®*MICOMBOX type 3*

X.25 Asynchronous PAD

User's Manual
Stock Number 800-1387-2a

MICOM®

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November 1986

THANK YOU FOR CHOOSING THE MICOM BOX Type 3 X.25 ASYNCHRONOUS PAD

The MICOM BOX Type 3 X.25 Asynchronous PAD, a member of MICOM's family of intelligent data communications products, is designed to help you get the most out of your communications lines.

This User's Manual, in turn, is designed to help you get the most out of your new PAD by giving you all the information you need to use it effectively.

WARRANTY

MICOM provides a warranty for this X.25 Asynchronous PAD, as described on the Warranty Page. Information about equipment repair by MICOM Customer Service is also on the Warranty Page.

PUBLICATION CHANGE REQUEST

At the end of this manual, there is a postage-paid comment form for you to use if you think of an improvement to (or find a mistake in) this manual.

NOTICE

Specifications, tolerances, and design characteristics described in this manual are subject to change without notice.

TRADEMARKS

MICOM and FEATUREPAK are trademarks of MICOM Systems, Inc.

SAFETY WARNING

Always observe standard safety precautions during installation, operation, and maintenance of this product. To avoid the possibility of electrical shock, be sure to disconnect the power cord from the power source before you remove the power supply fuse or perform any repairs.

WARRANTY

MICOM warrants that the equipment delivered shall be free from defective material and workmanship for a period of 1 year from the date of delivery of equipment when given normal, proper and intended usage, and agrees to repair or replace, without cost, any part manufactured by MICOM provided that:

(a) MICOM is promptly notified upon discovery that the equipment is defective;

(b) The equipment is returned prepaid to the MICOM plant from which the equipment was shipped; and

(c) MICOM's examination of the equipment shall disclose that any defect was not caused by accident, misuse, neglect, alteration, improper installation, unauthorized repair or improper testing.

MICOM may, in its sole discretion, elect to repair or replace the equipment, in which event MICOM shall have a reasonable time to make repairs or to replace the equipment. MICOM will return the equipment freight prepaid.

THE PROVISIONS OF THIS WARRANTY ARE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND MICOM'S LIABILITY ARISING OUT OF THE MANUFACTURE, SALE, OR SUPPLYING OF THE EQUIPMENT OR ITS USE, WHETHER BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, PRODUCTS LIABILITY OR OTHERWISE, SHALL NOT EXCEED THE ORIGINAL COST TO THE BUYER OF THE EQUIPMENT. IN NO EVENT SHALL MICOM BE LIABLE TO THE BUYER OR ANY OTHER PERSON OR ENTITY FOR UNINTENDED OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR USE DAMAGES) ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLYING OF THE EQUIPMENT.

MICOM warrants all repairs or upgrades performed at its factory location or performed by MICOM Customer Service for a period of 90 days after completion.

HOW TO GET YOUR EQUIPMENT FIXED BY MICOM CUSTOMER SERVICE

MICOM's Customer Service offers a wide range of support functions, including complete factory repair for both in-warranty and out-of-warranty equipment.

Before returning any equipment, please contact MICOM Customer Service or your local Distributor. In the U.S.A. and Canada, call MICOM's Customer Service Hotline (800) 833-3282. In all other countries, contact your local MICOM Distributor.

A Customer Service engineer will answer warranty-related questions, discuss your specific equipment problems, and — when necessary — give you shipping instructions for returning equipment to MICOM for repair. To return a product for service or repair, you *must* obtain a Return Authorization number from MICOM Customer Service.

When you do call Customer Service, it will be very helpful to know the PROM set number of the unit malfunctioning. You can easily determine this information by looking at the label on the bottom of the FEATUREPAK cartridge.

Shipping charges must be prepaid.

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SECTION 1

PRODUCT AND DOCUMENT OVERVIEW

The unit shown in figure 1-1 is the MICOM BOX Type 3 (MB3). This manual describes one use for the unit -- as an X.25 asynchronous PAD (Packet Assembler/Disassembler). Therefore, this product is called the MB3-XAP (MICOM BOX Type 3 X.25 Asynchronous PAD). Throughout this document, it will be referred to as the PAD.

The PAD is available with either a standard RS-232-C X.25 link (described in the body of this manual) or with an optional X.21 or V.35 high-speed X.25 link (described in appendix F). Figure 1-2 provides model numbers for the various units.

Asynchronous devices connected to the PAD can access CCITT X.25-compatible Public Data Networks (PDNs) or equipment. The PAD concentrates the asynchronous data from 4, 10, or 16 terminals or computer ports onto a single X.25 access line.

The PAD is fully configurable on-site to meet the operating requirements of CCITT-compatible PDNs and most existing terminals and computer systems. It meets the mandatory requirements of 1984 CCITT Recommendations X.3, X.25, X.28, X.29, and X.121. It also includes additional special capabilities that result in extra user convenience and flexibility.

The PAD is adaptable to different types of devices through the assignment of a set of parameter values for each channel interface. Other parameters control the format of data transferred between a terminal and a computer. These are provided in an effort to improve communications efficiency by reducing the number of packets generated over the PDN. Additionally, through the configuration of trunk-related parameters, the PAD operation can be optimized when it is connected to different kinds of networks.

The modular design of the PAD makes it easy to install and adapt to your needs. You can purchase one, two, or three modules, and you can add modules as your needs expand. The standard RS-232-C X.25 link interface circuitry is contained on a daughterboard that can be easily removed and exchanged for a high-speed X.21 or V.35 link interface daughterboard. The power supply can be set for either 115 or 230 V ac operation.

Modularity applies in the area of PAD firmware as well. All the PROMs that contain the PAD's operating software reside in an easy-to-install FEATUREPAK cartridge (refer to paragraph 1.3.4).
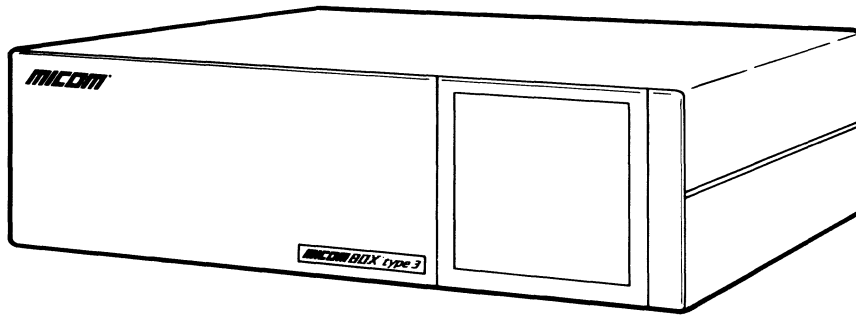
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Figure 1-1. MICOM BOX Type 3

NUMBER OF CHANNELS
4 = 4-CHANNEL BASE MODULE

10 = 4-CHANNEL BASE MODULE AND ONE
6-CHANNEL EXPANSION MODULE

16 = 4-CHANNEL BASE MODULE AND TWO
6-CHANNEL EXPANSION MODULES

RESERVED

INTERFACES [1]
0 = NO COMPOSITE MODULE

1 = RS-232-C COMPOSITE, [2] CABLE-TO-DCE
DEVICE

2 = V.35 COMPOSITE, [3] CABLE-TO-DCE DEVICE

3 = X.21 COMPOSITE, [3] CABLE-TO-DCE DEVICE

4 = V.35 COMPOSITE, [3] CABLE-TO-DTE DEVICE

5 = X.21 COMPOSITE, [3] CABLE-TO-DTE DEVICE

6 = RS-232-C COMPOSITE, [2] CABLE-TO-DTE
DEVICE

POWER SUPPLY
1 = 115 V ac
2 = 230 V ac

INDICATES THE MICOM BOX TYPE 3 ARCHITECTURE

[1] THE COMMAND PORT INTERFACE IS ALWAYS RS-232-C. INTERFACE
OPTIONS 0 THROUGH 6 RELATE TO THE COMPOSITE.
[2] REQUIRES THE STANDARD FEATUREPAK CARTRIDGE, MB3-XAP-STD
[3] REQUIRES THE HIGH-SPEED FEATUREPAK CARTRIDGE, MB3-XAP-HS

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Figure 1-2. Model Numbers for the MICOM BOX Type 3 X.25 Asynchronous PAD

1.1 DOCUMENT ORGANIZATION

This document is designed to assist you in understanding the different features and capabilities of the PAD. It is intended for use by the Network Administrator, the designer, the technician, and the user who wishes to access a PDN using a PAD.

This section introduces you to the PAD by describing:

* The different PAD models.

* The modules and other major hardware components of the PAD.

* General, terminal, and X.25 link characteristics of the PAD.

* Applications for the PAD.

* An optional MICOM product (the X.25 Control Center) that allows for centralized management of multiple PADs.

* The PAD's physical specifications.

The following paragraphs describe the general content of each of the remaining sections and appendixes in this manual.

SECTION 2   INSTALLATION AND CONFIGURATION provides the Network Administrator and communications technician with information on selecting an installation location, installing major components, checking channel-selection strap settings, performing a standalone or a rack-mount installation, connecting cables, connecting power, and setting software (soft) switch selections to meet your operating requirements.

SECTION 3   THEORY OF OPERATION gives an overview of the different characteristics and operational techniques that have been implemented in the PAD. It provides information on the PAD's support of 1984 Recommendations X.3, X.25, X.28, and X.29, and its support of the X.121 numbering plan.

SECTION 4   USER INTERFACE provides the terminal user with the procedures required to establish a connection to the PAD, place a call over the PDN, and check and modify configuration parameters for a call. This section also gives information on invoking test procedures, performing a local copy or call transfer, and on interpreting messages generated by the PAD.

SECTION 5   USING THE COMMAND FACILITY gives the administrator information on accessing and using the Command Facility. The Command Facility is a user-friendly, menu-driven software module that can be used to examine and modify configuration parameters, execute diagnostics, monitor PAD performance, and gather statistics.

SECTION 6   DIAGNOSTICS AND TROUBLESHOOTING provides both the operator and
            the experienced technician with information on the Self Test,
            indicators, Terminal-Activated Channel Tests (TACT), and operator
            troubleshooting.

APPENDIX A   CONFIGURATION SHEETS contains the Configure Menu and selection
            sheets that may be used to summarize all the parameters that can
            be configured using the Command Facility. These sheets should be
            prepared carefully and completely and should be retained for
            future reference.

APPENDIX B   FACTORY PARAMETER SETTINGS describes all of the PAD's configu-
            ration parameters as they are set by the factory. As described
            in section 5, you may use the Command Facility to change these
            default settings to meet the needs of your specific operating
            environment. However, you may be able to operate the PAD without
            changing these defaults. If you want to make only a few changes,
            the information in this appendix may help you get up and running.

APPENDIX C   ASCII CHART contains an ASCII chart that is an essential refer-
            ence to determine the various control characters used to define
            the PAD device profiles and other configuration parameters.

APPENDIX D   CONFIGURATION OF A LOCAL X.25 CONTROL CENTER (XCC) PAD gives
            instructions for configuring a PAD that is physically attached to
            the optional XCC.

APPENDIX E   TELEX SUPPORT describes the PAD's support for telex applica-
            tions.

APPENDIX F   HIGH-SPEED OPTIONS describes the PAD's V.35 and X.21 high-speed
            X.25 link interface options. These options include a special
            FEATUREPAK cartridge and an X.21 or V.35 daughterboard for the
            link (composite) interface. Installation and upgrade procedures
            included in this appendix are intended for the experienced com-
            munications technician.

1.2 PAD MODULES

The PAD modules are circuit boards that contain the logic and support circuitry necessary for operation. The modules are illustrated in figure 1-3 and described in table 1-1. (Refer to appendix F for descriptions of the high-speed modules.)
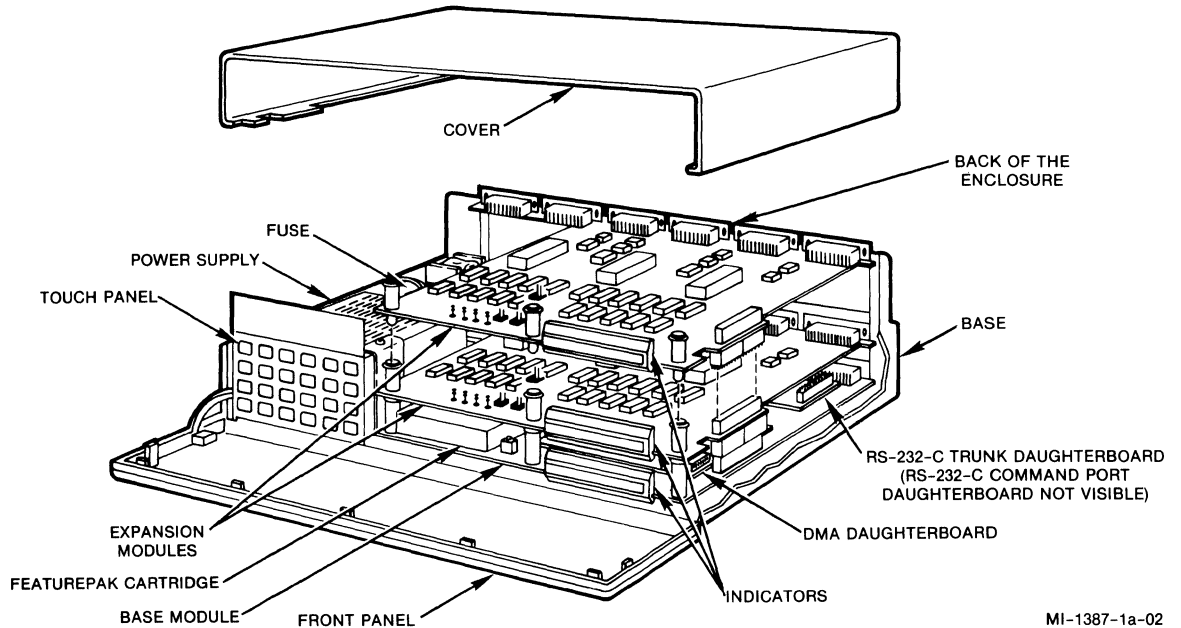
Figure 1-3. Locations of the Modules and Major Components

NOTE: A spare RS-232-C daughterboard and related cable may be ordered. The kit number is MBK-232-to-DCE. Kits are also available for the high-speed (X.21 or V.35) daughterboards (refer to appendix F).

Table 1-1. Module Descriptions

Module Number	Description
MB3-CCM	A 4-channel base (communications control) module is the only module in a 4-channel model, and is included in all other models. It has: • A Z80B microprocessor running at 6 MHz. • Standard EIA RS-232-C interface connectors (one for the Command Port, one for the composite port, and four for the channel interfaces). • 256 K of RAM, which is used as a data buffer. • 8 K of CMOS RAM, which is used for storage of configuration data that determines the operation of the PAD. • A lithium battery that provides standby power for the CMOS RAM. • The slot for the FEATUREPAK cartridge. • Two RS-232-C daughterboards that provide interface circuitry for the composite port (the X.25 link) and the Command Port, respectively. (When using one of the PAD's high-speed options, the RS-232-C daughterboard that provides interface circuitry for the X.25 link is replaced with either an X.21 or a V.35 daughterboard. Refer to appendix F for more information.) • One Direct Memory Access (DMA) daughterboard. Although physically present, the DMA daughterboard is not active unless one of the PAD's high-speed link interface options is used.
MB3-EM6	A 6-channel expansion module is included in a 10-channel model. Two expansion modules are included in a 16-channel model.

1.3 MAJOR COMPONENTS OF THE PAD

In addition to the modules described in paragraph 1.2, the PAD's major components are:

- Enclosure (base, cover, front panel, back)
- Touch Panel
- Indicators
- FEATUREPAK cartridge
- Power supply

An optional Rack-Mount Upgrade Kit (MB-RMK-1) is available for installing the PAD in a 19-inch wide rack (refer to paragraph 2.2.3).

1.3.1 Enclosure

The enclosure consists of a base, a cover, a front panel, and the back. The base, which interlocks with the cover, holds the major components. The movable and translucent front panel swings open for access to the inside of the unit. The back consists of interlocking panels that are attached to the modules. A blank panel is installed when an expansion module is not in place. The one enclosure allows 4- and 10-channel models to be field-upgraded to 10 or 16 channels, respectively.

1.3.2 Touch Panel

This is located behind the front panel. The membrane surface of the panel is sectioned into 24 keys. The Touch Panel is used to configure some of the PAD's operating parameters, and to reset the PAD (refer to paragraph 2.4).

1.3.3 Indicators

The indicators are also located behind the front panel and are labeled with their abbreviated names. They display the operating status of the unit and are used with the Touch Panel keys. When a unit is plugged into a power outlet, some indicators will go ON and will be visible through the front panel.

1.3.4 FEATUREPAK Cartridge

CAUTION: To avoid possible damage to an expansion module from static dis-
charge, be sure to touch the PAD's metal enclosure before reaching
for the FEATUREPAK cartridge.

A FEATUREPAK cartridge is inserted into an opening behind the front panel
(see figure 1-3). It contains the system software. Currently, two FEATUREPAK
cartridges are available for the PAD:

- MB3-XAP-STD, which supports a standard RS-232-C X.25 link interface
- MB3-XAP-HS, which supports a high-speed X.21 or V.35 X.25 link interface

The operating software in both FEATUREPAK cartridges includes, but is not
limited to, the following features:

- Support of 1984 CCITT Recommendations X.3, X.25, X.28, X.29, and X.121

- Configuration of operating parameters using the Command Facility (refer
  to section 5)

- Block mode terminal support (refer to paragraph 3.2.8.4)

- Extended packet sequencing (see figure 2-10)

- Extended frame sequencing (see figure 2-10)

- Fast Select (refer to paragraphs 3.1.4.4, 3.1.5, 3.5.3.1, 3.5.4.3,
  3.6.2, 4.4.1, and see table 4-4)

- KDD Network support (see figure 2-10)

- Local Copy and Call Transfer (refer to paragraphs 4.7 and 4.8)

- XCC (X.25 Control Center) support (refer to paragraphs 1.6 and 5.5.15,
  and to appendix D)

1.3.5 Power Supply

A multi-output ac power supply is installed for you prior to shipment. The
input voltage is 115/230 V ac, 50-60 Hz. Output voltages are +5, +12, and
-12 V dc.

Prior to shipment, the power supply is set for the voltage that is specified
in the model number (see figure 1-2), and an appropriate fuse is installed.

1.4 SUMMARY OF PAD CHARACTERISTICS

The following paragraphs summarize the general, terminal support, and X.25 trunk characteristics of the PAD.

1.4.1 General Characteristics

The PAD includes the following general characteristics:

* Functionally compatible with all MICOM asynchronous PADs

* Compatible with 1984 CCITT Recommendations X.3, X.25, X.28, X.29, and X.121

* From 4 to 16 asynchronous channels and a single X.25 composite channel

* Aggregate burst rate of 76,800 bps

* Dedicated Command Port and a user-friendly Command Facility

* Configuration parameters stored in separate memory and protected by a backup battery in case there is a power failure

* X.25 facilities supported:

    - Closed user group
    - Fast select
    - Packet size negotiation or DATAPAC Priority
    - Reverse charging
    - Throughput class negotiation
    - Window and packet size negotiation
    - RPOA transit network selection
    - Charging information
    - Network User Identification/Network User Address (NUI/NUA)

* Extensive call control capabilities:

    - Full X.121 addressing
    - Abbreviated addressing
    - Autocall feature
    - X.121 subaddressing
    - Call user data subaddressing

* Local copy and call transfer features

* Class selection with port contention

* TACT diagnostic tests

* Default configurations upon power-up

* Compact tabletop enclosure and rack-mount versions

* Modular design that facilitates PAD configuration and servicing

* FEATUREPAK cartridge for ease of firmware installation

1.4.2 Terminal Support Characteristics

The PAD includes the following characteristics to provide support for almost all asynchronous terminals:

* All channels independently configurable through the Command Facility

* Speed range from 50 to 9600 bps

* Autobaud and auto parity detection to 9600 bps

* Call accounting statistics upon call completion

* Dedicated, dial-in, or dial-out channel connections

* Extended flow control capabilities: XON/XOFF, CTS/RTS

* Support of block mode devices

* Extended packet forwarding conditions

* User-definable Welcome Message at channel logon

* User-definable Bulletin Message at channel logon

* Extended X.28 command mode

* Extended X.29 command mode

* Enhanced asynchronous terminal handling beyond the requirements of X.3:

    - Special terminal echo sequences
    - Formatted screen support
    - Automatic forms handling
    - Escape sequence forwarding
    - Printer/CRT editing
    - Echo masking
    - Telex support
    - HPX support
    - NUI/NUA support

1.4.3 X.25 Link Characteristics

The PAD includes the following characteristics on the X.25 link to the PDN:

- Compatible with 1984 version of Recommendation X.25 Link Access Procedure, Balanced/High-Level Data Link Control (LAPB/HDLC) operation

- Standard RS-232-C link operates at speeds up to 19,200 bps with an external clock, or up to 9600 bps with the internal clock

- Optional high-speed X.21 or V.35 link operates at speeds up to 72,000 bps

- Configurable X.25 link parameters:

    - K = Frame level window
    - W = Packet level window
    - T1 = Acknowledgement timer
    - N2 = Number of retransmissions
    - T3 = Assurance timer
    - Packet size
    - Segment size
    - NUI type
    - NUI validation

- Standard (modulo 8) or extended (modulo 128) packet sequence numbering

- Any combination of Permanent Virtual Circuits (PVCs) or Switched Virtual Circuits (SVCs)

- Configurable logical group and logical channel numbers

- Incoming call validation based on:

    - Password
    - Facilities
    - Requested channels

- Full support of Q-bit, M-bit, and D-bit as defined by CCITT Recommendations

1.5 APPLICATIONS

The PAD can be used in numerous applications, as covered in the following paragraphs.

