxx**
**Description of QWERTY keys**

| Key | Description |
|---|---|
| A-Z | The standard alphabetical letters used to enter search information. |
| 1-0 | The standard numerals used to enter search information. |
| **Esc** | Clears the major field in which the cursor is located |
| **Reset** | Resets DA input fields to initial values. |
| X (Backspace) | Moves the cursor one space to the left. If no character to the left, cycles between minor fields. Used for corrections to enter entries. |
| (Enter) | Cycles cursor between major fields. |
| (Tab) | Moves cursor from field to field. |
| (Lock) | Locks on capitalization. |
| (Return) | Cycles cursor between major fields. |
| (Shift) | Changes (shifts) input from lower case to upper case or selects top-labeled function on softkeys (when softkeys are available). |
| **,** (Comma) | Cycles cursor between major fields. |

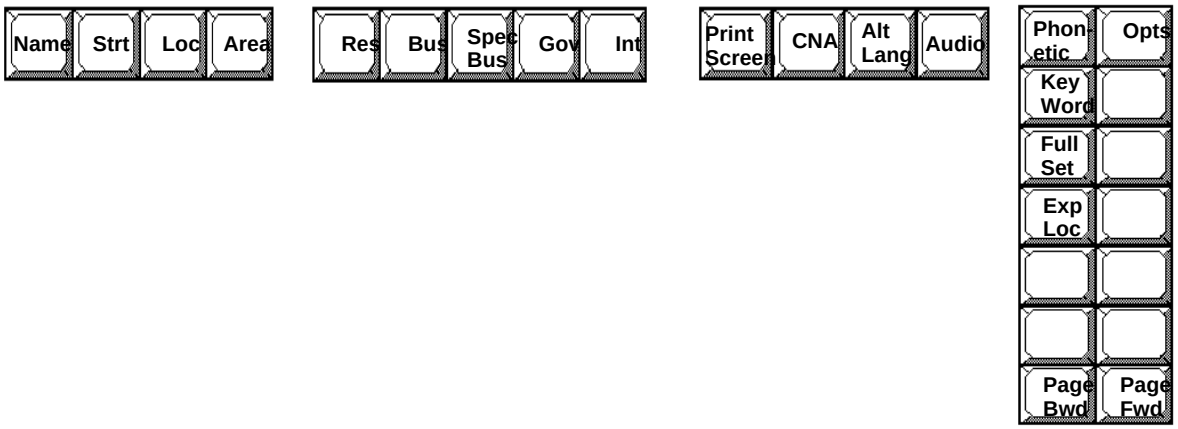
**-continued-**

| **Table 6-13xxx**<br>**Description of QWERTY keys** (continued) | |
|---|---|
| **Control** | Special function key, used in conjunction with other keys. |
| **Alt** | Special function key, used in conjunction with other keys. |
| Space bar | Enters a space or erases input in a field. |
| **End** | |

## Database keys

The database keys are illustrated in figure 6-28 and described in table 6-14.

**Figure 6-28**
**Database keys**




***Note:*** Shaded keys indicate functions not available in the current release of TOPS MPX NT DA.

| **Table 6-14xxx**<br>**Description of the database keys** | |
|---|---|
| **Key** | **Description** |
| **Name** | Moves cursor to major Name field and cycles cursor within minor Name fields. |
| **Strt** | Moves cursor to major Street field and cycles cursor within minor Street fields. |
| **Loc** | Moves cursor to locality field. |
| **Area** | Moves cursor to major area field and cycles cursor within minor Area fields. |
| **Res** | Initiates a residential search. |
| **Bus** | Initiates a business search. |
| **Spec Bus** | Initiates a special business search. |
| **-continued-** | |

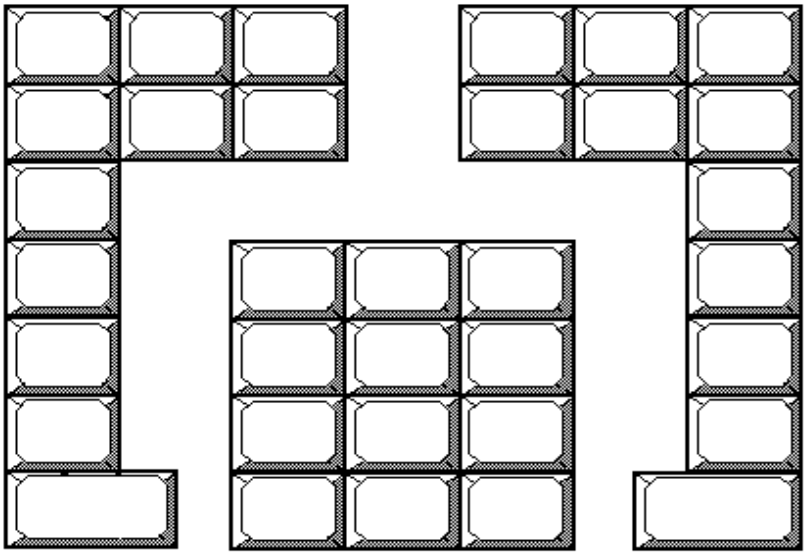
**Table 6-14xxx**
**Description of the database keys** (continued)

| | |
|---|---|
| **Gov** | Initiates a government search. |
| **Int** | Processes an intercept call. |
| **Print Screen** | Will be available with TOPS MPX-IWS. For TOPS MPX NT DA AOSS, use the following key sequence: **Control** + **P**. |
| **CNA** | Initiates a customer name and address search on a given telephone number. |
| **Alt Lang** | Pressed (prior to **Audio** key) to select an alternate language for the audio announcement. |
| **Audio** | Sends the call to recorded announcement for the requested number and releases call from the position, allowing new calls to be attached. |
| **Phonetic** | Initiates a phonetic search. This is a secondary search available only with Digital Directory Assistance (DDA). |
| **Opts** | Displays or removes options menu window in center of screen. Availability of options depends on operator position permissions. Options are nonpublished search, training search, non-connected search, and exit search. |
| **Key Word** | Initiates a key word search. This is a secondary search available only with DDA. |
| **Full Set** | Initiates a fullset search. This is a secondary search available only with DDA. |
| **Exp Loc** | Initiates an expanded locality search. This is a secondary search available only with DDA. |
| **Page Backward** | Displays the previously accessed page of information. |
| **Page Forward** | Displays the next available page of information. |
| **End** | |

## Call-processing keys

The call-processing keys, shown in figure 6-29, are used to enter numbers, report trouble, connect a subscriber to the service assistant, or process calls. Call-processing keys that are not functional with the current release of TOPS MPX are shaded in figure 6-29. Table 6-15 describes the call-processing keys used for TOPS MPX NT DA.

**Figure 6-29xxx**
**Call-processing keys**



Shaded keys indicate functions not available in the current release of TOPS MPX NT DA.

**Table 6-15**
**Description of the call-processing keys**

| Key | Description |
|---|---|
| **Make Busy** | Toggle action makes the position available or unavailable 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 AMA** | 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. |
| (Person) | Will be available with TOPS MPX-IWS. |
| (Station) | Will be available with TOPS MPX-IWS. |

**-continued-**

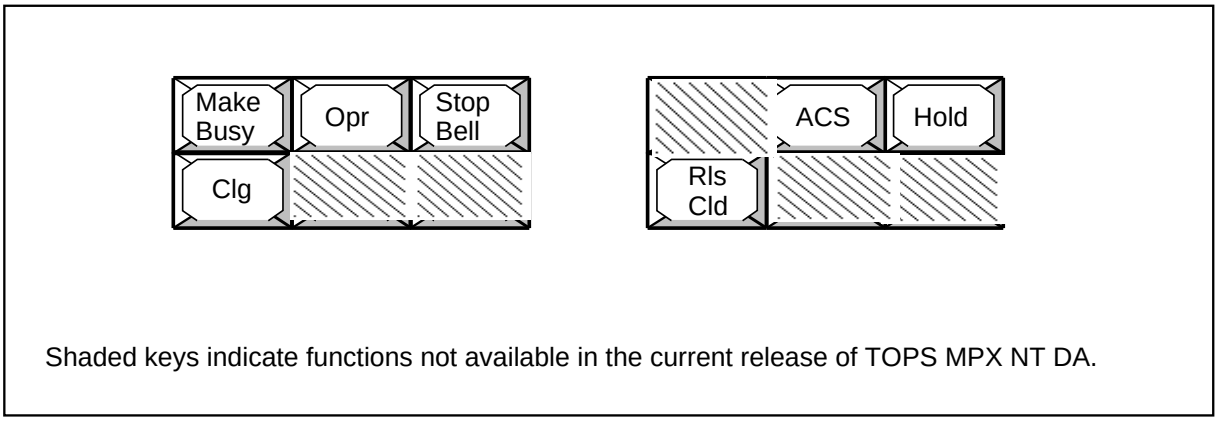
**Table 6-15**
**Description of the call-processing keys** (continued)

| | |
|---|---|
| **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. |
| **OIA** | Will be available with TOPS MPX-IWS. |
| **Cld** | Pressed in conjunction with the number keys and the **Start** key to enter a called number and connect to that forward party. |
| **SVCS** | Will be available with TOPS MPX-IWS. |
| **Spl** | Will be available with TOPS MPX-IWS. |
| **Fncts** | Will be available with TOPS MPX-IWS. |
| **IC** | Will be available with TOPS MPX-IWS. |
| **Trbl** | Pressed in conjunction with the number keys and the **Start** key to enter trouble codes. |
| **Misc** | Will be available with TOPS MPX-IWS. |
| **OGT** | Will be available with TOPS MPX-IWS. |
| **Start** | Pressed with other keys to terminate the entry of information. |
| **Pos Rls** | Pressed to release a call from the position. |
| **0 - 9** | Pressed for digit entry. |
| * | No TOPS MPX function defined. |
| # | Pressed for destructive backspace. |
| **End** | |