1.5.1 Terminal Concentrator

The PAD can support dedicated and dial-in connections. This makes it adaptable to many types of terminal applications (see figure 1-4). It can support terminals at speeds up to 9600 bps that are connected directly to individual channels or connected using point-to-point modems. In addition, its dial-in capabilities allow a population of more than 16 terminals to contend for its channels.
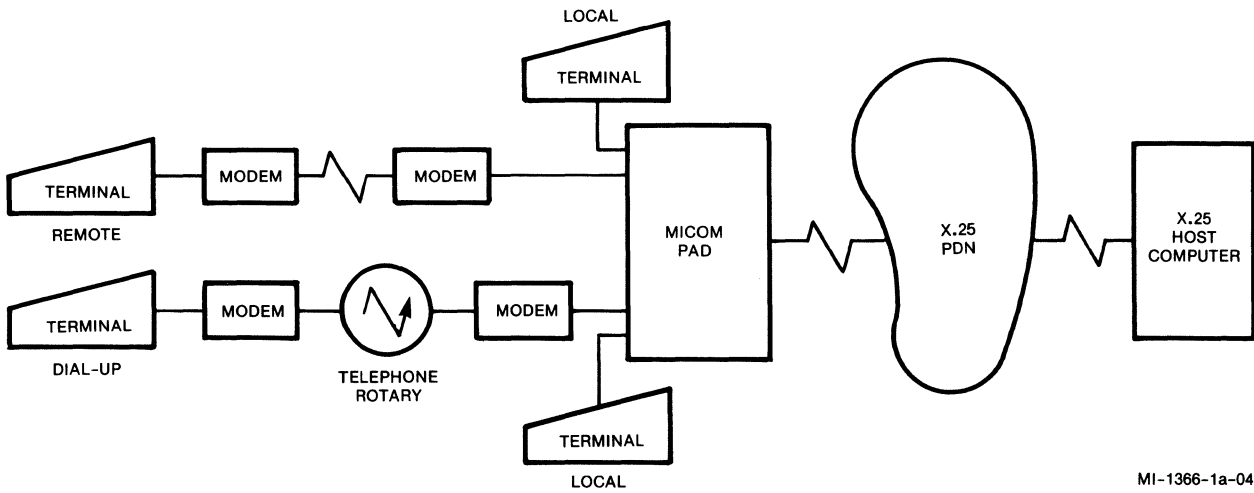
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Figure 1-4. Terminal Concentrator

1.5.2 Port Concentrator for X.25 Hosts

An increasing number of computer manufacturers provide X.25 protocol support for packet network access. The PAD can appear as a DTE or a DCE as defined by Recommendation X.25; it can operate as a DCE (looking like a PDN to a computer providing X.25 support) instead of operating in its more usual DTE role, as a concentrator PAD attached to a PDN. In the DCE configuration, the PAD serves as a port concentrator, connecting a cluster of terminals to a single computer port (see figure 1-5).

With the dial-in channel capability of the PAD, this port concentration capability can be used to provide contention for a large population of dial-in terminals. Only one X.25 port is required at the host computer for all these terminals.

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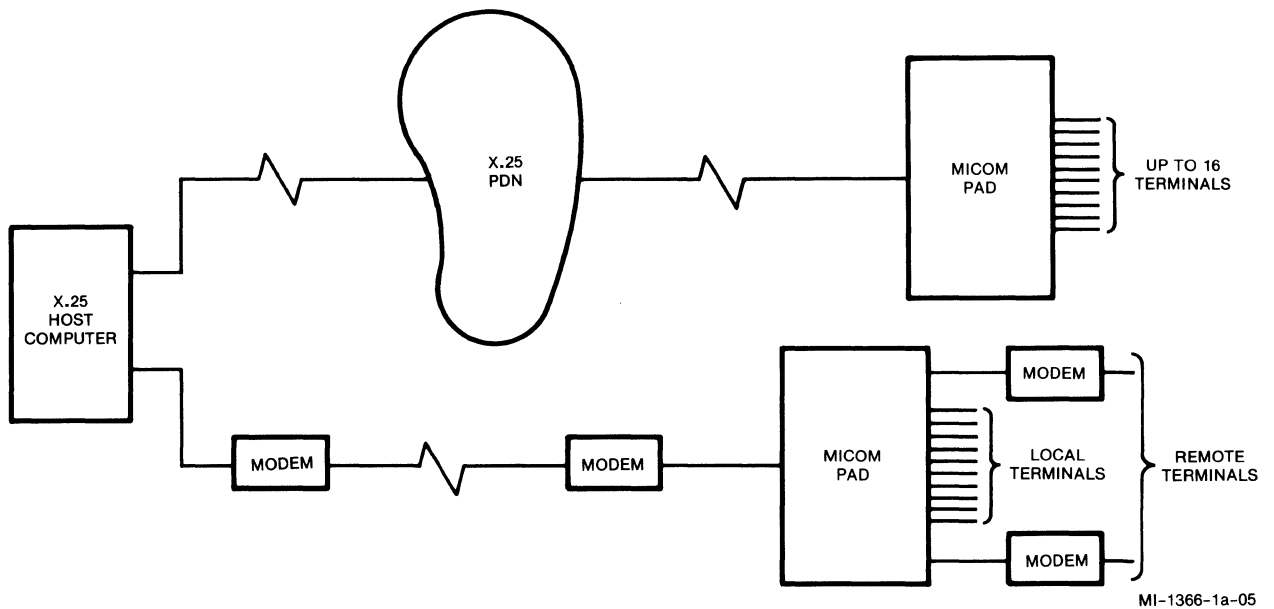
Figure 1-5. Port Concentrator for X.25 Hosts

1.5.3 X.25 Gateway

In conjunction with MICOM's Micro600 Data PABX, the PAD can act as a gateway from the user's local network to an X.25 Public Data Network.

On receiving a connection request from the Micro600, the PAD automatically generates a call to the PDN. Terminals or hosts can contend for the channels on the PAD. They, in turn, will transparently establish connections through the PDN.

Micro600 channels can be configured as either outgoing to the PDN or incoming from the PDN. This allows a single PAD to support connections to the PDN or from the PDN through the Micro600, by allocating one group of channels on the PAD to incoming Micro600 channels, and another group to outgoing Micro600 channels.

In the configuration shown in figure 1-6, any local terminal can be connected to either Host A or Host B. Also, remote terminals dialing in to the Micro600 can be connected to Host B through the PDN or to Host A through the Micro600. Considerable communications flexibility is provided by the PAD and Micro600 combination.

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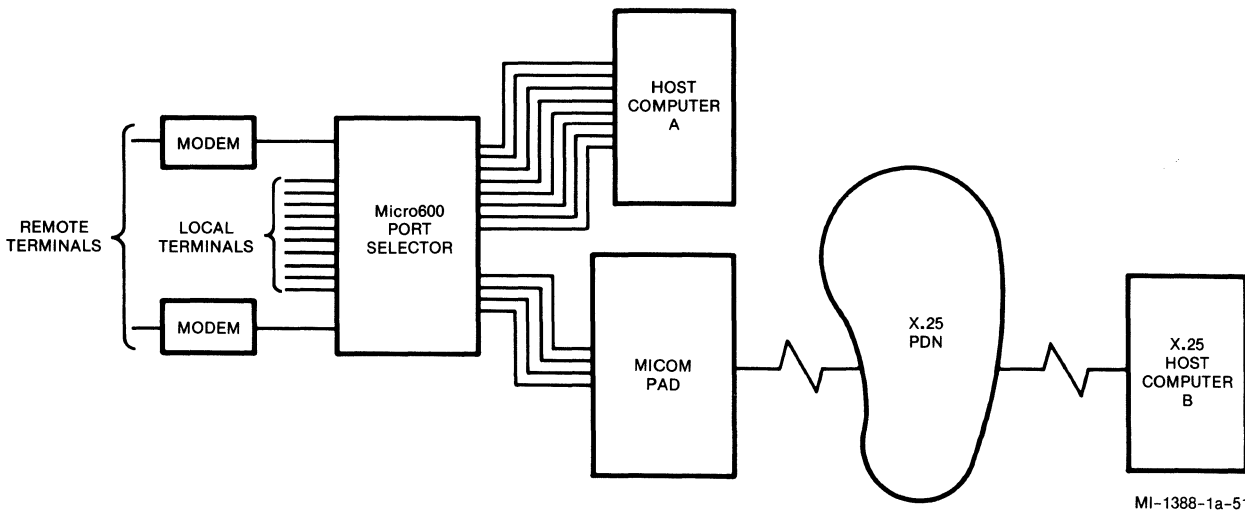
Figure 1-6. X.25 Gateway

1.5.4 Interfacing Non-X.25 Computers

Many minicomputers do not provide X.25 protocol support for packet network access. Even for those that do, it may be more convenient and cost-effective to use standard asynchronous computer ports and an external X.25 PAD to connect to the PDN. The PAD can be used for either a host computer connection or a terminal connection -- without making any changes to existing computer and terminal systems (see figure 1-7).

Special features of the PAD which make it unusually powerful as a minicomputer front-end include: automatic setup of the calling terminal PAD parameters; emulation of Bell 212 modem signaling at call setup time; and the optional ability to switch local terminals through to the host computer without placing a call through the PDN.

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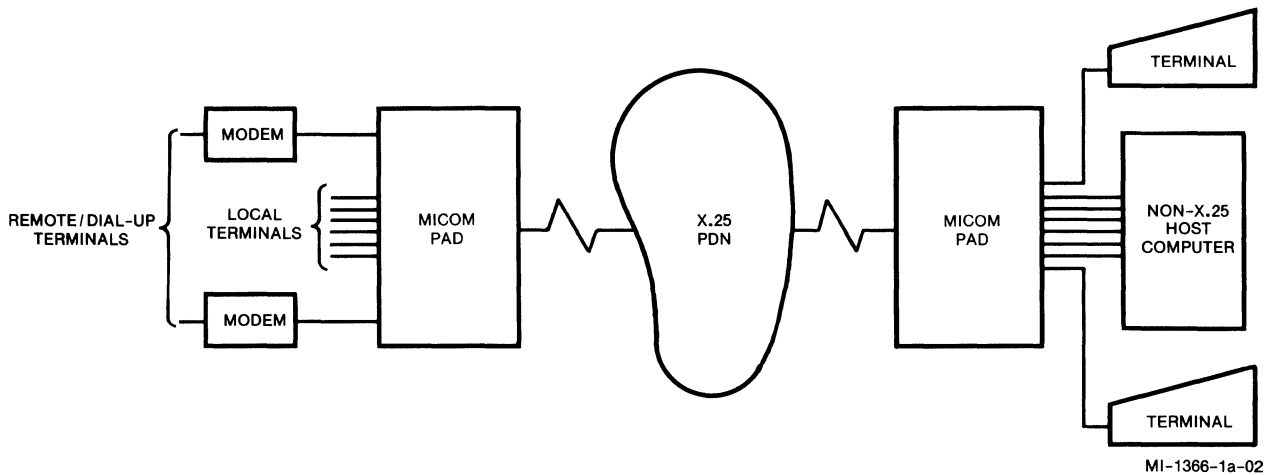
Figure 1-7. Interfacing Non-X.25 Computers

1.5.5 Computer Port Selection

Unlike standard PAD devices, the MICOM PAD can provide a por selection function which allows the user to select between different computers connected to a remote MICOM PAD (see figure 1-8). This powerful feature represents another major functional enhancement over the basic requirements of X.3 and X.28. Ports at a computer site that are connected to a MICOM PAD can be grouped into classes, and classes can be selected by remote PAD users. Port selection also automatically provides contention, allowing a large population of terminals to compete equally for a smaller number of ports.

The port selection function permits access to:

* A specific port.
* Any port of the desired speed.
* Any port on the selected computer.
* Any available port.

Port selection by remote PAD users is easy. All the user needs to do is enter a two-character class identifier when placing a call. The PAD ensures that a connection is made to the desired type of computer port.

REMOTE

UP TO 16 TERMINALS — MICOM PAD

X.25 PDN

MICOM PAD

ASYNCHRONOUS CHANNELS

HOST COMPUTER A

UP TO 16 TERMINALS — MICOM PAD

HOST COMPUTER B

ASYNCHRONOUS CHANNELS

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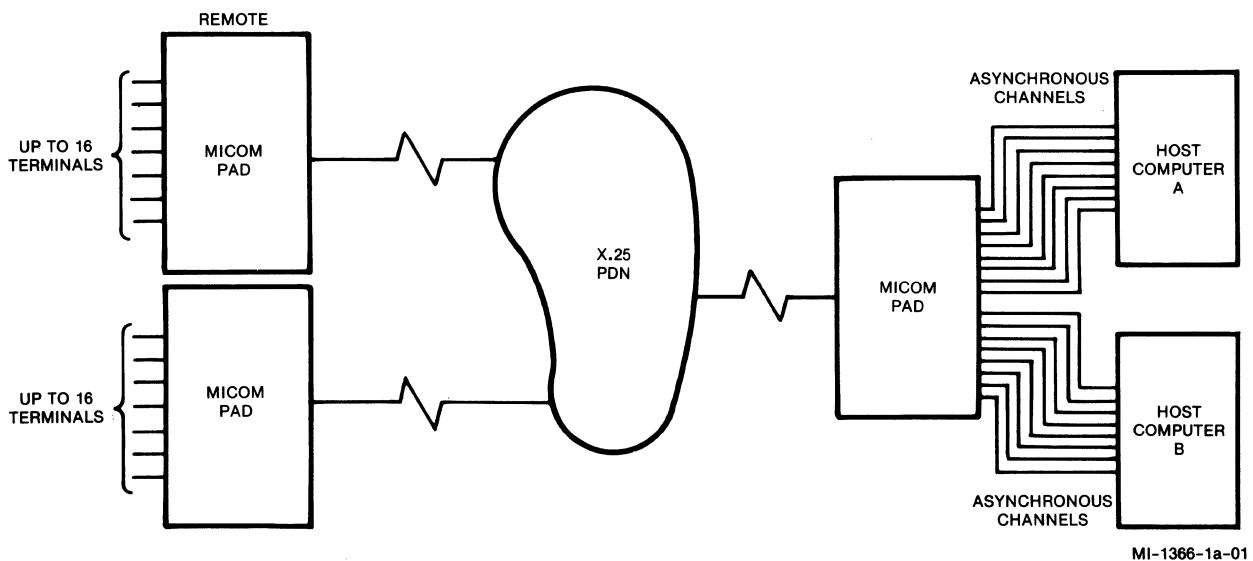
Figure 1-8. Computer Port Selection

1.6 CENTRALIZED MANAGEMENT OF THE PAD

MICOM offers an optional product, the XCC (X.25 Control Center), that allows you to control a number of MICOM PADs from a central site. The same XCC can be used to manage different types of MICOM PADs. Functions offered by the XCC include the following:

- Centralized creation and maintenance of configuration files
- Downline loading of configuration files
- Statistics collection and reporting
- Diagnostic facilities
- Message broadcasts

Figure 1-9 illustrates an XCC implementation. For information on configuration of XCC PADs, refer to paragraph 5.5.15 and to appendix D.

LEGEND:

— — — X.25 CONTROL CENTER MANAGEMENT AND CONTROL

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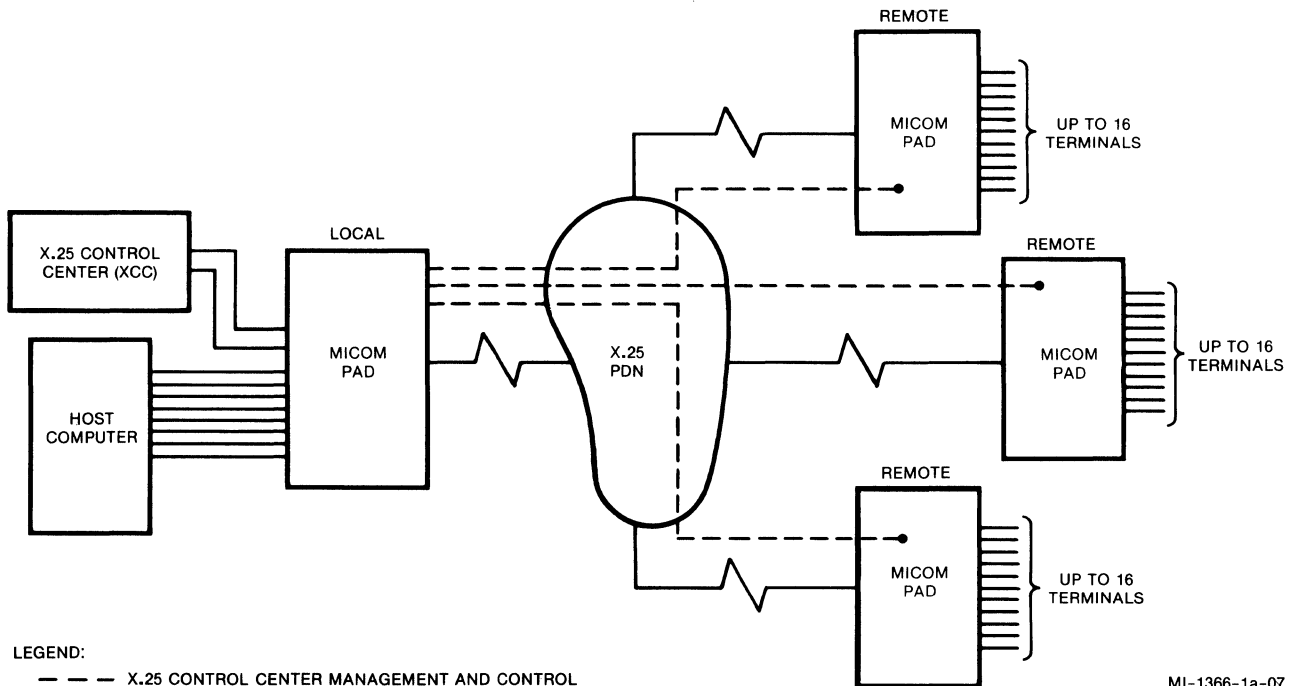
Figure 1-9. Typical XCC (X.25 Control Center) Implementation

1.7 PHYSICAL SPECIFICATIONS

Operating
Environment   32 to 114°F (0 to 45°C)
                   0 to 95 percent relative humidity (non-condensing)

Power   115 or 230 V ac $\pm$10 percent, 50 to 60 Hz

Size   Standalone:

                   15 1/2 inches (39.4 cm) wide
                    4 1/2 inches (11.4 cm) high
                   11 3/4 inches (29.8 cm) deep
                   Weight: 8 pounds (3.6 kg)

                   Rack-Mounted with Upgrade Kit MB-RMK-1:

                   19   inches (48.3 cm) wide
                    5 1/4 inches (13.3 cm) high
                   11 1/2 inches (29.2 cm) deep

Storage
Temperature   -40 to 176°F (-40 to 80°C)

Emissions
Control   Complies with FCC Part 15, Subpart J, Class A, for control
                   of radio-frequency interference.

Status
Displays   The base module has 12 indicators.
                   Each expansion module has six indicators.

Lithium
Battery   Located on the base module, the battery supplies power to
                   CMOS RAM for an accumulated power-down life of two years.
                   User life of the battery is four years (not rechargeable).

SECTION 2

INSTALLATION AND CONFIGURATION

This section provides the experienced communications technician with the
information needed to install the PAD and configure it in preparation for
operation.

2.1 SELECTING THE INSTALLATION LOCATION

The PAD has specific size, ventilation, and cabling requirements. The fol-
lowing list contains information that will guide you in your selection of a
location:

* Take into account the size of the enclosure (including the space needed
  for the rear connectors): 15 1/2 inches (39.4 cm) wide, 4 1/2 inches
  (11.4 cm) high, and 14 inches (35.6 cm) deep.

* The air vents on the bottom of the enclosure must always be kept clear
  of obstructions. Do not place the unit on paper or on any material that
  can be moved by suction; it will seal off the intake vent.

* All cables that are used to connect terminals and external modems to the
  PAD must be shielded and cannot be longer than 50 feet (15.2 meters).

* External cables must be disconnected from the rear connectors before the
  removal of the modules is attempted.

* The distance to the ac power outlet should not exceed 6 feet
  (1.8 meters).

2.2 INSTALLATION

Instructions for installation include:

* Expansion modules
* FEATUREPAK cartridge
* The PAD

2.2.1 Installing and Removing Expansion Modules

CAUTION: To avoid possible damage to an expansion module from static dis-
         charge, be sure to touch the PAD's metal enclosure before installing
         or removing a module.

To install or to remove an expansion module, you need to open the unit.

To open the unit, you need a Phillips-type screwdriver and the MICOM User
Key (or a screwdriver with a 1/4-inch blade).

There are two screws on each side of the enclosure (see figure 2-1). Use a Phillips-type screwdriver to remove all four screws. Then release four locking clips using the MICOM User Key that is provided with the equipment. (A screwdriver with a 1/4-inch blade may also be used.) Insert the User Key blade not more than halfway in four slots on both sides of the base (see figure 2-1). Pry the cover up with the key in each of four slots to release the clips. Lift the cover off when all four clips are released.

To close the unit, identify the front of the cover (see the stamp on the underside of the cover). Align the front of the cover with the front of the base and place the cover over the base. Align the slots in the cover edges on both sides with the tabs on the base edges (see figure 2-1). Push in the edge of the cover over the alignment tabs as you press the cover down. The locking clips will lock the cover in place. Then replace the four screws that you removed to open the PAD.

COVER

SCREW
(4 PLACES)

SLOT FOR
MICOM USER KEY
(4 PLACES)

BASE

REMOVE SCREW
(4 PLACES)

BLADE

MICOM USER
KEY

INSERT MICOM USER
KEY APPROXIMATELY
HALF OF BLADE LENGTH

LIFT TO REMOVE COVER

HALFWAY
POINT

COVER

ALIGNMENT SLOT
(4 PLACES)

BASE

LOCKING CLIP
(4 PLACES)

ALIGNMENT TAB
(4 PLACES)
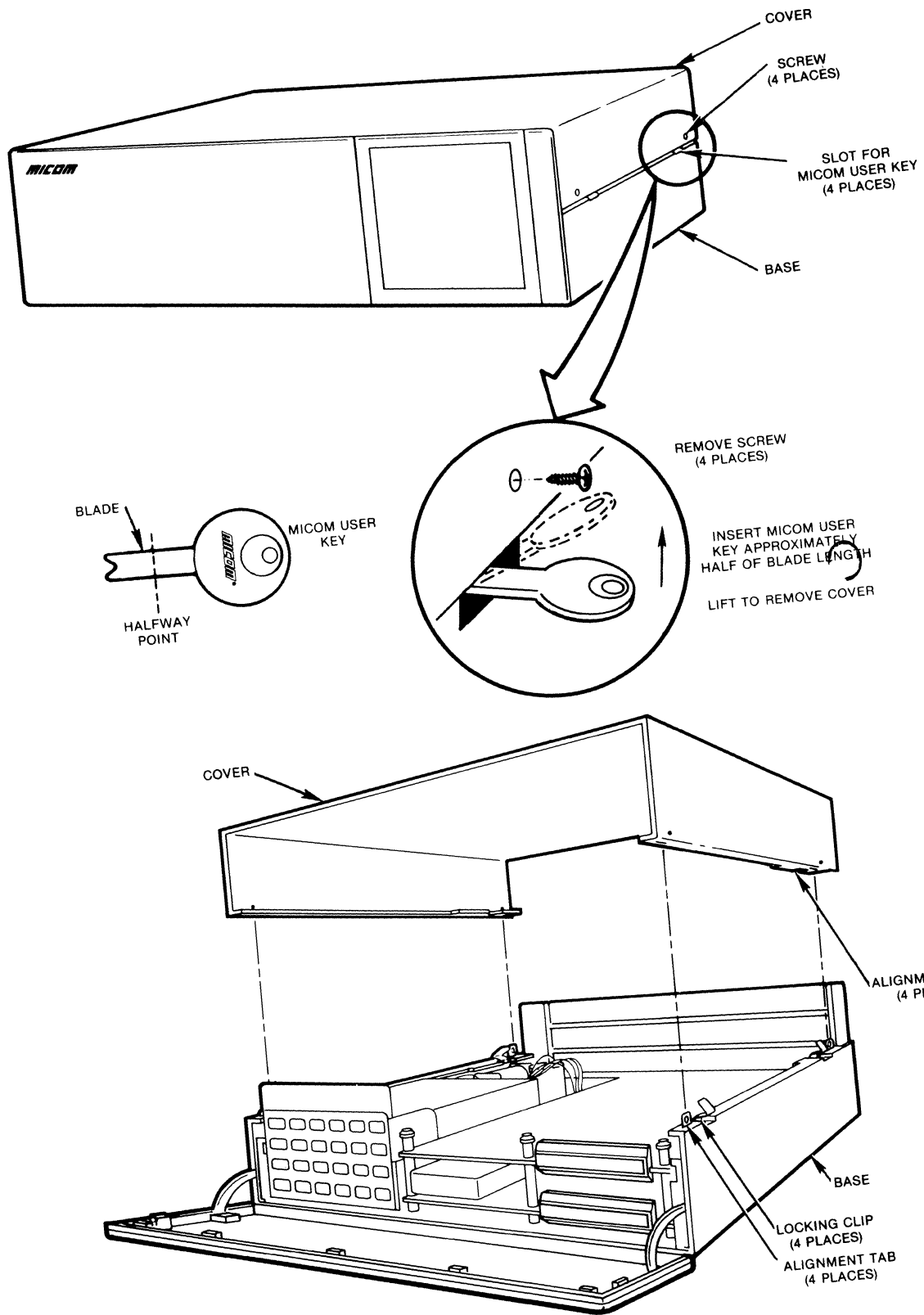
MI-1366-1a-60

Figure 2-1. Opening and Closing the Enclosure

To install an expansion module:

1. Apply the indicator strips.

   One indicator strip accompanies each expansion module. It shows the channel numbers for the module (see figure 2-2). The strip has an adhesive backing.

   For the first expansion module, apply the indicator strip labeled 5 through 10 in the location shown in figure 2-2.

   If you have a second expansion module to install, apply the strip labeled 11 through 16 in the location shown in figure 2-2.

NOTE: If necessary, also apply the base module indicator strip shown in figure 2-2.

INDICATOR STRIP FOR THE
SECOND EXPANSION MODULE

16 15 14 13 12 11

INDICATOR STRIP FOR THE
FIRST EXPANSION MODULE

10   9   8   7   6   5

INDICATOR STRIP FOR THE
BASE MODULE

AT DA CL CA LA BO CO LD 4 3 2 1
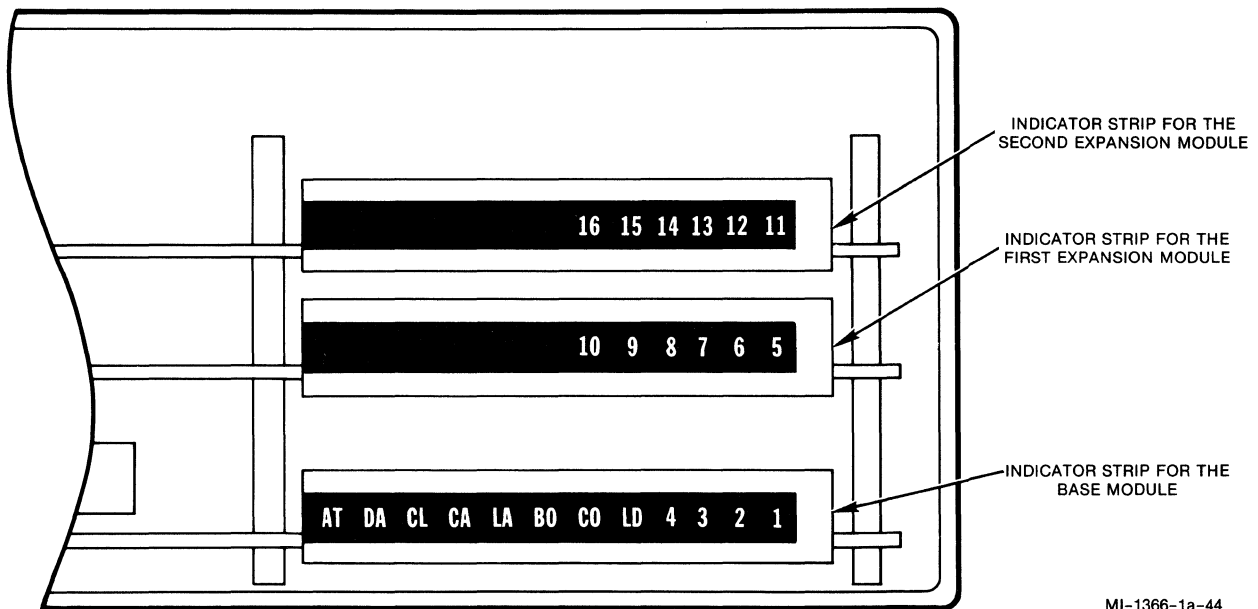
MI-1366-1a-44

Figure 2-2. Applying Indicator Strips to the Modules

2. Install the jumpers for channel selection.

   A jumper or jumpers must be installed on each expansion module to select either channels 5 through 10 or channels 11 through 16.

   In a 10-channel unit, ensure that a jumper is installed on the E3 header of the expansion module, to select channels 5 through 10 (see figure 2-3).

   In a 16-channel unit, ensure that a jumper is installed on the E3 header of the bottom expansion module (to select channels 5 through 10), and on the E1 header of the top expansion module (to select channels 11 through 16). See figure 2-3.

3. Secure the back of the module (see figure 2-3).

   A panel is attached to the back of each expansion module. Slide the panel into the side guides until it couples with the panel below. Where a module is not installed, you must slide in a panel without an attached module to form a solid back for the PAD's enclosure.

   Installing an expansion module requires the use of stacking connectors (perform step 4).

4. Connect the stacking connectors.

   A stacking connector has two parts: a shroud and a block. The shroud is on the bottom of the module being installed and fits over the block on the module below. As you slide in the back panel, align the shroud and the block. Then press the two together until the connector is completely coupled.

5. Secure the front of the module.

   In the front, the modules snap together using three standoffs. Place the standoffs (on the bottom of the module being installed) over the standoffs that are on the module below. Place the User Key over the standoff, so that the top of the standoff fits into the depression in the handle of the key. Press down until the standoffs snap together (see figure 2-1).

6. Connect the external cables.

   Connect the external cables to the connectors on the back of the enclosure (refer to paragraph 2.2.3).

MICOM USER KEY

PRESS DOWN TO SNAP TOGETHER

SNAP-TOGETHER STANDOFF (MALE)

SNAP-TOGETHER STANDOFF (FEMALE)

GUIDE

BACK OF THE ENCLOSURE

GUIDE

STACKING CONNECTOR (SHROUDS)

J1 STACKING CONNECTOR (BLOCKS)

HEADER E3
(INSTALL JUMPER TO SELECT CHANNELS 5 THROUGH 10 ON BOTTOM EXPANSION MODULE)

HEADER E1
(INSTALL JUMPER TO SELECT CHANNELS 11 THROUGH 16 ON TOP EXPANSION MODULE)

MICOM USER KEY

TWIST TO SEPARATE

MI-1387-1a-03

Figure 2-3. Expansion Module Installation and Removal

To remove an expansion module (see figure 2-3):

1. Disconnect the external cables from the back connectors.

2. Separate the three standoffs from the module using the MICOM User Key or a screwdriver with a 1/4-inch blade (refer to the CAUTION that follows). Firmly insert the User Key between the module edge and the standoff below. A fully inserted key will cause the module to unsnap (see figure 2-3). When the key is properly inserted, twist the key to one side to separate the module from the standoff. Repeat this operation for each standoff.

CAUTION: If you use a screwdriver instead of the MICOM User Key, be careful to avoid scratching or gouging the underside of the module.

3. Pull apart the stacking connector between the two modules.

4. Slide the back panel out of the side guides.

2.2.2 Installing and Removing a FEATUREPAK Cartridge

The receptacle for the FEATUREPAK cartridge is located behind the front panel (see figure 2-4). To open it, pull the panel top out and down.

CAUTION: To avoid possible damage to an expansion module from static dis-
         charge, be sure to touch the PAD's metal enclosure before reaching
         for the FEATUREPAK cartridge.

To install, insert the FEATUREPAK cartridge into the receptacle, with the connector pins going in first. Tracks on the cartridge will mate with the slides inside the unit. With a fair amount of pressure, push the cartridge, so that the pins of the connector are firmly seated. This will ensure the proper connection of the cartridge.

To remove, grip the cartridge firmly on the sides and pull with a fair amount of force to dislodge the connector. Then lift the front of the cartridge over the edge of the front panel.

2.2.3 Installing the PAD

The PAD can be installed either as a standalone or as a rack-mount. Each type of installation is described in the following paragraphs.

Place the standalone unit on a tabletop or shelf. Allow enough space for cover removal, handling of the back panel connectors, opening the front panel, and unobstructed air flow (refer to paragraph 2.1).

For a rack-mount installation, use a standalone unit with an optional Rack-Mount Upgrade Kit MB-RMK-1 (see figure 2-5). Mount the standalone unit in a standard 19-inch wide rack, using the kit. Installation instructions are included with the kit.

REMOVING THE
FEATUREPAK CARTRIDGE

FEATUREPAK CARTRIDGE
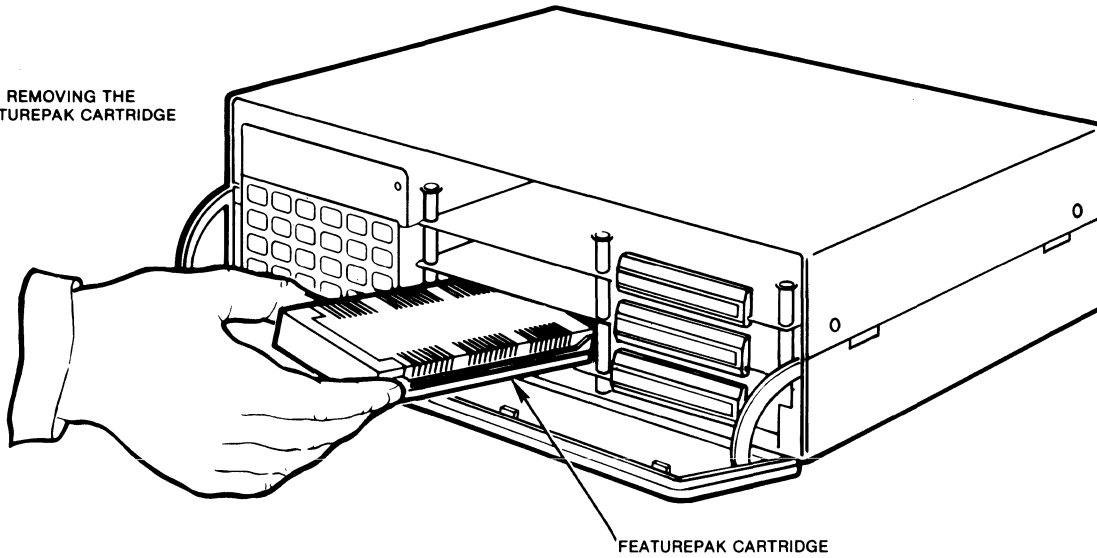
INSERTING THE
FEATUREPAK CARTRIDGE

CONNECTOR

FEATUREPAK CARTRIDGE
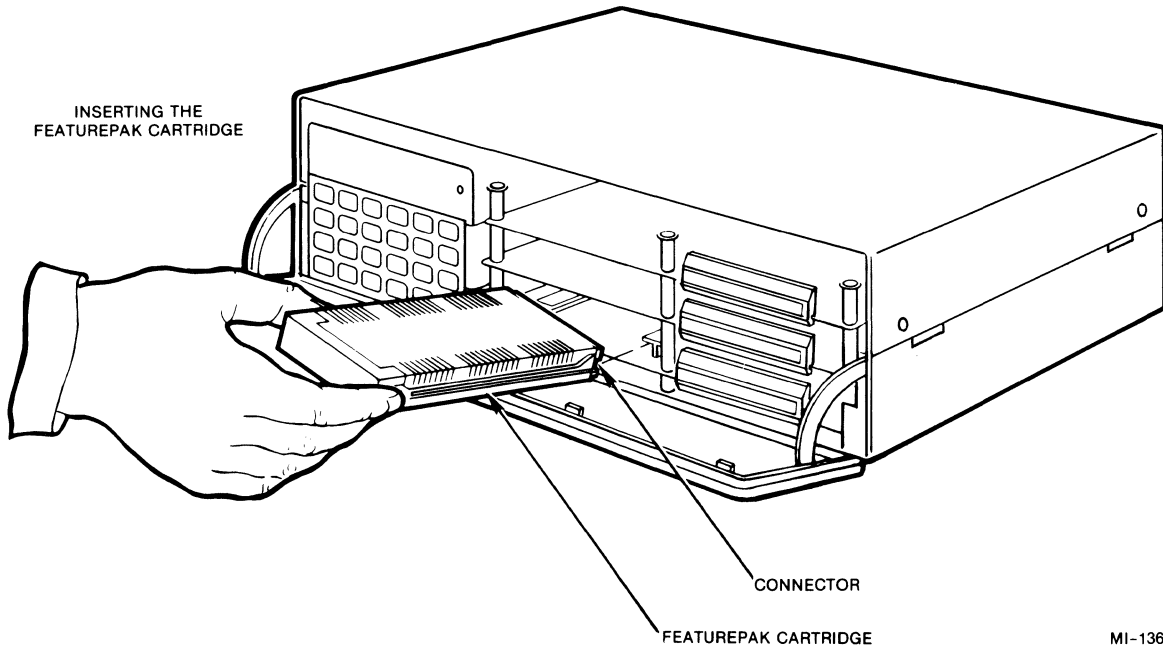
MI-1366-1a-62

Figure 2-4. FEATUREPAK Cartridge Removal and Installation

PIN

CUTOUT

RACK-MOUNT FRAME

ASSEMBLED UNIT
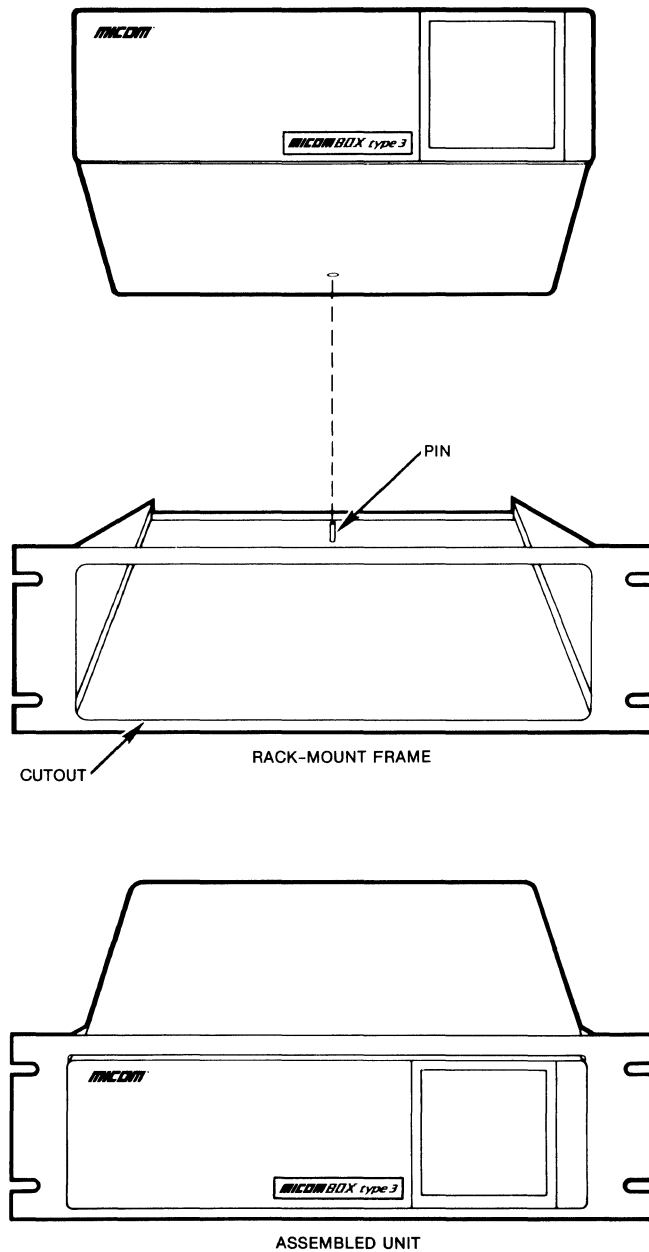
MI-1387-1a-04

Figure 2-5. Rack-Mount Installation

The system connections are made using the MICOM cables. User-provided cables may also be used (refer to the NOTE that follows). Connect these cables to the connectors located on the back of the enclosure (see figure 2-6).