## SA/IC position call-processing keys

Figure 6-30 shows the keys used by service assistants and IC managers. Note that they use only keys in the top two rows of the call-processing cluster. Table 6-30 defines these keys. Keys in the top row have clear keycaps with keytop designation label inserts.

**Figure 6-30xxx**
**SA/IC position keys (top rows of call-processing cluster)**




Shaded keys indicate functions not available in the current release of TOPS MPX NT DA.

**Table 6-16**
**SA/IC key descriptions**

| Key | Description |
|---|---|
| **Make Busy** | Toggles the position busy or ready. |
| **Opr** | Used with digit keys and the **START** key to log on, request assistance, page, and monitor. |
| **Stop Bell** | Pressed to stop the Sonalert from sounding. |
| **ACS** | Accesses loop 1 or loop 2 when used with digits and **START.** |
| **Hold** | Holds the connection on the active loop. |
| **Clg** | Pressed with number keys and the **Start** key to enter the calling number for calls that arrive ONI or ANIF. |
| **Rls Cld** | Releases the forward party. |

## 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. The following paragraphs identify standard TOPS MPX features. In addition, all toll call-processing and DA billing features will be available with the release of TOPS MPX-IWS.

## Emergency service feature

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

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

A second set of these four queues is used for recalls (reconnects). Reconnects are calls that, having been released to an IVS, 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. Ringing is not applied to recalls (reconnects).

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 (reconnect), the call is not queued but 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. Except in the case of recalls, ringing is applied to the subscriber while the call remains in queue. 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 (reconnect), the call is not queued but 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.

### Customer name and address (CNA) calls

CNA calls are handled by entering the called number in the Name field. A CNA search then returns the listing with name and address for display.

### 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.

### IVS allocation

When it receives 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 IVS for the call. Once the IVS is obtained, a network connection is established between the subscriber and the IVS. 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 IVS cannot be obtained, a verbal quotation is imposed. If billing information is missing or an IVS 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 IVS is connected.

If the network connections cannot be acquired, a second attempt is made by allocating another IVS and again trying to accomplish the IVS 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 switch responds with a message identifying the selected position.

## 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.

### Service assistants

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

For NT DA, the position software collects statistical data on operator performance as statistics packages. These packages are sent to the FT Gateway as data within Universal Gateway/Position Message Protocol (UMP) messages. Resulting statics reports are available at the FT Gateway's printers and administrative terminals. These are the statistics packages:

- transaction statistics - sent with each message
- call statistics - sent when the call is released
- sessions statistics - sent when the operator logs off

Force management information is obtained by the host DMS switch 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 *Operational Measurements Reference Manual*, 297-1001-320, *Operational Measurements (OM)*, 297-001-814, and *Basic Administration Procedures*, 297-2291-300 for details regarding OMs.

## Billing features

TOPS MPX handles only station-paid and no-charge calls. Billing is automated in DA where possible. The DMS switch distinguishes between billable and non-billable calls. On calls eligible for billing, the requested number is sent from the DAS to the DMS switch 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 switch. The operator can also adjust a charge by using the **No AMA** key. Other billing features will be available with TOPS MPX-IWS.

### 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) as described in AF1726. Billing for call completion, when provided with integrated toll and assist capability in the future, will require EBAF, phase two.

## Other available TOPS MPX features

Other features available for TOPS MPX are described in the following pages. 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.

### 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.

### 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.

### Position sanity timer

During operator call processing, a calling or called party may remain attached to an unoccupied position if, for example, an operator logs out before the call is released from the position or a portion of the position data path not controlled by the DMS switch is lost. If the positions are connected by a local area network (LAN) and the LAN goes down, the calling and called parties remain attached until the call is taken down.

A position sanity timer is activated when the DMS switch receives indication that all attached parties are onhook. If the timer expires, the DMS switch automatically takes the call down and generates a log, which frees resources and alerts operating company personnel to the problem. The duration of the timer is datafillable.

### 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 force management (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-LA TA carrier
  - called digits
  - time of day
  - originating area
  - language
  - automated service

  This set of criteria can be extended 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.