NOTE: Some equipment connected to the PAD does not require a shielded enclosure and shielded cables for the PAD in compliance with the FCC Rules and Regulations, Part 15/J. When this is the case, it may be necessary to use a filtered connector between the PAD and such equipment. This will provide the safeguards as required by FCC. Contact MICOM Sales Administration for correct filter application.

Connectors for all expansion modules are labeled for channel pairs. The first number in the pair applies to the first expansion module; the second number in the pair applies to the second expansion module (see figure 2-6). For example, the label CHANNEL 5/11 refers to channel 5 on the first expansion module, or to channel 11 on the second expansion module.

The system connections to be made when installing the unit are:

- Channel interface
- Composite interface
- Command Port
- Power (ac)
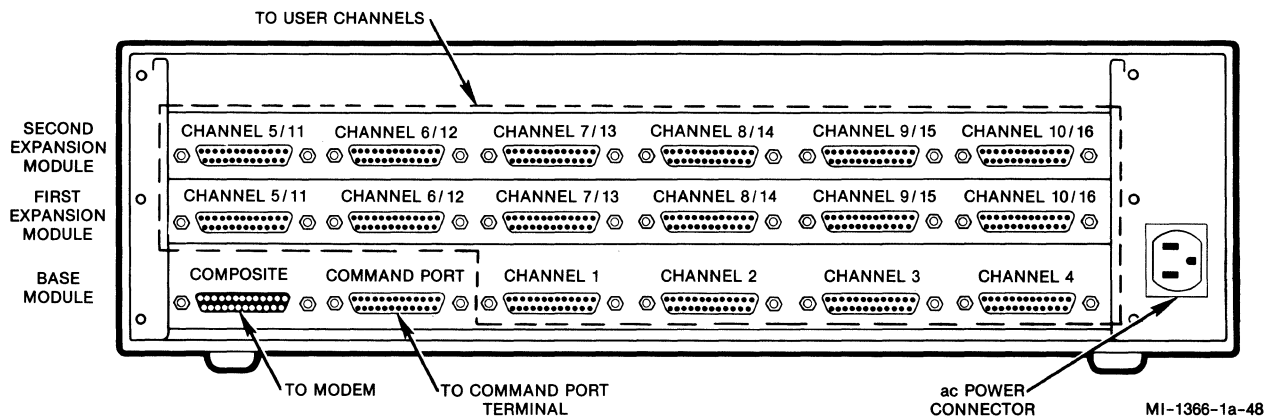
Figure 2-6. Connectors on the Back Panel of the Enclosure

2.2.3.1 System Cabling

System connections are made using MICOM cables. If other cables are used, they must be shielded and must not be longer than 50 feet (15.2 meters). (Refer to the NOTE in paragraph 2.2.3 for special cases where a filtered connector is used.) The MICOM cables are as follows:

Name	MICOM Part Number	Connections
Unique Straight	100-2645-xx	Channel, Command Port
Straight	100-2200-xx	Channel, Command Port, Composite
Crossover	100-2219-xx	External modem

NOTE: The unique straight cable is identical to the straight cable, except that it has a male connector on each end. The straight cable has a male connector on one end and a female connector on the other end.

Figure 2-7 shows cabling in a typical system arrangement. For cable pin assignments, see figure 2-8. All system connections are described in the following paragraphs.

CAUTION: To prevent errors caused by induced noise, do not operate the PAD with open-ended cables connected to the channel interface connectors. The other ends of the cables must be connected to devices.
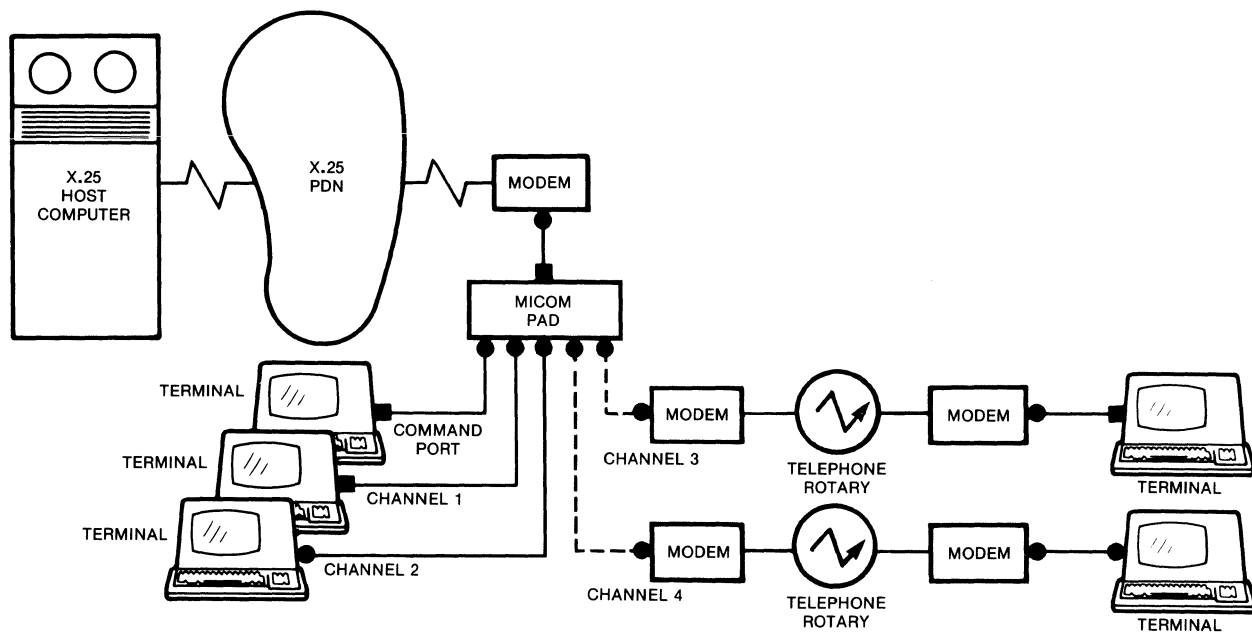
LEGEND:

● ——— ● = UNIQUE STRAIGHT CABLE (MICOM PART NUMBER 100-2645-XX)

● ——— ■ = STRAIGHT CABLE (MICOM PART NUMBER 100-2200-XX)

● — — ● = CROSSOVER CABLE (MICOM PART NUMBER 100-2219-XX)

NOTE:
REFER TO APPENDIX F FOR INFORMATION ON CABLING A
HIGH-SPEED X.21 OR V.35 X.25 LINK

MI-1387-1a-35

Figure 2-7. Example of System Cabling

STANDARD STRAIGHT CABLE
(MICOM PART NUMBER 100-2200-XX)

25-PIN CONNECTOR (FEMALE)	25-PIN CONNECTOR (MALE)		25-PIN CONNECTOR (FEMALE)	25-PIN CONNECTOR (MALE)
1	1	PROTECTIVE GROUND	1	1
2	2	TRANSMITTED DATA	2	2
3	3	RECEIVED DATA	3	3
4	4	REQUEST-TO-SEND	4	4
5	5	CLEAR-TO-SEND	5	5
6	6	DATA SET READY	6	6
7	7	SIGNAL GROUND	7	7
8	8	CARRIER DETECT	8	8
15	15	TRANSMIT CLOCK	15	15
17	17	RECEIVE CLOCK	17	17
20	20	DATA TERMINAL READY	20	20
22	22	RING INDICATOR	22	22
24	24	EXTERNAL CLOCK	24	24
25	25	BUSY OUT	25	25

CONNECTS TO THE PAD COMPOSITE — CONNECTS TO MODEM — CONNECTS TO TERMINAL — CONNECTS TO THE PAD COMMAND PORT OR THE CHANNEL

CROSSOVER CABLE
(MICOM PART NUMBER 100-2219-XX)

25-PIN CONNECTOR (MALE)	25-PIN CONNECTOR (MALE)	
1	1	PROTECTIVE GROUND
2	3	RECEIVED DATA
3	2	TRANSMITTED DATA
4	8	CARRIER DETECT
6	20	DATA TERMINAL READY
7	7	SIGNAL GROUND
8	4	REQUEST-TO-SEND
11	5	CLEAR-TO-SEND
17	24	EXTERNAL TRANSMIT CLOCK
20	6	DATA SET READY
22	25	BUSY OUT
24	17	RECEIVE CLOCK
25	22	RING INDICATOR
5	11	UNASSIGNED
15	18	UNASSIGNED
18	15	TRANSMIT CLOCK

CONNECTS TO THE PAD COMMAND PORT OR THE CHANNEL — CONNECTS TO MODEM

MI-1366-1a-65

Figure 2-8. Pin Assignments

2.2.3.2 Channel Interface Connections

Either a user cable or the MICOM cable may be used to connect your terminal or computer port (DTE) to a channel connector on the back panel. Panel labels identify the connectors -- CHANNEL 1 through CHANNEL 16 (refer to paragraph 2.2.3 for an explanation of the labels for channel pairs on expansion modules). Depending on the channel capacity of your unit, the connectors for 4, 10, or all 16 channels may be used.

Use either a shielded cable not longer than 50 feet (15.2 meters) or one of the following MICOM shielded cables (pin assignments for these cables are shown in figure 2-8):

- Straight cable (MICOM part number 100-2200-xx)
- Unique straight cable (MICOM part number 100-2645-xx)
- Crossover cable (MICOM part number 100-2219-xx)

The standard straight cable and the unique straight cable have identical circuit pin assignments. The only difference between the two cables is that the standard straight has one male and one female connector, while the unique straight has two male connectors. Because their pin assignments are identical, figure 2-8 shows only the standard straight cable. The two examples are used to show the standard straight cable connected to different equipment.

The crossover cable is used to connect to an external modem. Unlike a straight cable (where conductors are directly connected pin-for-pin), a crossover cable switches (crosses over) the pins so that a DCE can communicate with a DCE.

2.2.3.3 Composite Interface Connection

Connect an external modem to the connector on the back panel labeled COMPOSITE (see figure 2-6). Use either a shielded cable not longer than 50 feet (15.2 meters) or MICOM's shielded straight cable, part number 100-2200-xx (see figure 2-8).

2.2.3.4 Command Port Connection

Connect a terminal to the connector on the back panel labeled COMMAND PORT (see figure 2-6). Once the connection is made, this terminal is dedicated for use with the PAD Command Port Facility. Use either a shielded cable not longer than 50 feet (15.2 meters); or use MICOM's shielded straight cable (part number 100-2200-xx) or shielded unique straight cable (part number 100-2645-xx). For a remote access, connect a dial-in modem to the connector labeled COMMAND PORT, using MICOM's shielded crossover cable (part number 100-2219-xx). See figures 2-7 and 2-8.

2.2.3.5 Power Supply Connection

Using the MICOM power cord, plug its female connector into the power supply connector on the back panel (see figure 2-6). Plug the connector on the other end of the cord into the ac power supply wall outlet. Some indicators on the PAD will go ON (refer to paragraph 6.3 for descriptions of the indicators).

2.3 CHANGING EIA CONTROL SIGNAL BIAS FOR USER CHANNELS

A bias is set on the input EIA control signals (RTS, DTR, and Unassigned). When the input EIA control signals are not terminated by the device attached to the user channel, the bias ensures that the PAD will recognize these signals as being in a specific state. As such, the signals are not left floating and subject to noise.

The default EIA bias control setting for PAD user channels is off. This is the required setting for normal PAD operations. When bias control is set to off, the PAD will recognize an inactive EIA signal when:

- There is no connection to the signal.
- The attached device asserts the signal inactive.

In some cases, you may have to change the bias control setting to on. For example, if your terminal-to-PAD cables have only the Signal Ground, Received Data, and Transmitted Data signals, you must set bias control on to enable the terminals to place or receive calls.

When bias control is set to on, the PAD will recognize an active EIA signal when:

- There is no connection to the signal.
- The attached device asserts the signal active.

Whether bias control is set to on or to off, the PAD will always recognize the state asserted by the attached device when there is a connection to the signal.

The default EIA bias control setting (off) is correct for most PAD applications. However, if you need to change the bias control setting, you have a choice of two different methods. There is the Touch Panel method (refer to paragraph 2.4.2). Optionally, there is the Command Facility method (refer to paragraph 5.5.18, Soft Switches). Either method allows you to selectively configure channels 1 through 4, channels 5 through 10, and/or channels 11 through 16 to be biased ON.

2.4 USING THE TOUCH PANEL TO SET OPERATING PARAMETERS

There are two ways to set the PAD's operating parameters. One way uses the Command Facility (refer to paragraph 5.5.18). The other way, described in this paragraph, uses the Touch Panel. You can choose whichever method you prefer.

The operating parameters that you set using either method relate to the PAD's soft (software) switch groups. The ON or OFF settings of selections within those groups determine how the PAD will operate. For example, one selection determines whether the PAD will be cold or warm started upon reset.

You use Parameter and Value keys of the Touch Panel to set the PAD's operating parameters (see figure 2-9). You use the Touch Panel Reset keys to reset the PAD. Paragraph 2.4.1 gives you background information on how PAD operating parameters are stored. Paragraph 2.4.2 describes the operation of the Touch Panel.
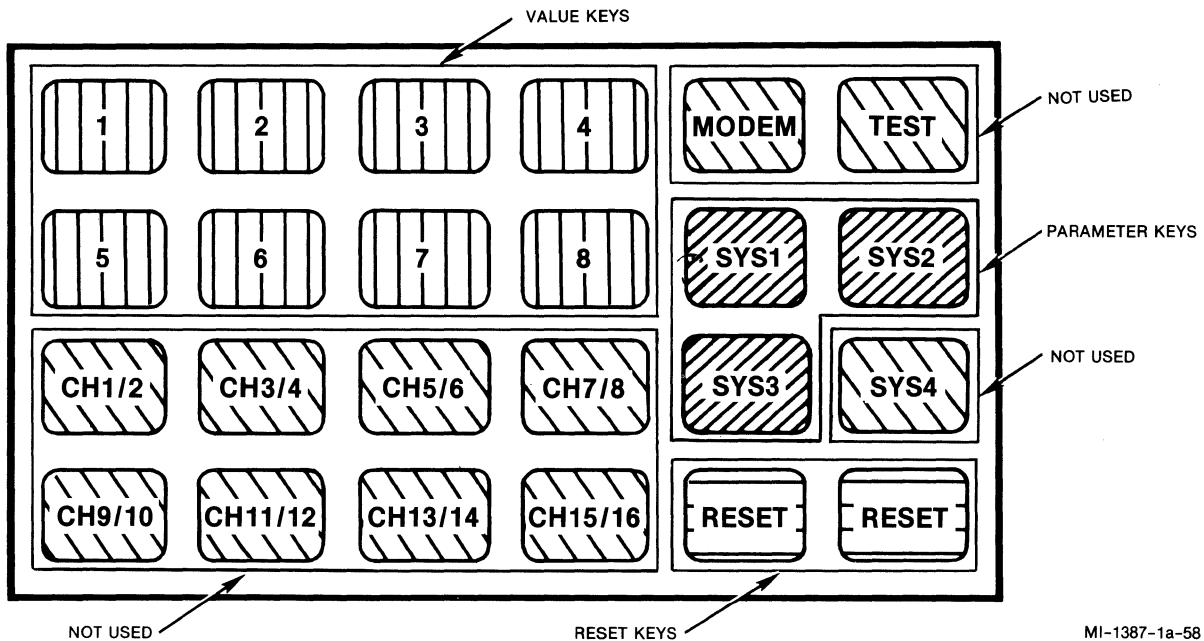
Figure 2-9. Touch Panel

2.4.1 How the PAD Stores Operating Parameters

Operating parameters that you set using the Touch Panel (or the Command Facility) are stored in battery-backed, nonvolatile CMOS (the battery is not rechargeable). A CMOS failure is software-detectable.

When a CMOS error or a battery-low condition is detected by the PAD, some indicators may go ON or start FLASHING. See table 6-1 for information on these indicators. In addition, the following message is output to the Command Port:

CMOS ERROR/BATTERY LOW

This message is displayed each time the PAD detects a CMOS error.

2.4.2 How to Operate the Touch Panel

The PAD's Touch Panel is used with the base module indicators to simplify the setting of PAD operating parameters. You press a Parameter key (SYS1, SYS2, or SYS3) that corresponds to the PAD's SYS1, SYS2, or SYS3 soft switch group. The PAD's base module indicators then show whether selections within that soft switch group are currently set to ON or to OFF.

The Touch Panel is located behind the front panel of the PAD. To access the keys, you pull the top edge of the front panel out and down.

1. Touch either the SYS1 or SYS2 key to select a group of operating parameters (see figure 2-10 for the SYS1 group or figure 2-11 for the SYS2 group). Touch the SYS3 key if you wish to change the EIA control signal bias for user channels (refer to paragraph 2.3 and see figure 2-12). After you touch one of these keys, the indicators will show the current settings of the selections.

   Also, after you touch SYS1, SYS2, or SYS3, a 25-second timer is started. If another SYS key or a numeric key is touched, the timer is restarted to 25 seconds. If the timer expires, the indicators revert back to their normal state; they reflect system status and channel data activity rather than the current status of operating parameters (refer to paragraph 6.3). Also, upon expiration of the 25-second timer, the current ON or OFF settings are stored in CMOS.

PARAMETER KEY | SYS1

VALUE KEYS: 1 (SEE 1) 2 (SEE 2) 3 4 (SEE 3) 5 (SEE 4) 6 (SEE 5) 7 (SEE 6) 8

INDICATORS: LD CO BO LA CA CL DA AT

VALUES | SELECTIONS

TRUNK
ON — DCE
OFF — DTE

FRAME SEQUENCING
ON — EXTENDED
OFF — STANDARD

KDD
ON — ENABLED
OFF — DISABLED

PACKET SEQUENCING
ON — EXTENDED
OFF — STANDARD

START
ON — COLD
OFF — WARM

(MUST BE OFF)

CLOCK
ON — EXTERNAL
OFF — INTERNAL

(MUST BE OFF)
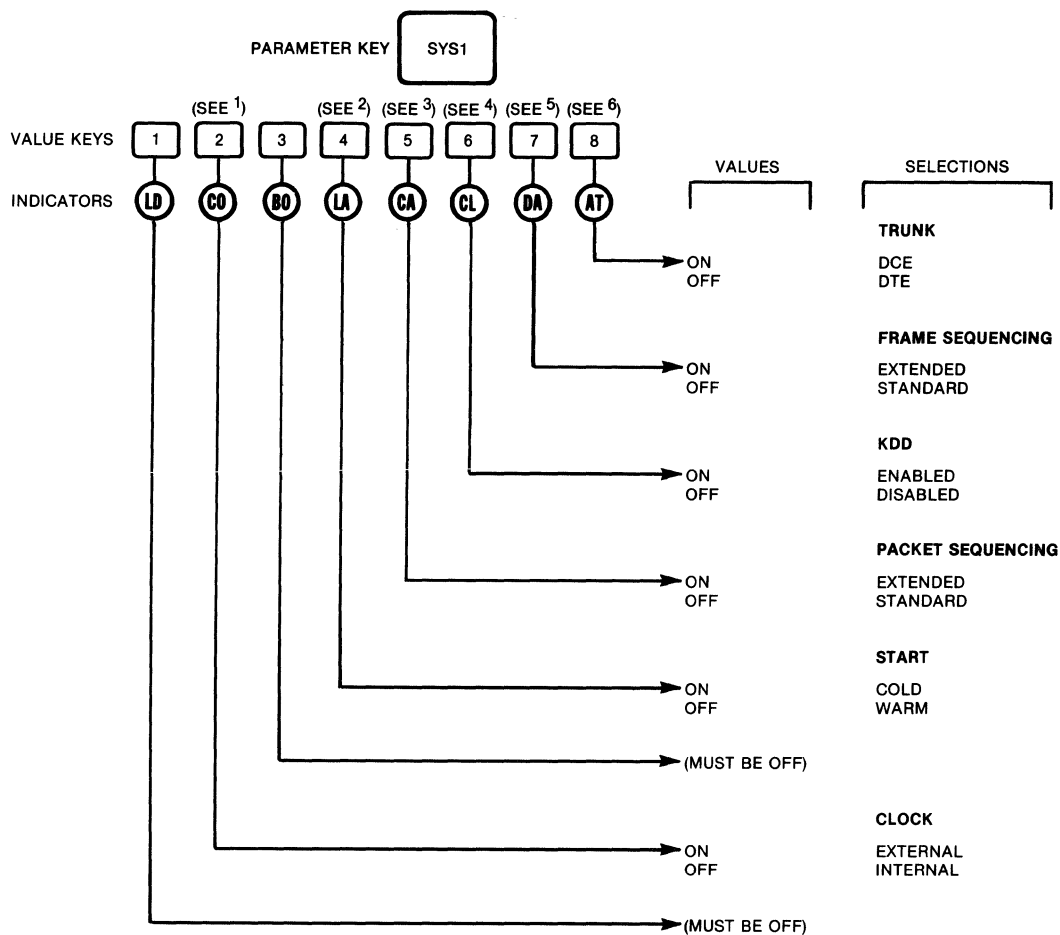
[1] THE CLOCKING SPEED IS FIXED AT 9600 bps.

[2] ONCE YOU HAVE RECONFIGURED YOUR PAD TO MEET YOUR OPERATING REQUIREMENTS, SELECTION 4 SHOULD BE OFF (WARM START). OTHERWISE, A PAD RESET OR A POWER FAILURE WILL CAUSE THE FACTORY-SET OPERATING PARAMETERS TO BE RESTORED.

[3] WHEN SELECTION 5 IS ON, THE PAD CONFORMS TO THE CCITT RECOMMENDATION FOR EXTENDED (MODULO 128) PACKET SEQUENCING. WHEN THIS SELECTION IS OFF, THE PAD CONFORMS TO THE CCITT RECOMMENDATION FOR STANDARD (MODULO 8) PACKET SEQUENCING.

[4] IF SELECTION 6 IS ON, SELECTION 5 MUST ALSO BE ON. WHEN KDD AND EXTENDED (MODULO 128) PACKET SEQUENCING ARE ENABLED, THE PAD IS COMPATIBLE WITH THE JAPANESE KDD NETWORK.

[5] WHEN SELECTION 7 IS ON, THE PAD CONFORMS TO THE CCITT RECOMMENDATION FOR EXTENDED (MODULO 128) FRAME SEQUENCING. WHEN THIS SELECTION IS OFF, THE PAD CONFORMS TO THE CCITT RECOMMENDATION FOR STANDARD (MODULO 8) FRAME SEQUENCING.

[6] NORMALLY, THE PAD WOULD BE SET TO HAVE A DTE APPEARANCE (CCITT X.25 LEVEL 2 AND 3), THUS MAKING THE PAD SUITABLE FOR CONNECTION TO PACKET DATA NETWORKS. SELECTION 8 MUST BE ON (DCE APPEARANCE) FOR CONNECTION TO OTHER X.25 EQUIPMENT (FRONT-END PROCESSORS OR HOST COMPUTERS) WHICH ARE CONFIGURED FOR DTE APPEARANCE.

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Figure 2-10. Using the SYS1 Key to Set Operating Parameters

PARAMETER KEY | SYS2

(SEE[1]) (SEE[2])

[1] [2] [3] [4] [5] [6] [7] [8] VALUE KEYS [3]

(LD) (CO) (BO) (LA) (CA) (CL) (DA) (AT) BASE MODULE INDICATORS

VALUES   SELECTIONS

→ (MUST BE OFF)

PACKET HANDLING

→ ON   DATAPAC PRIORITY
  OFF   X.25 PACKET SIZE NEGOTIATION

BLOCK MODE

→ ON   ENABLED
  OFF   DISABLED

SUBADDRESSING

→ ON   CALL USER DATA
  OFF   X.121

LOGICAL
GROUP
→ NUMBER [4]

NUMBER [4]	1	2	3	4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

READING ACROSS, THE ON OR OFF SETTINGS DETERMINE
THE LOGICAL GROUP NUMBER TO BE USED FOR THE
SWITCHED VIRTUAL CIRCUITS UPON COLD START. PRESS
VALUE KEYS 1 THROUGH 4, AS NEEDED, TO SET SELEC-
TIONS ON OR OFF.

[1] NORMALLY, YOU WOULD SET THE PAD TO SUPPORT SUBADDRESSING, USING THE X.121 METHOD.
YOU MUST SET SELECTION 5 ON (CALL USER DATA FIELD METHOD) IF YOUR NETWORK (FOR EXAM-
PLE, DATAPAC) DOES NOT SUPPORT X.121 SUBADDRESSING.

[2] NORMALLY, YOU WOULD SET THE PAD TO SUPPORT THE X.25 PACKET-SIZE NEGOTIATION FACILITY
CODING, AS PER CCITT 1980. SELECTION 7 MUST BE ON TO ACCOMMODATE THE 128-BYTES
PRIORITY OPERATION OVER THE CANADIAN DATAPAC NETWORK.

[3] SELECTIONS 1 THROUGH 5 TAKE EFFECT UPON COLD START.

[4] NORMALLY, YOU WOULD SET THE PAD TO SUPPORT $n + 2$ VIRTUAL CIRCUITS, WHERE n IS EQUAL
TO THE NUMBER OF PHYSICAL CHANNELS. FOR NUMBERING, THE PAD ASSUMES AN LGN = 0
AND AN LCN = 1 THROUGH $n + 2$. THIS ALLOWS, FOR EXAMPLE, 18 VIRTUAL CALLS FOR 16
CHANNELS.

WHILE AN LGN = 0 IS SUITABLE FOR MOST COUNTRIES, THE UNITED KINGDOM'S PSS NETWORK,
FOR ONE, REQUIRES AN LGN = 4 FOR SVC OPERATION. YOU CAN RESET SELECTIONS 1 THROUGH
4 SO THAT THE LGN WILL BE SET TO A VALUE BETWEEN 1 AND 15 (INSTEAD OF 0), ON COLD
START.

WHEN THE LGN IS SET TO A VALUE OTHER THAN 0, THE LCN RANGE WILL BE 0 THROUGH $n + 1$,
WHERE n EQUALS THE NUMBER OF PHYSICAL CHANNELS INSTALLED.

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Figure 2-11. Using the SYS2 Key to Set Operating Parameters

PARAMETER KEY SYS3

VALUE KEYS 1 2 3 4 5 6 7 8

BASE MODULE INDICATORS (LD) (CO) (BO) (LA) (CA) (CL) (DA) (AT)

VALUES   SELECTIONS

BIAS FOR CHANNELS 11 THROUGH 16
→ ON   ON
  OFF   OFF

BIAS FOR CHANNELS 5 THROUGH 10
→ ON   ON
  OFF   OFF

BIAS FOR CHANNELS 1 THROUGH 4
→ ON   ON
  OFF   OFF

→ (MUST BE OFF)

→ (MUST BE OFF)

→ (MUST BE OFF)

→ (MUST BE OFF)

→ (MUST BE OFF)
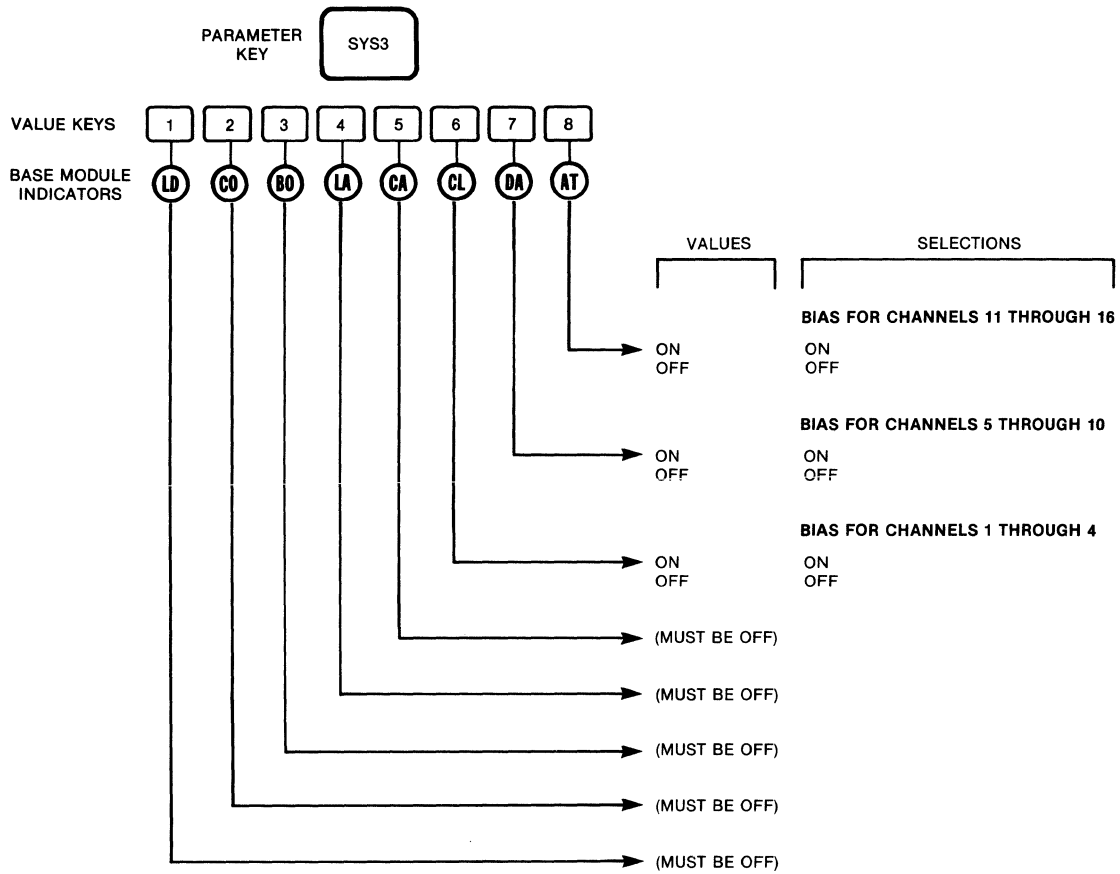
NOTE:
FOR NORMAL PAD OPERATION, THE EIA CONTROL SIGNAL BIAS IS
OFF (INACTIVE). THEREFORE, OFF IS THE DEFAULT VALUE FOR
SELECTIONS 6, 7, AND 8.

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Figure 2-12. Using the SYS3 Key to Select EIA Control Signal Bias

2. Touch the keys labeled 1 through 8 to make specific selections from the group of parameters (SYS1, SYS2, or SYS3) you have just selected. Repeated touching of one of these keys toggles the corresponding value between OFF and ON. The indicators (1 through 8) will show the new status (ON or OFF). The correlation of selections-to-indicators is shown in table 2-1.

Table 2-1. Correlation of Soft Switch Selections to Indicators

Indicator	Selection
LD	1
CO	2
BO	3
LA	4
CA	5
CL	6
DA	7
AT	8

3. Touch both Reset Keys to reset the PAD and store the current selection values. During the reset, the PAD's base module indicators should be ON.

SECTION 3

THEORY OF OPERATION

This section will be helpful when:

- You plan the initial installation of the PAD.
- You examine what happens when you change applications.
- You change devices that use the PAD to access the Network.

In this section, concepts and terminology are described in detail to illustrate the relationships that exist in the following operational areas:

- X.25 trunk handling

- Asynchronous device support; X.3 and MICOM PAD extensions to the CCITT Recommendation

- Physical channel connection/EIA handling

- X.25 addressing schemes

- What is involved in placing a call

- What occurs when an incoming call is received

- X.28 support with additional MICOM characteristics

- X.29 support with additional MICOM characteristics

- Permanent virtual circuits

Because of the strong relationships that exist in these operational areas, the text in this section includes extensive cross-referencing notes. We have also cross-referenced each subject or characteristic with its related configurable parameters in section 5.

3.1 THE X.25 TRUNK

Packet switching networks provide two methods of connection for the asynchronous equipment user:

- A dedicated X.25 access line
- Dial-up or dedicated asynchronous lines

In order to use the X.25 access line, asynchronous equipment users must connect by using equipment (i.e., host computer, front ends, and communication processors) which complies with the Recommendation X.25 as adopted by CCITT in 1984 and which has implemented related Recommendations X.3, X.28, and X.29. The MICOM PAD fully supports these requirements.

The MICOM PAD will normally be used as an in-house PAD when a user has a cluster of asynchronous terminals or a non-X.25 computer system that must be interfaced to the X.25 packet data network. However, the PAD can also be used for an extension to the backbone PDN to offer both dial-in and dedicated asynchronous device access.

Because the network's asynchronous access facilities are typically limited to 1200 bps, you may also require a PAD when a higher data rate is required.

In summary, the MICOM PAD is a very cost-effective system when it is necessary to interface a number of asynchronous terminals at high data rates.

3.1.1 The X.25 Connection

The PAD uses a full-duplex, point-to-point circuit as a physical transmission path to the PDN or to other equipment that adheres to the X.25 procedures defined by CCITT.

While some networks and equipment still support older link access procedures, the MICOM PAD supports only the most current LAPB procedures with the more efficient HDLC format. Therefore, you must be sure that the PAD is only connected to an X.25 access link defined for LAPB-HDLC operation.

The PAD can connect to public or private data networks or directly to an X.25-based host computer or front-end processor.

A PAD is usually set to exhibit an X.25 DTE logical appearance on the trunk. When interconnecting the PAD to other X.25 equipment, the PAD may have to be set up to operate as an X.25 DCE. This can be achieved by setting a single soft switch (refer to paragraph 2.4).

In addition to the DTE or DCE logical appearance setting, the PAD allows you to tune the trunk parameters to meet the characteristics of the X.25 facilities being used (for example, line speed and quality) and to achieve a better match with different networks and/or X.25-based equipment.

3.1.2 Trunk Parameters

K
: Known also as the frame or HDLC window, this parameter indicates the maximum number of information frames that can be unacknowledged at any given time on the X.25 trunk between the PAD and the Network.

  The factory setting is 7.

T1
: The T1 timer protects against loss of frames between the PAD and the Network. Both sides of the circuit must have the same timer value.

  The factory setting is 5.

N2
: This parameter specifies the allowable number of times an unacknowledged frame can be retransmitted before the link is reset.

  The factory setting is 10.

T3
: The T3 timer ensures the functionality of the X.25 trunk. When no activity is detected on the trunk for the duration of the T3 timer, the PAD uses the X.25 link-assurance procedure. If the link-assurance procedure detects a trunk failure (or if a system reset occurs), the PAD actively attempts to bring the trunk up using an SABM/UA sequence.

  The factory setting for the T3 timer is 15 seconds. (If the timer is set to 0, the link-assurance procedure is disabled and the PAD will not initiate an SABM/UA sequence if a system reset occurs.)

W
: This parameter indicates the maximum number of packets which can be unacknowledged at any given time for each of the PAD's established X.25 calls.

  The factory setting is 2.

Packet Size
: The packet size defines the maximum number of characters that the PAD will insert into a Network-bound packet or will expect in an in-bound packet.

  The factory setting is 7.

Segment Size
: The PAD maintains a segment counter for networks that use the segment as the chargeable unit instead of the packet or character.

  The factory setting is 6.

NUI Type   This parameter specifies the type of Network User Identifi-
                          cation (NUI) that the PAD will support.

                          The factory setting for this parameter is zero: NUI support
                          disabled.

NUI Validation   This parameter enables the validation of NUIs, and speci-
                          fies the action to be taken when the validation succeeds or
                          fails.

                          The factory setting for this parameter is zero: NUI vali-
                          dation disabled.

If you need to change any of the factory settings of the trunk parameters,
refer to paragraph 5.5.6.

3.1.3 Virtual Circuits

The most striking feature of packet switching is the ability to have virtual
circuits (also referred to as logical channels). Quite simply, this means it
is possible to support multiple simultaneous communications sessions with only
one physical connection -- the X.25 trunk.

It is important to select the number and type of virtual circuits (switched
or permanent) to achieve optimum use of the PDN and the X.25 trunk. The num-
ber of virtual circuits dictates the number of simultaneous sessions that can
be supported over the X.25 trunk. This number can be less than, equal to, or
greater than the number of physical channels. It is fully dependent on your
operational requirements.

The PAD supports concurrent PVC and SVC operation over the X.25 trunk.

The factory setting for virtual circuits is as follows: the number of PVCs
is set to zero, and the number of SVCs is set to the number of physical chan-
nels, plus two.

3.1.3.1 Permanent Virtual Circuit

A PVC is a subscription option that must be specified when you order an X.25
access line. From a user viewpoint, a PVC is a permanent logical connection
between two end-points over the network. It is comparable to a point-to-point
leased line. You select a PVC when you require that a device connected to the
PAD only communicates with a predefined destination.

The use of the PVC eliminates the need for the user to initiate any connect
or disconnect procedures.

  • For each PVC that you subscribed to, you must associate one of the PAD's
    channels (1 through 16).

• The Network identifies each PVC with a unique logical group number (LGN) and logical channel number (LCN). Permissible values are: 0 through 15 for the LGN and 0 through 255 for the LCN.

• An asynchronous channel defined for PVC operation cannot be used to call different destinations. This service is basically a logical point-to-point dedicated connection.

• Refer to paragraph 3.9 for further details.

3.1.3.2 Switched Virtual Circuit

A Switched Virtual Circuit is required for each virtual call. A virtual call is set up dynamically when one device attached to the PAD needs to communicate with another device connected to the PDN.

The Network identifies each SVC with a unique Logical Group Number (LGN) and Logical Channel Number (LCN). The permissible values are: 0 through 15 for the LGN and 0 through 255 for the LCN. You cannot define SVCs to use any LGN/LCN number defined for PVC use. In addition, the total number of SVCs plus the total number of PVCs cannot exceed 18 (the number of physical channels, plus two).

Typically, the PDNs differentiate between the various types of virtual circuits by the appropriate allocation of the LGN.

• You must configure all logical group numbers and logical channel numbers assigned to you for operating switched virtual circuits.

• You should subscribe to SVCs which have both incoming and outgoing call capabilities.

  If you wish to restrict the number of calls in each direction, you may do so by restricting some of the PAD channels to either or to both calling directions rather than subscribing to one-way SVCs. However, once a call is established, data transfer is always in both directions.

• If your PAD is connected to the TRANSPAC/FRANCE Network or to equipment with functionality similar to TRANSPAC, you must configure the LGN and the LCN of one of the SVCs to 0.

• Do not configure unassigned numbers or more circuits than you have subscribed to. The PAD can be set to ignore calls or to restart the trunk when it detects an incoming call over an undefined circuit (refer to the in call selection in paragraph 5.5.6). This condition results in performance degradation.

- When a user places a call, the PAD will use the highest numbered, free logical channel defined for SVC operation. This is true only if the PAD is configured as a DTE; if the PAD is configured as a DCE, it will use the lowest numbered, free logical channel. The Network's incoming call uses the lowest numbered, free logical channel. If you configure more logical channels than subscribed to, the Network will clear the PAD's call requests and indicate a local procedure error.

3.1.4 X.25 and National Facilities in Network-Bound Calls

The PAD supports a number of X.25 facilities that can be requested on a per-call basis. You should consult your Network to determine which of these are available. You may also need to subscribe to one or all of the facilities you expect to use. Some networks do not support all of them. Others may support non-X.25 facilities, referred to as National facilities.

3.1.4.1 Using X.28 Connect Command

When a call is initiated, the user can specify the requested facility by using a Facility Request Indication Code. When the PAD detects one or more of these indication codes in the X.28 Call Connect Request Command, it performs the necessary encoding of the Call Request Packet. The complete format of an X.28 Call Connect Request Command is described in paragraph 3.5.

Supported Facilities

Indication Code	Facility Request
G + Id	Closed user groups and associated two-digit ID assigned to the closed-user group by your network
R	Reverse charging
F	Fast select
P	Packet size negotiation or DATAPAC priority code
D	Throughput class negotiation
Txxxx	RPOA transit network selection. xxxx represents the four-digit DNIC of the desired network.
C	Charging information
Nxxxxxxxxxx	Network User Identification (NUI). xxxxxxxxxx represents an NUI string of 0-10 alphanumeric characters. The following characters must not be included in the string: space delete - , + CR

If NUI validation is disabled, up to 20 characters may be entered. They will be encoded in the facilities field as entered.

Other Facilities

Other facilities can be incorporated in the Call Request Packet by using a free format syntax in the X.28 Call Connect Request Command.

NOTE: Individual facility codes must be separated by commas. The facility field must be terminated with a -.

The format is:

   $Xcc=pp:pp:.....pp

   Where: cc=facility code in hexadecimal

         pp=facility parameter field in hexadecimal

Example:

To request window size negotiation with a symmetrical window size of 3, enter:

   $X43=03:03

The user can also specify a non-X.25 (that is, a National) facility by using the free format syntax:

   $Ncc=pp:pp:.....pp

   Where: cc=facility code in hexadecimal

         pp=facility parameter field in hexadecimal

Please consult CCITT proceedings and/or your Network guide for the coding of different facilities.