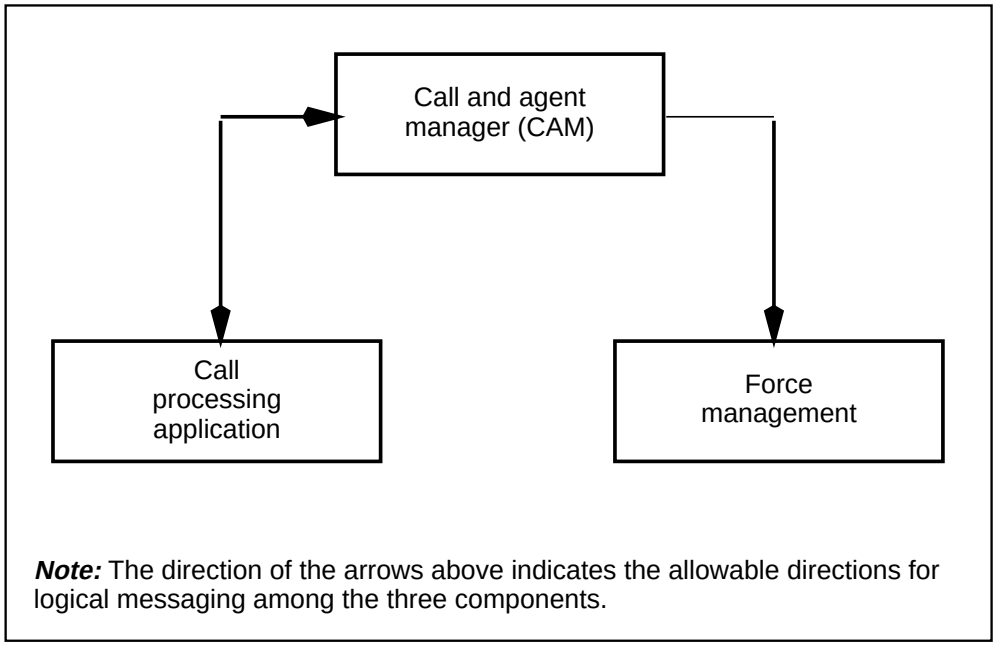
In combination, these capabilities provide a new platform for the provision of existing services and for expeditious deployment of new services.

### System configuration

QMS is a generic call, agent, and force management system that consists of three software components, as shown in figure 6-31.

The three-part structure of QMS has no 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.

**Figure 6-31xxx**
**QMS logical connectivity**




***Note:*** The direction of the arrows above indicates the allowable directions for logical messaging among the three components.

**Call and agent manager (CAM)** The QMS component shown in the center of figure 6-31 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 of "pegging" the proper "registers." The operating company may choose to display these statistics to the end user in traditional force management 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 such as 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

### Operator profiles

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.

### Senior operator position

In addition to service assistants, TOPS QMS creates a class of operators called senior operators. Service assistants help 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. Senior operator capability is available through the **Cld** key and loop-around trunks.

## 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.

# 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. In the future, TOPS MPX-IWS operator positions will also be able to handle integrated DA and toll and assist calls.

### 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 411, 555-1212, or NPA-555-1212 calls. 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 Interactive Voice Subsystem (IVS) 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 IVS, but because the subscriber remains off-hook after hearing the IVS 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 NT 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 for an 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 IVS is not available, intercept calls are operator quoted. The operator accesses the 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 switch. Therefore, these calls are processed automatically 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. When the intercept entry is found, the call is connected to an IVS 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 IVS 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 that 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.

### Customer name and address calls

In addition to the types of DA and intercept calls listed above, TOPS MPX NT DA also provides customer name and address (CNA) information. CNA calls are handled by entering the called number in the name field. A CNA search then returns the listing with name and address for display.

## 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 following list describes the characteristics of monitoring in the TOPS MPX NT DA system:

- The service assistant or in-charge operator initiates monitoring of any operator in the pool.
- The voice connection is monitored by a three-port conference connection.
- The monitored operator's screen is displayed at the monitoring operator's position.
- Each UMP message from the Fault Tolerant (FT) Gateway to the monitored position is also sent to the monitoring position.
- Operator keystrokes and local position actions (such as invoking a different window) are not tracked at the monitoring position, and UMP messages sent from the monitored position to the FT Gateway are not reflected.

## 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 switch.

### 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 (reconnect), 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 entering **Cld** plus 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. In the future, with integrated toll and assist service in TOPS MPX-IWS, the latter type of call completion will be supported.

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 DA and intercept search requests, announcements, and multiple requests.