NOTE: When National facilities are specified, they must follow the X.25 facilities. The PAD will separate the X.25 facilities from the National facilities, using the CCITT National marker when the Call Request Packet is encoded.

3.1.4.2 Using Abbreviated Connect Command

You can also predefine the X.25 facilities using mnemonic addressing. In this case, you can preconfigure the facility indication code associated with each mnemonic. For security purposes, the user cannot override the predefined facilities when mnemonic addressing is used. For information on mnemonic definition, refer to paragraph 5.5.8.

3.1.4.3 Using Automatic Facility Requests

In addition to facility request codes on a per-call basis, the PAD can be configured to automatically encode all Call Request Packets with one or more X.25 facilities. For example, you can configure the PAD to issue all calls with reverse charging. In addition to reverse charging, you can also configure the PAD to encode all calls with packet size and window size negotiation facilities (refer to paragraph 5.5.6).

3.1.4.4 PAD Processing of Facility Requests

In addition to encoding the facility field of the Call Request Packet, the PAD processes facilities request codes as follows:

Facility	PAD Action
Closed User Group	No additional action. The Network performs the closed-user group interlocking mechanism.
Reverse Charging	No additional action
Packet Size Negotiation	If selection 7 in soft switch group SYS2 is set ON (DATAPAC/CANADA priority call), the PAD will encode the facility field with the appropriate code instead of the standard CCITT Packet Size Negotiation Facility code.
Throughput Class	When the PAD detects a Throughput Class Facility Request, it will encode the facility parameter field with the throughput class code equivalent to the speed of the calling device. If the remote PAD is another MICOM PAD, it will attempt to use this code to match the calling device with a channel of the same speed (refer to paragraph 3.1.5).
Fast Select	When the PAD detects a Fast Select Request, it will prompt the user for an entry of up to 124 bytes (the user can enter up to 256, but only 124 will be transmitted, and the rest discarded). The entry will be inserted in the call user data field of the Call Request Packet. The PAD supports Restricted Fast Select, which means that the destination device cannot convert the call into a normal call. For Restricted Fast Select, the response is a Clear Indication Packet with up to 128 bytes in the call user data field.
RPOA	No additional action. The PAD encodes the facility field with the basic CCITT RPOA facility format. (The extended format is not used.)

Facility	PAD Action

Charging Information

No additional action. The PAD encodes the facility field with a request to return charging information when a call is cleared. (Charging information can only be provided by your Network; to use this facility, your Network must support the provision of charging information.)

Network User Identification

When the PAD detects the presence of the NUI facility request, command signal echo is turned off. It is restored to its parameter value when one of the following characters is recognized:

CR   -   ,

If the line display character is entered (Ctrl-R is the default line display character), the entire edit buffer is displayed, including the NUI string.

As configured, the PAD may validate the NUI string entered, and may take various other actions: the call may be cleared if the validation fails, or, if the validation is successful, the NUI may be stripped from the facilities field and an associated NUA may be inserted into the Call Request Packet as the calling address. (Refer to paragraph 3.1.10 for further information on the operation of NUIs and NUAs, and to paragraphs 5.5.6 and 5.5.17 for their configuration.)

When NUI validation is disabled, an NUI string of up to 20 characters (if entered) will be encoded in the facilities field.

Free Format Facilities

Not validated by the PAD

3.1.5 X.25 and National Facilities in Inbound Calls

The PAD can be configured to restrict incoming calls on the basis of the requested facilities. However, you must enable reverse charge calls if you expect users to access the PAD through the dial-in access ports of the public packet data network. You may also want to enable reverse charging if it is desirable to receive billing at a single location or if the network tariff structure offers a volume discount based on the volume of data transmitted and received at a single location.

You must also enable the Fast Select Facility if you want to accept Fast Select calls.

PAD Processing of Incoming Facilities

When incoming call packets specify X.25 facilities, the PAD performs the following functions:

Facility	PAD Action
Closed User Group	No action
Packet Size Negotiation	If the trunk packet size is configured for 256 bytes and the requested packet size is 128 or 256 bytes, the call is accepted. A Call Accept Packet is transmitted with a confirmation of 128- or 256-byte packet operation for both transmit and receive directions. Asymmetric packet-size requests will not be accepted.
Window Negotiation	The call is accepted if the window size is larger than 2 but less than 7. A Call Accept Packet is transmitted with a confirmation of 2 and 3 through 7 for both transmit and receive directions. Asymmetric window-size requests will not be accepted.
Reverse Charge	If Reverse Charge acceptance is enabled, the call is accepted. You may also have to subscribe to this facility with your Network in order for the call to be routed to the PAD.
Fast Select	If Fast Select acceptance is enabled, the user at the receiving channel is prompted for a response of up to 128 bytes (the user can enter up to 256 bytes, but only 128 will be transmitted, and the rest discarded). The user or device has approximately two minutes to enter this data. The PAD will forward the response in the Clear Request Packet.
Throughput Class	When the PAD detects a Throughput Class Facility in an incoming call, it will decode the throughput class code to determine the speed of the calling device (75, 150, 300, 600, 1200, 2400, 4800, or 9600 bps). It will then attempt to perform speed-matching with one of its channels as described in paragraph 3.6.4. When the call is accepted by the receiving device, the PAD will transmit a Call Accept Packet indicating the speed of the assigned channel.
RPOA	No action
Charging Information	No action
Network User Identification	No action

Facility	PAD Action
Non-X.25 Facilities	The call is accepted.
Other X.25 Facilities	The call is accepted.

3.1.6 Trunk Out-Of-Order

The following paragraphs describe the PAD's response to a physical or a logical trunk disconnection. Also described is the effect of a trunk disconnection on the PAD's dial-in channels.

3.1.6.1 Physical Disconnection

* Temporary Failure

  The PAD will sustain a loss of DCD or DSR signals for up to a length of time specified by the following formula:

  $$2 \text{ X } N2 \text{ X } T1 + T3 \text{ value}$$

  Based on the default parameters settings, this value is equivalent to 115 seconds.

* Permanent Failure

  If the link assurance procedure is enabled, and fails, the PAD will clear all switched virtual calls in progress and reset all permanent virtual circuits. The clear/reset service signal will contain an appropriate diagnostic code indicating a trunk failure.

  The PAD's LD indicator will go ON and all dial-in and dial-out devices will be physically disconnected.

3.1.6.2 Logical Disconnection

* Temporary Failure

  When the PAD enters the disconnected phase because of protocol errors or internal malfunctions, it will automatically try to reestablish operation by continually transmitting a Disconnect (DISC) Command, and then wait for a UA response to resume frame and packet level reestablishment procedures.

- Using a Command

  If the trunk is logically disconnected by the Trunk Down Command, the PAD will be in a disconnected phase. It will continue to transmit a DM response to any received command until the Trunk Up Command is issued using the Command Facility.

3.1.6.3 Effect of Trunk Failure on Channels

If the trunk is disconnected either logically or physically, the PAD will raise the Busy Out (BO) signal on Pin 22 of all channels configured for dial-in operation. This will cause the attached dial-in modem to take the phone line off-hook. Where two or more PADs are colocated and the phone lines are configured as rotary, this feature will cause the incoming telephone call to be routed to the PAD that has its X.25 trunk up. Note that the modem must be strapped to honor this busy signal. Otherwise, the PAD will answer the call when an incoming ring occurs.

3.1.7 Trunk In-Service

The PAD will reinitialize the trunk when one of the following conditions occurs (if trunk parameter T3 is nonzero):

- The Trunk Up Command is initiated using the Command Facility
- The PAD Reset Command is initiated
- The PAD is physically reset

When any one of these conditions exists, and trunk parameter T3 is nonzero, the PAD reinitializes the trunk by transmitting a DISC Command and waiting for a UA response. When the UA response is received, the PAD resumes frame and packet level reestablishment procedures. (The PAD initiates an SABM/UA sequence to reestablish the frame level, followed by the packet level restart procedure.)

When the restart procedure has reestablished operation at the packet level, the PAD will consider the trunk status to be up and the PAD's LD indicator will be OFF.

Effect of Reestablishing Trunk Operation

After reestablishing trunk operation, the PAD will automatically try to reconnect all channels configured for fixed speed and parity, dedicated, and autocall on device ready. However, this will only occur if the device connected to the channel is still connected and powered-on.

3.1.8 Packet Description

All data transmitted over the X.25 trunk is in packet form. The PAD does not change or rearrange data received from a device. It simply assembles received characters into packets and received packets into characters.

Networks normally support information in packets containing up to 128 bytes of user data. However, some networks are capable of handling a larger packet size. For example, the normal arrangement for DATAPAC is 256-byte packets. The PAD can support 128- or 256-byte packets for both incoming and outgoing packets.

A permanent arrangement to operate a particular packet size must be negotiated with your Network administration. With this kind of a permanent arrangement, the PAD's trunk can be configured to support 128- or 256-byte packets.

In addition, some networks support a negotiation facility at call set-up time to determine the packet size. Others demand a Packet Size Negotiation Facility Request at each call setup. To support the mandatory packet size negotiation, you can configure the PAD to automatically issue a Packet Size Negotiation Request for every outgoing call. The value of the packet size used for this negotiation is as configured for the trunk.

If your normal operational mode is based on 256-byte packets and you wish to selectively issue a 128-byte packet size negotiation facility on a call basis, you can do so by using the P Facility Indication Code in the X.28 Connect Command.

NOTE: If your PAD is connected to DATAPAC/CANADA, you must use this procedure to issue a Priority call. However, first you may have to change the ON/OFF setting of one soft switch selection (refer to paragraph 2.4.2) until DATAPAC completes their implementation of the X.25 packet size negotiation. This will cause the PAD to encode the Call Request Packet to be compatible with DATAPAC.

3.1.8.1 Number of Characters in a Packet

The actual number of characters in a packet is variable. The packet will basically be formed and forwarded to the Network as soon as a forwarding condition is detected by the PAD. For example, the PAD may send a packet to the Network every time it receives a carriage return character or after an idle period has elapsed following receipt of the last character. Thus, the packet utilization is controlled by two major factors:

• The amount of data activity as dictated by the user application

• The configuration of the packet-forwarding parameters to offer a balance between packet character density and optimum response time

The amount of data in a packet has a serious effect on the response time and charges incurred over the Network. While transmitting full packets is the most cost effective, it may not be the ideal answer to your application. On the other hand, you should minimize the occurrence of single character packets. This condition represents a serious degradation of the trunk's useful bandwidth. To help you strike an optimum balance between response time and cost, the PAD supports a comprehensive array of functions and forwarding conditions that can be selected on a channel basis. You are given full control over these parameters. However, you must apply careful judgment when you specify these values.

3.1.8.2 Packet Window

The packet window is a mechanism that is used to restrict the number of packets that the Network or the PAD can accept on any logical channel at any given time. The size of the window refers to the maximum number of transmitted packets that have not been acknowledged at any given time. Allowable packet window values are 2-7. To enable extended packet sequencing for networks such as Japan's KDD, selections 5 and 6 of soft switch group SYS1 must be ON (refer to paragraph 2.4.2).

A window size of 2 is the PAD default value and is satisfactory for most users. In certain circumstances, a different size may be desirable. Some networks offer a permanent arrangement to support a window size of 2 through 7. Other networks that support an extended Call Request format require that each call be coded with the Window Size Negotiation Facility. The PAD can be configured to automatically code each call request with a Window Size Negotiation Facility. The value of the window size will be the same as configured for the trunk window parameter.

3.1.8.3 M-Bit Support

The MICOM PAD will set the M-bit in full packets under the following conditions:

- When the edit mode is enabled the PAD will wait for the 129th character. If it is received before a data forwarding character and the packet size is configured for 128 bytes, the first packet of the two 128-byte editing buffers will have its M-bit set. The second packet, formed by the 129th to 256th bytes of the editing buffer, will not have its M-bit set, even if it is full.

- When the packet size is configured for 128 or 256 bytes and idle timer forwarding (Parameter 4) is enabled, the PAD will wait for the 129th or 257th character. If the PAD receives it before a data forwarding character (if defined via Parameter 3) or before the idle timer expires, each full packet, except the last packet, will be transmitted with the M-bit set.

- When Parameter 106 (Character-Count Forwarding) is enabled and the count is greater than 128 bytes, the PAD will wait for the count to be reached. If no data forwarding conditions occur prior to receiving the 129th character, the PAD will set the M-bit in the first 128-byte packet. The character count has a maximum value of 255. Hence, this condition cannot affect the M-bit setting of 256-byte packets.

NOTE: Incoming packets are forwarded to the attached device as they arrive with no special M-bit treatment.

3.1.9 Trunk Password Protection

You can protect your PAD against unauthorized access by defining a trunk password. Specifically, this means that call requests for your PAD must have the proper password in octets five through eight of their 16-octet call user data field. If the call user data method of subaddressing is enabled, the trunk password must be in octets 7 through 10 (refer to paragraph 3.6.1). Typically, the caller has no control over octets 1 through 4. A caller's failure to include the proper password will result in the PAD rejecting the call with a diagnostic code equal to 133.

3.1.10 NUI Support (Channel Password Protection)

You may ensure that only authorized calls are placed from user channels with the PAD's NUI function. NUIs may be used independently as channel passwords, or, when the DCS version of NUI-NUA support is selected, they may be used in conjunction with NUAs (network user addresses). The NUI Type trunk parameter specifies the type of NUI support desired (refer to paragraph 5.5.6.). From 1 to 100 NUI strings and corresponding NUA strings can be created and stored in CMOS (using selection number 16, NUI, on the Command Facility Configure Menu -- refer to paragraph 5.5.17).

When NUI support is enabled (the NUI Type trunk parameter is set to 1 or 2), the user must enter an NUI facility request with each Call Connect Request Command. (Refer to paragraph 3.1.4.1 for information on entering the NUI facility request; refer to paragraph 3.1.4.4 for information on PAD processing of the request.) If the NUI facility request is not present in the connect command, the PAD will clear the call with a diagnostic code of 139 (NUI/password required).

When the NUI Validation trunk parameter is set to 1, 3, 5, or 7, the PAD validates the NUI facility request string entered by comparing it to the pre-configured NUI strings stored in CMOS. As specified by the setting of the NUI Validation trunk parameter, the PAD may clear the call with a diagnostic code of 140 (invalid NUI/password) if a match is not found, or it may pass the call through; if a match is found the PAD may strip the NUI from the facilities field before issuing the Call Request Packet, or it may allow the NUI facility request to pass through. (Refer to paragraph 5.5.6 for information on configuring the NUI Type and NUI Validation trunk parameters.)

When the DCS version of NUI-NUA support is selected (the NUI Type trunk parameter is set to 1), and validation of an entered NUI facility request is successful, the PAD will insert the corresponding NUA into the Call Request Packet as the calling address.

3.2 ASYNCHRONOUS DEVICE SUPPORT

In a typical minicomputer and terminal system (see figure 3-1) using point-to-point leased lines, the minicomputer directly controls such functions as:

• Character echo
• Control character sequence
• Editing
• XON/XOFF
• BREAK handling
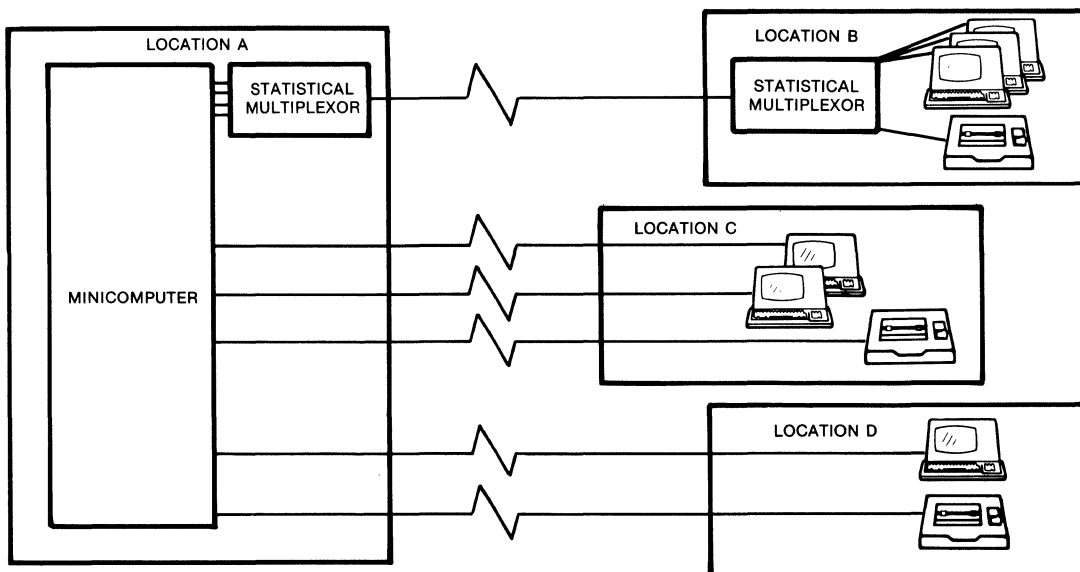
MI-1366-1a-10

Figure 3-1. Typical Minicomputer and Terminal System

Application programs use this control ability to perform cursor positioning, selective echo, echo suppression, and other functions for CRT and printer devices. When this type of system is connected over an X.25 PDN (see figure 3-2), the operation changes from character-oriented operation to block-oriented or packet-mode operation. This results in the computer losing synchronization with the terminal and a subsequent loss of control.
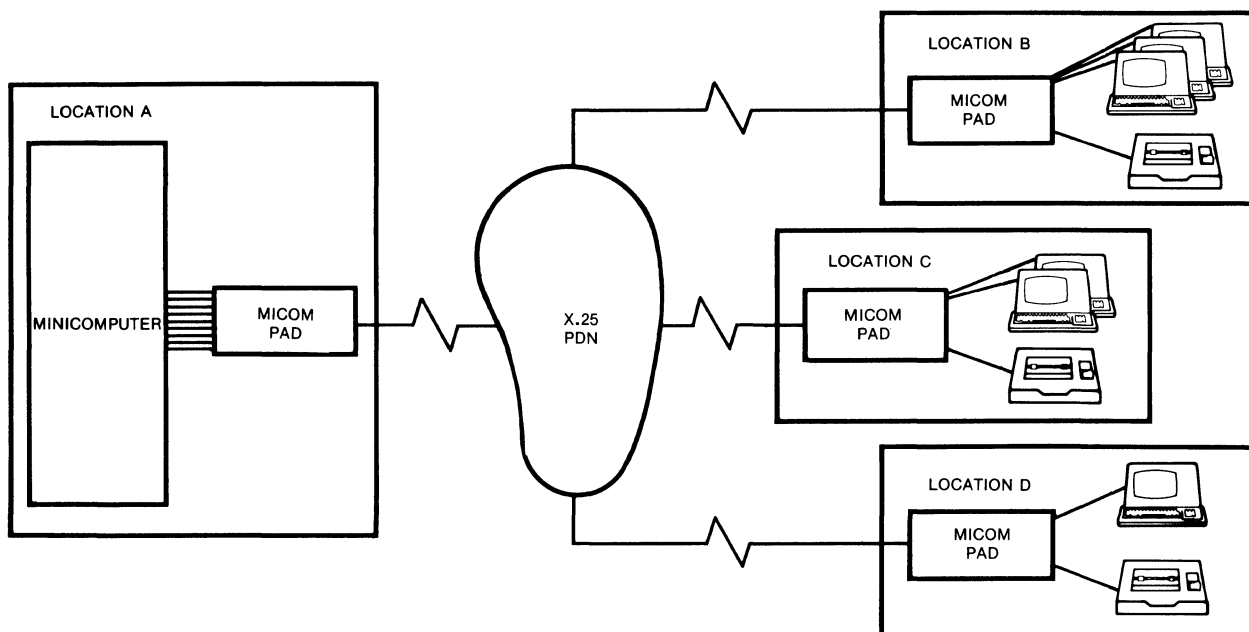
MI-1366-1a-11

Figure 3-2. Minicomputer and Terminal System Using PDN Facilities

To keep the application programs unchanged and most of the computer and terminal operational procedures in place, the PAD must take over the asynchronous terminal handling that was previously handled by the host computer. To satisfy this requirement, MICOM PADs fully support all 22 CCITT X.3 parameters (see table 3-1) and an additional set of 20 parameters. These parameters can be used to support a wide variety of asynchronous equipment. They can also be used to reestablish control over the terminals in the remote sites and to reduce overhead on the X.25 trunk by performing many functions that would otherwise need to be performed by the host computer (host computer handling always involves greater transmission of data).

Collectively, the 42 parameters are grouped in what is called a device profile. The PAD supports up to 24 user-defined device profiles that can be assigned to the PAD's individual asynchronous channels.

By configuring each of the device profile parameters, the user is adapting the resources of the PAD, on a per-channel basis, to the characteristics of the attached start/stop device and/or the application program to which the device is logically attached.

Table 3-1. Device Profile Parameters

Parameter	Reference Number
PAD Recall	1
Echo	2
Data Forward	3
Idle Timer	4
Device Flow Control	5
Service Signal	6
BREAK Handling	7
Discard Output	8
CR Padding	9
Line Folding	10
Speed	11
PAD XON/XOFF	12
Auto LF Insertion	13
LF Padding	14
Edit	15
Char Delete	16
Line Delete	17
Line Display	18
Editing Service Signals	19
Echomask	20
Parity Treatment	21
Page Wait	22
Bits Per Character	100
Device Parity	101
Network Parity	102
XON Char	103
XOFF Char	104
Enhanced Flow Control	105
Data Fwd Count	106
ESC Timer	107
Sp BREAK Char	108
Temp Echo Supp Char	109
Echo Subst Char	110
Echo Control	111
Special Echo Seq. ID	112
Page Length	113
Form Feed Character	114
Form Feed Padding	115
Inactivity Timer	116
X.29 Access Char	117
Flow Count	118
Telex	119

NOTE:
  The MICOM-enhanced parameters are
  numbered 100 through 119. The CCITT
  parameters are numbered 1 through 22.

When a device profile is assigned to a channel (using the Command Facility, as described in paragraph 5.5.3), the behavior of the channel is basically controlled by the values of the parameters in the profile. However, these parameters can be modified by X.28 commands when a device is physically connected to a channel. In fact, an alternate profile can be assigned to the channel in order to satisfy the requirements of a single calling session. When a call is in progress, the parameters can also be altered by the destination device using X.29 messages.

Any alteration of this type is only valid for the duration of the call. As soon as the call is cleared, the initial device profile parameters are reinstated to that channel.

In the following paragraphs, the parameters that are included in a device profile are grouped by major function. This format shows the relationships between different parameters and how they can affect your operation. This information should help you determine how device profiles can be used most effectively in your application.

3.2.1 Data Character Definition

The MICOM PAD allows you to define the format of data characters to be received or transmitted. Character definition parameters include the number of data bits and the number of stop bits. Parity checking and generation are independently enabled; the parity type may also be defined when parity is enabled.

3.2.1.1 Data Bits Per Character

The PAD supports characters which consist of 5, 6, 7, or 8 data bits plus a parity bit. For terminal applications, Parameter 100 is normally set to 7-bit characters. Eight-bit support should be configured for host computer channels and graphic terminals.

3.2.1.2 Fixed Parity

Parameter 21 enables you to independently enable parity checking, parity generation, or both. When parity is enabled, Parameter 101 defines the parity type to be checked and/or generated.

The PAD supports Even, Odd, Mark, Space, or Transparent parity. Characters which consist of 5 or 6 bits must be configured with Transparent parity using Parameter 101. For 8-bit characters, Transparent parity means no parity. When 9-bit character support is required, you should configure the character for 8 bits and set the parity to either Odd or Even.

3.2.1.3 Autoparity Recognition

For 7-bit character operation, you can configure the PAD for fixed parity or for autoparity recognition using Parameter 101. If autoparity is selected, the PAD will determine the parity dynamically when a channel logon sequence is received. The channel logon sequence is CR.CR (CR underlined means user-entered; CR not underlined means transmitted without user entry). The selection of autoparity automatically selects autobaud recognition (refer to paragraph 3.2.2.2).

3.2.1.4 Parity Checking

Parity checking is enabled with Parameter 21. For 7-bit characters, the PAD will check the parity of device-generated characters. A parity check will cause the PAD to generate a ? to the attached device. If the bad character is not corrected using the editing functions, the data forwarded to the host will include a ? in lieu of the character.

3.2.1.5 Network Parity

The PAD can be configured to pass data transparently or to perform parity conversion to the Network. When Parameter 102 is enabled, the PAD will replace the parity bit of the character received from the device with the bit that corresponds to the type of parity specified as Odd, Even, Mark (1), or Space (0) before forwarding the character over the X.25 trunk.

Each virtual call can support a different network parity to accommodate different remote devices. This feature is particularly useful when the host computer cannot support the full combination of parity options.

3.2.1.6 Stop Bits

The number of stop bits is a function of the data rate. At 100 bps or 110 bps, the number of stop bits is set to 2. At 50, 75, and 134.5 bps, the stop-bit setting is 1.5. At 300 bps and higher speeds, the number of stop bits is set to 1.

3.2.2 Data Rate

The PAD lets you select a channel's data rate or lets you define the channel as an autobaud channel. Either function is performed using Parameter 11.

3.2.2.1 Asynchronous Data Rate

The PAD supports the following asynchronous data rates: 50, 75, 100, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, and 9600 bps.

3.2.2.2 Autobaud Recognition

For a channel that supports a dedicated physical connection, the channel would typically be defined to operate at one of the fixed speeds using Parameter 11 of the profile assigned to the channel.

For a dial-in channel or in applications where the PAD is front-ended with a Data PABX, the channel can be configured for autobaud recognition. The PAD will then determine the speed dynamically when a channel logon sequence (CR character) is received. In this mode, the PAD can detect all speeds in the 110 through 9600 bps range except 134.5 bps. There is no requirement for a Low or High speed signal from a dial-in modem.

NOTE: The autobaud recognition can only be performed when the channel is configured for 7- or 8-bit characters.

For a dial-out channel configured for autobaud, the PAD will generate an outbound sequence of characters to autobaud the attached device when an incoming call is received (refer to paragraph 3.6.5).

3.2.3 Echo Control

The PAD allows character echoing to be enabled or disabled. It also allows selective echoing.

3.2.3.1 Echoing User Input

In a typical leased line, or in a dial-in minicomputer and terminal system, the computer ports and terminals are configured for full-duplex operation. They rely on the computer to perform the echoplex function. The purpose of this echo function is to confirm receipt of the keyed character and to retain control of where the echoed character is displayed on the terminal.

In a packet-switching environment, the PAD (not the host computer) is normally configured to perform this echo function in the remote terminal sites. Local echo by the PAD results in faster response, better utilization of the X.25 trunk, and enables the application program to preserve data integrity.

At the host computer site, the PAD and the computer to which it is connected should both be configured for no echo.

The PAD's character echo function is enabled by Parameter 2.

3.2.3.2 Selective Echoing

When the PAD's character echo function is enabled, you may selectively disable echo for certain characters. These characters will be passed for host computer action without local echo by the PAD. Typically, you would allow echo of all displayable characters and some control characters. The decision as to which control characters the PAD should echo locally and which should be passed without echo depends entirely on the application terminal and computer capabilities.

Parameter 20, Echomask, instructs the PAD to mask (suppress) the echoing of selected characters or selected groups of characters when Parameter 2, Echo, is enabled.

3.2.3.3 Handling Escape Sequences

The use of Escape (ESC) Sequences in computer systems is quite common. The ESC character is normally followed by qualifying characters specifying the type of ESC sequence requested by the terminal user. In a leased-line system each character is transmitted directly to the host computer and processed accordingly. In order to simulate this environment, the PAD ensures that all characters reach the host computer in a single output sequence, and that the characters following the ESC are not echoed to the generating device. Parameter 107 defines this special ESC sequence. The echo of the ESC character itself may be suppressed by Parameter 20.

3.2.3.4 Selective Echo Control

When echo is handled by the computer, user passwords are not normally displayed at the device. Using packet data networks with echo disabled at the host computer can create a security problem. The remote PAD cannot distinguish a password from normal data entry. The selective echo control feature allows the MICOM PAD to suppress echo on receipt of a user-defined character from the user's terminal. Refer to Parameter 109 for the definition of this character. Echo is then reenabled when a forwarding condition or subsequent input of the echo suppression character is detected.

When echo is temporarily suppressed, an echo substitution character, defined by Parameter 110, will be echoed instead. However, this substitution character is echoed only if it is not suppressed by Parameter 20 (Echomask).

3.2.3.5 Special Echo Sequence

The Special Echo Sequence enables the MICOM PAD to emulate a host computer system where a sequence of characters is echoed in response to receipt of a single ASCII character from the attached terminal. For example, you can use this to erase the CRT terminal and position the cursor at the home position when a particular key is pressed. This feature is enabled only if Echo, Parameter 2, is set to 1.

Each device profile can be associated with any one of three sets of echo sequences specified by Parameter 112. Each set contains up to eight different echo sequences and associated input trigger characters.

The input trigger character will cause previously accumulated data to be forwarded. The trigger character itself is not forwarded.

3.2.4 Input/Output Data Priority

The PAD can be configured, using Parameter 111, to emulate host computer handling for both character input and character output.

3.2.4.1 Output Priority

In a full-duplex CRT environment, the computer can reposition the cursor, output data, and then return the cursor to a previously known position. In this fashion, the host computer preserves screen integrity. Likewise, for a printer, the host can be programmed to reecho the user's input on the next line.

To emulate host computer character handling, the MICOM PAD offers a similar capability by setting Parameter 111, Echo Control, to 2. Using this parameter, the character-handling operations of the host computer are not changed. Once the computer output is forwarded to the attached device, the PAD will reecho any data that may have been previously accumulated to the device.

3.2.4.2 Input Priority

In a conventional host echoplex environment, the host can be configured to suspend output to the terminal when the user is keying in data.

In a packet-switching environment, the PAD performs the echo. In this environment, the host computer has no way of knowing when the user is actively keying in data. The host will write to the device when it is ready. This can result in corruption of the user input form being displayed or printed.

When Echo Control (Parameter 111) is set to 0, the PAD will hold the output that is destined to the device until it detects one of the following conditions:

* A forwarding condition

* No keying activity for a period of time (if Parameter 4, Forwarding Idle Timer, is nonzero). This is true whether or not Parameter 15, Edit, is enabled. The inactivity period is determined both by the value entered for Parameter 4, and by the resolution of Parameter 4, which is determined by Parameter 119, Telex Support. When Parameter 119 is zero (telex support disabled), the resolution of Parameter 4 is 50 milliseconds (in accordance with CCITT specifications); when Parameter 119 is nonzero (telex support enabled), the resolution of Parameter 4 increases to 200 milliseconds.

3.2.4.3 No Priority

Parameter 111 (Echo Control) enables you to define input priority, output priority, or no priority handling. When no priority (Parameter 111 = 1) is specified, the PAD will not hold the computer's output.

3.2.5 Formatted Screen Support

Formatted data-entry screens are normally supported over packet-switched networks by performing echo from the host computer. While this guarantees the integrity of the display format, it results in high overhead over the X.25 trunk. It also causes response time delays and higher packet charges.

This allows the host computer to indirectly control when input data is echoed by the PAD. Typically, the application that needs this will require that each input field be appropriately echoed against each prompt sent from the host computer. This is enabled by setting Parameter 111 to 4.

The PAD achieves this by echoing the user's input until a forwarding condition occurs. Additional characters from the terminal are accumulated during data entry. But, the PAD will not echo characters to the terminal or forward them to the host until a data packet is received for output to the terminal (typically cursor repositioning or field prompt) and the output operation has been completed. The characters accumulated for the second packet or field will then be echoed to the terminal and forwarded to the host. The MICOM PAD will accumulate up to five fields, terminated with a packet forwarding condition, without echoing them to the attached terminal. At the end of the data entry function, the data displayed on the screen will reflect the input source document.

3.2.6 Editing

The PAD's editing capabilities enable any data that is input at an attached device to be edited prior to forwarding the accumulated data to its destination. In support of this, the PAD has a full editing package which can be invoked on a per-channel basis, under the following conditions:

• When the user is in X.28 mode

• During data transfer mode if Parameter 15 of the device profile associated with that channel is enabled

3.2.6.1 Editing Functions

When editing is on, Parameters 16, 17, and 18 define which input characters will cause the PAD to delete a character, delete the contents of the editing buffer, and/or re-display the contents of the editing buffer.

Forwarding conditions are also affected when editing is on:

• The PAD will not forward data when the packet is full, but will when the edit buffer is full (refer to paragraph 3.2.6.2).

• The PAD will not forward data on character count (Parameter 106).

• The PAD will not forward data on idle timer (Parameter 4).

3.2.6.2 Editing Buffer

To process editing functions, the PAD provides temporary storage for the user's input in a 256-byte editing buffer.

The PAD stops accepting characters into the editing buffer when it detects a forwarding condition (Parameter 3). The idle timer is not taken into consideration when editing is enabled.

When the PAD accumulates 256 bytes in the editing buffer, the buffer is full and the PAD will act as follows:

• If the next character is an editing character, the PAD performs the required editing function.

• If the next character is not an editing character, the PAD discards the character and all subsequent characters until a CR is entered. All data currently stored in the buffer is forwarded. The PAD also displays the following message (unless Parameter 6 is set to 0):

    edit line too long

3.2.6.3 Editing Signals

When the PAD detects Parameter 16, 17, or 18, it acknowledges the user's request by generating appropriate service signals. The character-deleted and line-deleted service signals are defined by Parameter 19, Editing Service Signals. Because CRTs and printer devices have inherently different capabilities (i.e., the printer cannot erase a character once it has been printed), you can use Parameter 19 to tailor the editing service signals to suit your device.

For a character delete function, you may define one of the following service signals:

* The character \ . This character is appropriate for a printer or a hard-copy terminal that cannot erase a character once it has been printed. The deleted character will appear to have been struck out.

* The characters BS SPACE BS. This sequence is appropriate for a display-type device. The deleted character is erased and the cursor is positioned for the replacement character.

* Any ASCII character, as appropriate for your device and application.

For a line delete function, you may define one of the following service signals:

* The characters XXX CR LF. This sequence is appropriate for a printer or a hard-copy terminal. A deleted line is marked with XXX and the cursor is positioned for the replacement line.

* The characters BS SPACE BS, transmitted as many times as there are characters in the line. This sequence is appropriate for a display-type device. The deleted line is erased from the display.

For a line display function, the PAD transmits the character sequence CR LF (accumulated data).

3.2.7 Output Formatting

Several of the profile parameters (refer to paragraph 5.5.3) let you specify the format of output. For example, with Parameter 10 you can define the number of characters to be output before the PAD automatically inserts a CR. This and related parameters are described in the following paragraphs.

3.2.7.1 Padding LF, CR, and FF Characters

The PAD can accommodate many different types of printing terminals by making allowances for mechanical delays associated with the movement of the print mechanism. It does this by inserting null (padding) characters after the LF, CR, or FF characters that are received from the host or are originated locally.

You can define up to 127 padding characters using Parameter 9 for CR, Parameter 14 for LF, and Parameter 115 for FF.

3.2.7.2 Line Folding

The PAD can accommodate many types of terminal devices by controlling the width of the output lines. For example, this allows the attachment of devices which support 40 or 132 characters a line. When the output reaches the count defined by Parameter 10 (Line Folding), the PAD will automatically insert a CR and an LF character. You may also disable this feature by setting the parameter to zero.

3.2.7.3 Line Feed Character Insertion

The PAD can insert an LF character in data transmitted to the device when it detects a CR character in incoming, outgoing, echoed data, or any combination thereof. You can control this behavior using Parameter 13.

3.2.7.4 Automatic Pagination

By use of the PAD's pagination, you can use forms of any length with many different types of hard-copy devices without any changes to your current applications programs. To enable this feature, you need only specify the number of lines per page in Parameter 113. The PAD will automatically insert the required number of line feed characters when the end-of-page character defined by Parameter 114 is detected from the host computer.

3.2.8 Flow Control

To avoid data loss, the PAD may need to stop input on one or more of its channels. It can do this in one of two ways:

- CTS/RTS EIA (out-of-band) method
- XON/XOFF Character (in-band) method

The PAD can also accommodate block mode terminals (refer to paragraph 3.2.8.4).

3.2.8.1 EIA Method

For devices that support EIA flow control (typically host computers), the PAD can be configured using Parameter 105 to lower its CTS lead to halt reception. When it is able to accept more data, it raises it. The device may also need to control data transmission from the PAD. If so, you will want to enable flow control in both directions.

When EIA flow control is enabled for both directions, the PAD will monitor lead 4 (RTS) to see if the attached device wants to exercise flow control.

3.2.8.2 Character Method

For devices that support XON/XOFF flow control (typically terminal devices), the PAD can be configured using Parameter 5 to issue XOFF to halt transmission, and XON to signal the device to resume transmission. Parameter 5 enables you to configure the use of XON/XOFF flow control for data transfer mode only, or for both data transfer and command modes. Also, if the device can initiate flow control, the PAD can be configured using Parameter 12 to support flow control for both directions.

In order to accommodate different devices, you can define the XON/XOFF characters to be used for flow control. Note that XON/XOFF characters are not forwarded or echoed if flow control is enabled. Refer to Parameters 103 and 104.

3.2.8.3 User Signaling

You may instruct the PAD to prompt a terminal user to stop entering data by issuing a BEL character when it invokes CTS flow control. This is enabled by setting Parameter 105 appropriately.

3.2.8.4 How the PAD Handles Block Mode Terminals

For non-block mode terminals, the PAD buffers are allocated dynamically to channels as required. The number of buffers allocated to a channel before the channel is flow-controlled is calculated dynamically, and is based on the system's total buffer utilization. (Refer to paragraph 3.2.15 for more information on buffer allocation.) After the PAD attempts to flow-control an attached device, a maximum of 63 additional characters are accepted before the PAD begins to discard characters.

This method of buffer allocation and flow control presents problems for the following types of devices:

- Block mode terminals which do not respond to flow control and which may transmit up to 2 K bytes of continuous data

- Devices which respond to flow control, but may transmit a maximum of 512 bytes after flow control is initiated (for example, some minicomputers)

The solution for both types of devices is the same. The change necessary for block mode support is the removal of the check (after flow control) that allows receipt of only 63 characters before data is discarded.

CAUTION: This solution works only in half-duplex applications. Problems may arise if you attempt to use this feature in a full-duplex environment.

After exercising flow control, a PAD set up for block mode will accept a minimum of 512 characters before it begins discarding data (it may actually accept more characters, depending on the activity of the other devices attached to it at that time).

To enable the PAD for block mode, you must set soft switch 6 in the SYS2 group ON (refer to paragraph 2.4).

3.2.9 BREAK Signal Support

The following paragraphs describe how you define the BREAK key, what action the PAD takes upon detecting a BREAK signal, and when the PAD generates a BREAK signal.

3.2.9.1 BREAK Key

In addition to the normal BREAK key, you can define an additional character that the PAD should interpret as a BREAK key. This is most useful for terminals and personal computers not equipped with a BREAK key. Refer to Parameter 108.

3.2.9.2 Action on BREAK Detection

When BREAK is detected from the device in the data transfer mode, the PAD may:

- Take no action.

- Send a Reset Packet.

- Allow the user to escape to the X.28 mode. This is the only available method to escape to the X.28 mode when transmitting transparent data.

- Send an Interrupt Packet. If the destination device is another PAD unit but not a MICOM PAD, the Interrupt Packet may be required to generate a physical BREAK signal to the remote start/stop device.

- Discard the output. This will cause the PAD to stop output to the device and discard all incoming packets until a Resume Output Packet (an X.29 set message) is received.

- Send a BREAK Indication Packet. When it is received by another MICOM PAD, this will result in a physical BREAK signal being generated to the remote attached device. An X.29 packet is also sent back by the receiving MICOM PAD to resume output.

  You can specify any combination of these actions to meet your operational requirements by setting Parameter 7.

3.2.9.3 Generation of a BREAK Signal

The PAD will generate a BREAK signal when it receives an X.29 BREAK Indication Packet from the Network. In addition to generating a BREAK signal, the PAD will issue an X.29 message to set X.3 Parameter 8 of the calling party to 0. This will enable the remote PAD to resume output.

3.2.10 Data Forwarding

Data collected from a channel is assembled into a packet until any one of the following conditions causes it to be transmitted.

3.2.10.1 Forwarding Conditions

- The PAD receives a termination character (also called a data forwarding character) as defined by Parameter 3.

- The PAD detects a BREAK key unless Parameter 7, action on BREAK, is set to 0.

- The PAD detects an X.28 mode recall character as specified by Parameter 1.

- The PAD detects an X.29 mode recall character as specified by Parameter 117.

- The PAD receives no characters during a period of time specified by Parameter 4 (Idle Timer), unless Editing (refer to paragraph 3.2.6) is enabled using Parameter 15.

- The packet (128 or 256 bytes) is full, unless Editing (refer to paragraph 3.2.6) or Parameter 106 (Character Count Forwarding) is enabled.

- The PAD receives a number of characters that is equal to the character count specified by Parameter 106, unless Editing is enabled.

- The PAD detects a special echo sequence trigger character (refer to paragraph 3.2.3.5). This can also be used to cause the PAD to forward on data forwarding characters not covered by Parameter 3.

- The PAD detects an edit buffer full condition (refer to paragraph 3.2.6).