### DA search requests

The operator may perform a DA database search while servicing a DA or intercept call. The database response is displayed in the DA area of the screen. If the requested listing is not contained in the initial search response, the operator may 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** key is the primary key used by operators for audio announcements. For offices supporting more than one language, the DAS places an asterisk in the operator name field 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.

NT DA supports audio announcements for several languages, but only a primary and secondary language can be datafilled at one time. When an IVS is unavailable, or when a 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 DAS redisplays the listing data and 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 of the previous requests in the call are quoted verbally.

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 how they are combined.

### 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 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 DAS permits this action. This type of mixed search is not recommended, however, 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.

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 quoted verbally, because no line selection characters are displayed. When intercept search information is provided on a DA call, the search is billed as if it were the search of a DA database.

### Customer name and address requests

By using a telephone number search argument, the operator can find name and address information for a subscriber. This is known as a customer name and address (CNA) search. The CNA key is used to initiate the telephone number search. These calls are billed as regular DA calls. The billing record contains nothing to indicate that it is a CNA call.

### Automated Directory Assistance Service (ADAS)

ADAS automates the up-front inquiry portion of directory assistance calls. For a typical automated DA call, ADAS answers the call and plays a greeting identifying itself as an automated directory assistance service. Next it plays a locality prompt, such as “What city?” and records the caller’s response. Then it plays a listing prompt, such as “What is the name of the listing?” and records that response as well. Finally it plays a sign-off message, such as “Thank you, please hold while your call is processed.”

ADAS trims the pre- and post-utterance silences from the recording of city and listing and plays the trimmed recording to the operator. As a final step, it opens a voice path between the caller and the operator. The operator then initiates the DA database search and processes the rest of the call in the typical fashion. Using ADAS saves operators seconds on every call and frees them from having to ask repetitive questions.

# TOPS MPX administration

Administering TOPS MPX involves monitoring both system and operator performance. For additional information on system monitoring, refer to *Operator Services Administration Guide*, 297-2291-320. For additional information on operator performance, refer to *TOPS MPX NT DA Force Management Guide*, 297-2291-311.

## NT DA datafill considerations

The following datafill items must be the same in both the DMS switch and the NT DA Fault Tolerant (FT) Gateway:

- position number
- permanent virtual circuit (PVC)
- operator identify

The following datafill items are required for TOPS MPX NT DA positions:

- for database gateway and DMS gateway: LAN addresses of all positions
- for general operator positions: LAN addresses of the database gateway and DMS gateway positions

In addition, the identity of positions designated as database gateway and DMS gateway (as well as the identity of their subtending positions) must be coordinated between the DMS switch and the NT DA FT Gateway.

The function of the general operator, assistance, or in-charge (IC) position is datafilled at the DMS switch. The terminal and operator access records are datafilled at the FT Gateway. When an operator logs on, both the operator function and the position function are checked for agreement at the DMS switch. Similarly, when an operator logs on for access to a DA service through the FT Gateway, both terminal and operator access records are checked for agreement at the FT Gateway. At logon, the FT Gateway downloads the locality key table and the NPA intercept table to the position.

## 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 information displays 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. Optionally, this function may 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 switch 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:

- transferring calls from one operator to another 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 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 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 the 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. Refer to *AMA Bellcore Format User Guide*, 297-1001-160 for complete details on 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)
   a. general (GEN)
   b. transfer 1 (XFR1)
   c. transfer 2 (XFR2)
   d. transfer 3 (DA)
2 Second priority - nonrecall (or nonreconnect)
   a. general (GEN)
   b. transfer 1 (XFR1)
   c. transfer 2 (XFR2)
   d. 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. Refer to *TOPS Data Schema*, 297-2271-451, for a complete description of these tables. 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 increment the counter. Queued calls that are served decrement 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 *Operator Services Translations Guide*, 297-2291-350.

### 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. Table 8-1 summarizes the major differences between the capabilities of senior operators and those of service assistants.

**Table 8-1**
**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.

At the DMS MAP, knowledge 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.

TOPS MPX handles return-to-service, busy, and test messages 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. Link failures between the DAS and the DMS are detected and reported by the Intelligent Console Terminal (ICT).

## 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.

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 DAS gateway interface are made up of messages sent over the DAS gateway 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. Refer to *Log Report Reference Manual*, 297-1001-840, for a description of standard logs.

## 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 TOPS MPX maintenance documents:

- *TOPS MPX Trouble Locating and Clearing Manual* 297-2291-520
- *TOPS MPX Alarm and Performance Monitoring* 297-2291-521
- *TOPS MPX Recovery Procedures* 297-2291-522
- *TOPS MPX Maintenance Guide* 297-2291-524
- *TOPS MPX Card Replacement Procedures* 297-2291-525

## TOPS MPX maintenance tools

Two maintenance tools monitor and control applications running on TOPS MPX positions from the maintenance position on the token-ring or from a remote dial-up terminal: the TOPS MPX trace log viewer, and the TOPS MPX profiler. Both tools are launched and controlled by the Network Management Interface (NMI).

### TOPS MPX trace log viewer

With TOPS MPX tracing, an application provides notice that a certain event has occurred within the application at a certain time. By showing what an application is doing at any given time during its execution, tracing provides

useful information for trouble-shooting problems when they arise. Traces identify the TOPS MPX position that generated the trace, the type of event that triggered the trace, and the level of severity of the trace generated. All traces are written to a trace log file that can store up to 1000 traces at a time.

The TOPS MPX trace log viewer application makes it possible to view current traces generated by applications, save traces to log text files, and view previously saved trace log files.

### TOPS MPX profiler

The TOPS MPX profiler utility can be used to query a position's hardware, its software, and its current operating configuration. It is possible to run the profiler utility on the maintenance position and obtain all of this information from any powered-on TOPS MPX position in the traffic office.

## Network management interface (NMI)

The NMI interfaces TOPS MPX tools applications with TOPS MPX positions and allows the applications to be controlled from the maintenance position. It is possible, working from the maintenance position or from a remote dial-up, to apply tools to one or more positions in the traffic office. In addition, the NMI can be used to run the tools applications directly on TOPS MPX positions.

The NMI performs the following functions:

- launches TOPS MPX tools applications on request
- provides a user-friendly dialog to help select a TOPS MPX position from a list box
- maintains and manages multiple TCP/IP connections for receiving large data segments from multiple remote TOPS MPX positions on the network, and distributes data to the appropriate applications
- incorporates a simplified Simple Network Management Protocol (SNMP) agent to control and monitor remote TOPS MPX positions

When installed on the maintenance position, the NMI runs in maintenance mode. It also serves as a platform to launch the TOPS MPX tools applications, support their network requests, and control data traffic between the operator positions and the maintenance position.

When installed on a TOPS MPX position, the NMI is configured to run in local mode by default. In local mode, all the tools can still be run but only the local position can be accessed. This configuration is installed on all positions in the network, except for the maintenance position.

When configured in remote mode, the NMI can be accessed across a telephone line using a computer, a modem, and LAN access software

(NTG328AA). When used to monitor the network remotely, NMI has the same capabilities it has when used at the on-site maintenance position.

# Regulatory and user considerations

This chapter contains regulatory and user considerations pertinent to TOPS MPX.

## Regulatory agency approvals

Appropriate 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 the 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, and so forth) 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 (DSU)

Northern Telecom recommends a standalone type UDS D56, or a GDC 56K or GDC 500N DSU, or an equivalent 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

# Appendix A: **TOPS MPX components and associated PECs**

## Hardware components

TOPS MPX hardware components are listed under the following categories: TOPS MPX operator position, base unit plug-in circuit cards, workstation cables, wiring closet equipment, and TOPS MPX equipment frame cables.

### TOPS MPX operator position

TOPS MPX is currently in transition from the GB series of terminals to the FB series. This list provides PEC and CPC codes for both series.

***Note:*** Three PEC codes are associated with the keyboard: NTNX51HA for the original IBM DA keyboard, NTNX51HB for the new NT DA keyboard, and NTNX51HC for the keycap kit required to convert from NTNX51HA to NTNX51HB.

#### GB series

- 8512 monitor unit (equals A0368912 plus labels) . . . . . NTNX51LA (B0238521)
  or 8518 field-replaceable monitor . . . . . NTNX51LB (B0238522)
- Base unit (upgraded PS/2 with token-ring card) . . . . . NTNX51GB . . . . . (B0238414)
- Cable management bracket . . . . . NTNX5153 (B0235141)

#### FB series

- 9518 monitor unit . . . . . NTNX51LC (B0238522)
- Base unit (PS/2) . . . . . NTNX51FB (B0236832)
- Cable management bracket . . . . . NTNX5122 (B0237579)

### Both series

- Keyboard unit . . . . . NTNX51HB (B0238253)
- French keyboard unit . . . . . NTNX51HD (B0238692)
- Kit for upgrade to French keyboard unit . . . . . NTNX51HE (B0238693)
- DSU (UDS D56, V.35, standalone modem) . . . . . A0336874
- DSU (GDC 56K) . . . . . NTNX5154 (B0235487)
- DSU (GDC DC500N) . . . . . (A0602029)

  ***Note:*** The DSU is used with the database gateway or router and the DMS gateway positions only.

- Headset jack assembly (modular) . . . . . NTNX5309 (B0235533)
- Power supply strip with twist-lock connector . . . . . A0384297

  ***Note:*** A twist-lock connector is recommended.

- Power supply strip with straight-blade connector . . . . . A0384296

  ***Note:*** This strip is available with twist-lock or straight-blade connector.

- GDC 9.6 Kbps modem (for maintenance/operator position only) . . . . . A0351816

### Base unit plug-in circuit cards

- Digital telephony (audio) card . . . . . NTNX51BD (B0232558)
- Token-ring card:
  with NTNX51GB . . . . . A0368911
  or with NTNX51FB . . . . . A0602526
- RTIC card . . . . . A0369273

  ***Note:*** The RTIC card is used in the database gateway or router and the DMS gateway only.

### Workstation cables

- Cables between workstation and miscellaneous frame . NT0R82AB (A0348376), A0385644, and NTNX36QU (B0235273)

  ***Note:*** NT0R82AB and A0385644 are manufactured by an outside vendor.

- Cable between RTIC card and DSU (modem) . . . . . NTNX36DM (B0230859)

  ***Note:*** This cable is used with the database gateway or router and the DMS gateway only.

- Cable between DSU (modem) and TOPS MPX equipment frame . . . . . NTNX36DP (B0230904)

  ***Note:*** This cable is used with the database gateway or router and the DMS gateway only.

- Cable between GDC 9.6 Kbps modem and maintenance/operator position (NTNX51GB) . . . . . A0600741
- Cable between GDC 9.6 Kbps modem and maintenance/operator position (NTNX51FB) . . . . . A0601464

### Wiring closet equipment

- TOPS MPX equipment frame . . . . . NTOX02AB
- Common framework . . . . . NTOX25AA
- Earthquake framework . . . . . NTOX25AH
- TOPS MPX equipment frame mounting hardware kit . . NTNX5109
- One-to-two frame miscellaneous hardware kit . . . . . NTOX58AL
- Multistation access unit (MAU) . . . . . 64565005
- MAU mounting brackets . . . . . P0709734
- Building internal cross-connect (BIX) block . . . . . NTNX5103
- BIX block mounting plate . . . . . PO702320

### TOPS MPX equipment frame cables

- MAU-to-MAU cable . . . . . NTNX36DK (B0230860)

- Cabling from TOPS MPX equipment frame to DMS switch or DAS . . . . . NTNX36DN (B0230862)
- Cabling from TOPS MPX equipment frame to TSG . . . NTNX36DQ (B0231996)

## Software components

This section lists software needed for the NT DA application.

### NT DA AOSS position software

- Gateway Communication Module . . . . . NTG327AA
- LAN Access Module (maintenance position only) . . . . NTG328AA
- LAN Manager Module . . . . . NTG325AA
- NAS DA Application and Base . . . . . NTG326AA
- Network Communication Module . . . . . NTG329AA
- Operating System Module . . . . . NTG384AA
- Task Manager Module . . . . . NTG383AA

### NT DA AOSS switch software

- Host OC Data Link Handling . . . . . NTX039AA
- Host TOPS MP OC Data Link Handling . . . . . NTX873AA
- Toll Features I . . . . . NTX801AA
- TOPS MPX STD DA Terminal (Standalone/Host) . . . . NTXC38AA
- TOPS MPX STD DA Terminal (Remote) . . . . . NTXC39AA

### Optional switch software

- Automated Intercept Call Completion . . . . . NTXN49AA
- Enhanced MFADS . . . . . NTXJ96AA
- Host/Remote Networking via Call Type . . . . . NTXN54AA
- New Peripheral Maintenance Package . . . . . NTX270AA
- PARS Remote . . . . . NTXN04AA
- QMS: Call and Agent Manager . . . . . NTXR48AA
- QMS External Management Information System (MIS) Interface . . . . . NTXR50AA
- SSP 800 Overflow Call Routing . . . . . NTXQ40AA
- TOPS E911 . . . . . NTXE34AA
- TOPS External Personal Audio Response System (PARS) . . . . . NTXJ37AA
- TOPS Host Queue Management System . . . . . NTXP41AA

- TOPS Remote Queue Management System . . . . . NTXP42AA
- Two-Digit ANI ID - TOPS Office . . . . . NTXN52AA

### Optional ADAS software

- ADAS APU . . . . . NTG320AA
- APU Maintenance . . . . . NTXS29AA
- Channelized Access on LPP/LIS . . . . . NTXH77AA
- EIU . . . . . NTXF05AA
- EIU Peripheral Load for SuperNode OPC . . . . . NTG310AA
- Enhanced Service Resource Management . . . . . NTXS31AA
- File Transfer Protocol (DARPA) . . . . . NTXS11AA
- LMS on LPP . . . . . NTXF20AA
- OA&M Position . . . . . NTG321AA
- TCP/IP Protocols . . . . . NTXF19AA
- TOPS ADAS . . . . . NTXQ23AA
- TOPS DA Audio Response Call Handling . . . . . NTXA62AA
- UAE/UNIX Conversant Software . . . . . NTXS30AA
- UAE/UNIX Conversant Software . . . . . NTXS30AA
- VPU . . . . . NTG322AA

# List of terms

**ABSBH**

Average busy season busy hour

**ADAS**

Automated Directory Assistance Service

**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

**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.

**Automated Directory Assistance Service (ADAS)**

A voice processing system for directory assistance (DA) services. ADAS automates the initial inquiry portion of DA call processing. This limits the amount of time the operator interacts with DA caller and reduces the operator's average work time (AWT).

**automatic message accounting (AMA)**

An automatic recording system that documents all the necessary billing data for 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 inter-LATA/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)**

The protocol between positions and switch for 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

**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

**CC**

Central control

**CCITT**

Consultative Committee on International Telegraphy and Telephony

**CCS**

Common Channel Signaling

**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.

**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.

**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 Signaling (CCS)**

A signaling system in which a multiplicity of labeled messages may be transmitted over a single channel using time-division digital techniques.

**Consultative Committee on International Telegraphy and Telephony (CCITT)**

Committee responsible for creating a series of recommendations for telephony service.

**CNA**

Customer name and address

**CPU**

Central processing unit

**customer name and address (CNA)**

CNA is a service that allows a subscriber to ask an operator to search for a subscriber's name and address in a telephone listing database.

**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**

A full-duplex data set used to connect the message desk terminal devices to the DMS-100 switch. It is used to transmit messages between the message desk and the DMS-100 switch.

**DCH**

D-channel handler

**DCM**

Digital carrier module

**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.

**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

**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.

**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

**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.

**end office (EO)**

A switching office arranged for terminating subscriber lines and provided with trunks for establishing connections to and from other switching offices.

**EO**

End office

**Fault Tolerant (FT) Gateway**

The NT Power 6/40 FT Gateway computers access the DA and intercept applications. The FT Gateway supports Universal Gateway/Position Message Protocol (UMP).

**FT Gateway**

Fault Tolerant Gateway

**hardkeys**

Keys that are not program defined.

**HDBH**

High day busy hour

**high day busy hour (HDBH)**

The one day among 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 the DMS switch, a central office equipped to control peripheral modules at remote sites.

### 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.

### Interactive Voice Subsystem (IVS)

A system that announces a telephone number in response to an inquiry to an operator. The response is usually assembled by a computer from a prerecorded vocabulary of words.

### intercept service (INT)

A service that intercepts calls and handles them automatically 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 outside another.

**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 Intra-LATA 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

**ISDN**

Integrated Services Digital Network

**IVS**

Interactive Voice Subsystem

**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 switch, 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 local area network (LAN) for TOPS MPX positions. 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

**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.

**outgoing trunk (OGT)**

A trunk used for calls going out to a distant toll center.

**PARS**

Personal Audio Response System

**peg count**

A record of single measured events

**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.

**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.

**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.

**TA**

Toll and assist

**table editor (TE)**

In the DMS switch, 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.

**T&C**

Time and charges

**TCP/IP**

Transmission Control Protocol/Internet Protocol

**TE**

Table editor

**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.

**TMS**

TOPS message switch

**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)**

A DMS-100 Family XMS-based peripheral module (XPM) used as a concentration and switching device for data links. It interfaces the network to TOPS MPX positions.

**TOPS MP**

Traffic Operator Position System Multi-Purpose

**TOPS MPX**

Traffic Operator Position System MPX

**Traffic Operator Position System (TOPS)**

A call processing system made up of a number of operator positions. Each operator position consists of a visual display unit (VDU), a controller, a keyboard, and a headset. TOPS is a trademark of Northern Telecom.

**Traffic Operator Position System MPX (TOPS MPX)**

A dedicated DA/intercept position based on the IBM PS/2 personal computer with customized software, keyboard, and interface. The TOPS MPX connects to the DMS switch 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.

**Transmission Control Protocol/Internet Protocol (TCP/IP)**

TCP/IP is the protocol for external messaging supported by TOPS MPX NT DA.

**TTY**

Teletypewriter

**UMP**

Universal Gateway/Position Message Protocol

**Universal Gateway/Position Message Protocol (UMP)**

UMP is the protocol supported by both the positions and the FT Gateway in TOPS MPX NT DA.

**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

**X.25**

CCITT-defined, network-layer protocol 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

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# E



# F

## G



## H



## I



## K



## L

# M



# N

# O



# P

# Q



# R



# S

# T

# U



# V



# W

DMS-100 Family

# TOPS MPX NT DA

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