- The PAD will also forward accumulated data on expiration of the inactivity timer, specified by Parameter 116, before clearing the call.

3.2.10.2 Forwarding ESC Sequences

In some computer-terminal systems, it is necessary to forward a complete ESC sequence to the host in the same data packet.

This allows the user to instruct the PAD to override Parameter 3 by delaying data forwarding when an ESC character is detected. The ESC character, and all characters subsequently received during the delay time specified by Parameter 107, are transmitted over the Network in the same packet.

3.2.11 X.28 Mode

By setting Parameter 1, you can control whether the device connected to a channel should be allowed to issue any X.28 commands after establishing a virtual call (refer to paragraphs 3.7.3 and 3.7.4).

3.2.12 X.29 Mode

You may control whether the device connected to a channel should be allowed to issue X.29 messages, by setting Parameter 117 (refer to paragraph 3.8).

3.2.13 Inactivity Timer

You can configure the PAD to clear a call if it detects no data activity in either direction for a certain period of time. This period is defined by Parameter 116 (Device Profile Inactivity Timer). Because the resolution of this timer is one minute, you should configure this timer equal to the desired value, plus one.

3.2.14 Page Waits

Parameter 22, Page Wait, enables the PAD to suspend transmission of additional characters to the attached device after a specified number of linefeeds (the value of Parameter 22) have been transmitted. When this "page wait" condition occurs, the PAD transmits the page wait service signal, CR PAGE. The PAD will not transmit additional data until the page wait condition is cancelled.

Page wait conditions are cancelled when the XON character (as defined by Parameter 103) is received.

3.2.15 Buffer Allocation

Normally, when total buffer utilization is 50 percent or less, the PAD allows a channel to use up to 25 percent of the system's buffers (in addition to the editing buffers) before flow control is asserted. When total buffer utilization is over 50 percent, each channel is allowed seven buffers; when these are filled, flow control is asserted.

Parameter 118 enables you to override this normal buffer allocation. When Parameter 118 is set to a value other than zero, and total buffer utilization is 50 percent or less, the PAD allows a channel to use the physical number of buffers specified as the value of Parameter 118 (in addition to the editing buffers) before flow control is asserted. When total buffer utilization is over 50 percent, the PAD allows each channel either seven buffers, or the number of buffers specified as the value of Parameter 118 -- whichever number is less.

NOTE: After the PAD attempts to exercise flow-control over an attached device, a maximum of 63 additional characters are accepted before the PAD begins to discard characters.

3.3 CHANNEL CONNECTIONS

3.3.1 How Different Types of Devices are Accommodated

The PAD provides access to a wide variety of asynchronous devices, i.e., visual displays, send and receive printers, RO terminals, data collection devices, and various computer systems.

Terminals can be connected to the PAD with dial-up, leased lines, or with local EIA RS-232-C cables. You can share the PAD between dial-up terminals or use it in a dedicated mode for several devices at a single location. In addition to supporting terminal devices, the PAD channels offer a very flexible interface for almost any asynchronous host computer. The ability to connect host asynchronous ports to the PAD allows any computer with dial-up or dedicated terminal support to use the packet data networks without changing the host software or hardware.

Support of these different device types is made possible by individually assigning appropriately configured device profiles to each channel (refer to paragraph 5.5.2). Also, each channel can be configured to support one of several EIA signaling methods to accommodate the requirements of the different attachments. The following paragraphs describe the EIA methods and how they affect the device connect and disconnect procedures. Table 3-2 describes the different types of channel connections.

Table 3-2. Types of Channel Connections

Channel Option Number	Connection Type	Impact on the Channel's Operation
0	Dedicated	EIA signals will remain High following a call clear.
	Dedicated With Extended EIA Controls Enabled[1]	EIA signals will be dropped for 500 ms following a call clear.
1	Auto Answer	EIA signals will remain High for two minutes following a call clear.
2	Ring-Out	EIA signals will be dropped, following a call clear.
	Ring-Out With Extended EIA Controls Enabled[1]	Following a call clear, EIA signals will be dropped for 500 ms. If DTR remains High, the EIA signals will be raised again.
3	Auto Answer	EIA signals will be dropped immediately, following a call clear.
4	Ring-Out (with security)	Following a call clear, the channel will become available only upon DTR toggle.
	Raise DCD (with security)[1]	Following a call clear, the channel will become available only upon DTR toggle.
6	Raise DCD	EIA signals will be dropped, following a call clear.

[1]Call Option 1, value 64 (Extended EIA Controls) must be used in combination with this channel connection type (refer to paragraph 5.5.2).

Table 3-2. Types of Channel Connections (continued)

Channel Option Number	Connection Type	Impact on the Channel's Operation
8	Host Port	The PAD will send the Invitation to Clear Message, when a physical disconnect or clear service signal is detected. There will be a delay before data is output to the host port. This delay will be equal to the idle timer value (if that value is an even number), or equal to the idle timer value plus 128 (unless that value is already greater than 128).
16	Priority Channel	The channel will have a higher priority than other channels on the PAD.
32	Enable Call Accounting	Upon conclusion of a call, call accounting information will be obtained from the channel.
64	Disable X.28 Extended Mode	X.28 access will be restricted to the standard X.28 commands.
128	Micro600 Line Interface Option	The channel will be able to interface with MICOM's Micro600 Data PABX.
xxx	Combination of Options	Options 0 through 6 cannot be combined with each other. Options 8 through 128 can be combined with each other, or with one of the 0 through 6 options.

3.3.2 Cabling

Because channels have an EIA-DCE, that is, modem appearance, you would nor-
mally use a standard RS-232-C cable between terminal equipment and the
channel.

The PAD channels also support the attachment of private wire modems or auto-
answer modems, 212 and 103. In this case, you need to use a crossover cable
between the modem and the channel.

For detailed information on these cables and cable numbers, refer to para-
graph 2.2.3.1.

3.3.3 Physical Connection Versus Physical Path

Throughout this document, a physical connection refers to successful com-
pletion of the EIA handshake procedures between a PAD channel and a device.

However, a call cannot be completed, and inbound data cannot be forwarded
before this physical path is established.

For autobaud or autoparity channels, a connection is only established on
successful completion of the speed and/or parity detection of the attached
device. For fixed speed and parity channels, both physical connection and
physical paths have the same meaning.

3.3.4 Channel Physical Interface

The channel interfaces are DCE RS-232-C type, that is, each channel interface connector is wired to look like a modem.

In accordance with RS-232-C signal protocol, control of eight simultaneous signals is provided for each channel.

The control signals generated by the channel are:

- Carrier Detect   lead 8
- Data Set Ready   lead 6
- Clear-To-Send   lead 5
- Ring-Out (Pulsing)   lead 22
- Busy-Out (Constant)   lead 22

The control signals monitored by the channel are:

- Data Terminal Ready   lead 20
- Request-To-Send   lead 4
- Ring-In   lead 25

The data signals supported are:

- Received Data   lead 3
- Transmitted Data   lead 2

The type of connection configured for a channel (refer to paragraph 5.5.2) determines the status of these leads in both idle and operational modes. In addition, you can suspend the operation on any given channel by invoking either the Busyout or the Disconnect Command from the Command Facility. Either one will cause a dial-in channel to raise BO on lead 22 (the Busyout Command will take effect only upon termination of any call in progress). Also, the PAD will not monitor any input control signals on channels that are in the busy-out or disconnect state. Refer to paragraph 5.6 for details about these commands.

3.3.5 Dedicated Connection

All PADs are shipped with factory configurations to support dedicated connections on each of the channels. You would normally implement dedicated connections for devices that are colocated with the PAD by using an RS-232-C cable that supports the leads previously outlined.

You can also attach devices with private wire modems when it is not possible to use a cable, or when a dial-in modem is not an acceptable alternative.

3.3.5.1 EIA Leads in Idle State

In idle state, a channel configured for dedicated support will maintain the output control signals DCD, DSR, and CTS High, for leads 8, 6, and 5, respectively. See table 3-2 for the status of the EIA signals following a call-clear condition.

3.3.5.2 Physical Connection

Physical connection is considered complete when either one of the input control signals (lead 20 or 4) is High. However, if EIA flow control is enabled for that channel (that is, Parameters 5 and 12 are set to 0, and Parameter 105 is set to 3), only lead 20 will be considered a valid input to establish the connection.

An incoming call, routed to a dedicated channel, will only be accepted if the physical path is established. If you expect to receive calls on a channel, you should configure it for fixed speed and parity support.

3.3.5.3 Physical Disconnection

The PAD will clear a call in progress on a channel when the incoming signals on leads 20 and 4 are dropped for more than 500 milliseconds. However, if EIA flow control is enabled for that channel (that is, Parameters 5 and 12 are set to 0, and Parameter 105 is set to 3), only lead 20 is considered a valid incoming signal for disconnection.

If the call is cleared by the Network or by the PAD, the channel will generate the appropriate X.28 service signals. The EIA status will be as outlined in table 3-2.

3.3.6 Auto Answer (Ring-In) Connection

Auto answer support allows the channel to support Bell 212 or compatible modems. You normally use the auto answer support when you want to access the PAD over the telephone network.

3.3.6.1 EIA Leads in Idle State

In idle state, a channel configured for dial-in support will maintain all EIA leads Low. The exception is when it is in the Busy-Out state. Then, it will maintain its BO (lead 22) permanently High.

The status of the X.25 trunk can also affect the EIA status of the dial-in channel (refer to paragraph 3.1.6.3).

3.3.6.2 Physical Connection

When a channel is enabled (not busied-out), the PAD will search for a ring-in indication on input lead 25. When RI is received from the attached modem, the PAD will raise EIA leads 6 and 8 (viewed by the modem as DTR and RTS) and wait up to 1 minute for input leads 4 and 20 to be raised. These are the modem DCD and DSR leads. If input leads are not raised within the 1 minute time period, the PAD will drop the DTR and RTS leads.

A physical connection is considered successful at the conclusion of this handshake procedure.

3.3.6.3 Physical Disconnection

The PAD will clear a call in progress on a channel when the incoming signal on lead 20 or 4 (the modem DCD and DSR leads) is dropped. However, if EIA flow control is enabled for that channel, a loss of signal on lead 20 (DSR) will cause the call to be cleared (the DCD lead will have no effect).

The PAD will also drop the EIA leads if the user fails to establish a call within two minutes or makes four unsuccessful call attempts.

If the call is cleared by the Network or the PAD, the channel will either drop the EIA leads immediately, or it will wait for two minutes or four retries for the user to initiate another call. EIA signals will remain High for two minutes, when channel option number 1 is selected. EIA signals will be dropped immediately, when channel option number 3 is selected (refer to paragraph 5.5.2).

3.3.7 Ring-Out Connection

The ring-out capability allows a computer with dial-up or dedicated terminal support to use the packet data network with no changes to cabling, computer hardware, or software.

Two EIA signaling methods are provided to indicate an incoming call to the host: pulsed ringing and constant ringing (raise DCD).

3.3.7.1 EIA Leads in Idle State

In idle state, a channel configured for ring-out support will maintain all EIA leads Low.

3.3.7.2 Pulsed Ringing

This method allows a channel to emulate a Bell 212 or compatible modem.

Physical Connection

When an incoming call is routed to a ring-out pulsed ring channel, the channel will pulse EIA lead 22 (BO) up to five times in a 2-seconds-on/4-seconds-off cycle.

During this period it will wait for lead 20 (DTR of the attached port) to become High before it raises leads 6 and 8 (DSR and DCD). Subsequently, it will wait for lead 4 (RTS) to become High before it raises lead 5 (CTS).

The PAD will only accept the incoming call if DTR and RTS are detected during the allowable ring time of 30 seconds.

Physical Disconnection

The channel will drop the EIA leads and clear the call in progress if the signal on lead 20 (DTR) disappears for more than 500 milliseconds. It will also drop the EIA leads when the call is cleared from the network or by the PAD. See table 3-2 for EIA leads status following a call-clear condition.

Additional security is provided when channel option 4 is selected (refer to paragraph 5.5.2). Following a call clear, a channel configured with channel option number 4 will not be available for incoming calls, until DTR is toggled. Following DTR toggle, the channel will again be available to accept calls.

3.3.7.3 Constant Ringing (Raise DCD)

This method allows a channel to emulate a dedicated line, that is, a non-switched modem.

Physical Connection

When an incoming call is routed to a ring-out constant ring channel, the channel will raise lead 8 (DCD) and wait for lead 20 to become High before it raises lead 6 (DSR) and lead 5 (CTS).

Physical Disconnection

The channel will drop the EIA leads and clear the call in progress if the signal on lead 20 (DTR) disappears for more than 500 milliseconds. It will also drop EIA leads when the call is cleared from the Network or by the PAD. See table 3-2 for the status of the EIA signals following a call-clear condition.

Additional security is provided when channel option 4 is selected (refer to paragraph 5.5.2). Following a call clear, a channel configured with channel option number 4 will not be available for incoming calls until DTR is toggled. Following DTR toggle, the channel will again be available to accept calls.

3.3.8 Host Port

When channel option 8 is selected (refer to paragraph 5.5.2), the channel behaves differently following a physical disconnect or during data output (see table 3-2 and refer to paragraph 3.6.5).

3.3.9 Priority Channel

Data coming through each channel is grouped in a first-in/first-out queue for forwarding to the Network. When the PAD is used as a host frontend, you can reduce the impact of batch type transmissions (printer-bound) over inter-active data (terminal-bound) by assigning the terminal-bound data a high priority. This feature can be configured on a per-channel basis (refer to paragraph 5.5.2).

3.3.10 Enable Call Accounting

A channel is configured for call accounting, when channel option number 32 is selected (refer to paragraph 5.5.2). Upon conclusion of a call, call accounting information will be obtained from this channel (refer to paragraph 5.10).

3.3.11 Disable X.28 Extended Mode

When channel option 64 is selected (refer to paragraph 5.5.2), the channel user will be restricted to the standard X.28 commands (refer to paragraph 3.7).

3.3.12 Micro600 Line Interface Option

Channel option number 128 (refer to paragraph 5.5.2) allows a PAD to interface with MICOM's Micro600 Data PABX.

3.3.13 PAD Action on Data Loss

A possible network data-loss condition, on a given virtual circuit, is signaled to the user with a reset service message. Data loss can also occur when the device attached to a channel does not obey flow control when invoked by the PAD.

If it is necessary, you can configure the PAD on a per-channel basis to clear an SVC instead of resetting the SVC when a data loss condition occurs. A PVC can only be reset (refer to paragraph 5.5.2).

3.3.14 User Connection Messages

When a connection is established, the PAD service signals are not inhibited using X.3 Parameter 6. The MICOM PAD issues the messages described in the following paragraphs.

3.3.14.1 Herald Message XX

The Herald Message is configurable (refer to paragraph 5.5.10), and XX indicates the PAD channel to which the user is connected. The channel number provides useful information for such functions as problem reporting. The Herald Message can be up to 32 ASCII characters.

The factory setting for the Herald Message is:

    mb3-x.25 async pad channel nn

3.3.14.2 Bulletin Message

This message follows the Herald Message and is also configurable (refer to paragraph 5.5.11). It is typically used for Network notices (i.e., to advise users of events such as a planned system shut down). The Bulletin Message can be up to 120 ASCII characters.

3.3.14.3 X.28 Service Prompt

This configurable prompt (refer to paragraph 5.5.12) follows the Bulletin Message. It will also be displayed when the PAD channel is ready to accept an X.28 command. The X.28 Prompt Message can be up to 16 ASCII characters.

The factory setting for the X.28 Service Prompt is * .

3.3.15 EIA Control Signal Bias

A bias is set on the input EIA control signals (RTS, DTR, and Unassigned). When the input EIA control signals are not terminated by the device attached to the user channel, the bias ensures that the PAD will recognize these signals as being in a specific state. As such, the signals are not left floating and subject to noise.

The default EIA bias control setting for PAD user channels is OFF. This is the required setting for normal PAD operations. When EIA bias control is OFF, the PAD will recognize an inactive EIA signal when:

* There is no connection to the signal.
* The attached device asserts the signal inactive.

In some cases, you may have to change the EIA bias control setting to ON. For example, if your terminal-to-PAD cables have only the Signal Ground, Received Data, and Transmitted Data signals, you must set EIA bias control ON so that the terminal can place and receive calls.

When EIA bias control is set ON, the PAD will recognize an active EIA signal when:

* There is no connection to the signal.
* The attached device asserts the signal active.

Whether EIA bias control is set ON or OFF, the PAD will always recognize the state asserted by the attached device when there is a connection to the signal.

The default EIA bias control setting (OFF) is correct for most PAD applications. However, selection 17 (Soft Switches) on the Configure Menu allows you to selectively configure channels 1 through 4, channels 5 through 10, and/or channels 11 through 16 to be biased ON (see the description of the SYS3 Prompt in paragraph 5.5.18). Optionally, you can change the settings using the Touch Panel (refer to paragraph 2.4.2).

3.4 ADDRESSING

The following paragraphs define the Network address (including a sub-address), and describe how the PAD handles address fields in both incoming and outgoing call packets.

3.4.1 Introducing X.121

CCITT Recommendation X.121 defines a universal numbering scheme for addressing devices. This numbering scheme ensures that a device on a public packet data network can be accessed using the same address from anywhere in the world.

A device is defined as any addressable entity connected to the Network via an X.25 access line.

3.4.2 X.121 Numbering Structure

Each device connected to the Network via an X.25 access line, such as a MICOM PAD and other X.25 equipment, is assigned a Network address.

The X.121 numbering plan specifies an address of up to 15 digits with the following structure:

International prefix This is a one-digit prefix which is required by some networks to determine that the called address belongs to another Network.

DNIC This is a four-digit Data Network Identification Code which uniquely identifies the public packet data network to which the called device is connected.

The following are sample network DNICs:

TELENET = 3110
TYMNET = 3106

NTN This is up to a ten-digit Network Terminal Number. The NTN portion of the address is not restricted, and the definition of its format is dictated by the different network administrations.

Subaddressing

The NTN is typically divided into two parts. The first part is used to route the call to an X.25 device connected to the Network. The second part is referred to as the subaddress. It is passed transparently (that is, not verified by the Network) for the device's own use. For example, a subaddress can be used by an X.25 host computer to determine which application is selected by the incoming call. The MICOM PAD uses it to determine the channel where it should route the incoming call. The length of the two parts differ from one network to another. Typically a two-digit subaddress is used, but some networks can assign up to four digits.

3.4.3 X.121 Support

The PAD fully supports encoding of the X.121 address structure for both outgoing and incoming calls. The following paragraphs describe PAD handling of the address fields, including the subaddress, in both incoming and outgoing call packets.

3.4.4 Incoming Calls

The following paragraphs describe ways in which incoming calls can be routed to the PAD.

3.4.4.1 Call Routing

The PAD supports a class, also known as a rotary mechanism, where an incoming call can request a resource (for example, computer port, a particular device, and so on) by specifying the channel or the group of channels where the resource is attached. This is most useful when the PAD is acting as a frontend to one or more host computers, or when PAD channels are connected to computer ports that support different applications programs. Using this method, a caller can address a particular computer or applications program by specifying the associated PAD channel in the call request.

When the PAD determines the rotary to which it should route the call, it will attempt to find a free channel in that rotary. If none is found, the call is cleared. If there is a free channel the PAD will initiate the EIA handshake procedures as outlined in paragraph 3.3 before accepting the call.

This call/rotary selection mechanism utilizes the X.121 addressing scheme as it pertains to subaddressing. However, for networks that do not support X.121 subaddressing, the PAD allows you to use the call user data field of the incoming call instead.

Subaddressing Using the X.121 Method

If your Network supports X.121, you will normally configure the PAD for X.121 subaddressing. However, some networks offer 2-, 3-, or 4-digit sub-addressing. The PAD may then have to communicate with devices that have sub-scribed to any of these subaddressing lengths. In order to accommodate this requirement, the PAD implements the following algorithm for determining the subaddress in an incoming call.

If the length of the called address is greater than the length of its own address by 1 or more digits, the least significant 1 or 2 digits of the called address will be considered as the class rotary requested. If the length is the same, the PAD will assume a class/rotary equal to 00.

If your network only propagates the subaddress field (for example, AUSTPAC/ AUSTRALIA and other compatible implementations), the length of the called address will be less than the length of the PAD's own address. In this case, the PAD will retain the least two significant digits (or one if there is only one) of the called address field for class/rotary selection.

Subaddressing Using the Call User Data Method

The call user data method can be used instead of the X.121 scheme when X.121 is not supported by your network. In this case, the PAD interprets octets 5 and 6 of the incoming call packet's call user data field as being the requested class/rotary.

The channel selection mechanism (X.121 or call user data) can be combined with the trunk password to minimize the chances of routing an unauthorized call to one of the PAD channels.

3.4.4.2 Channel Addressing

Rotaries

The PAD class selection allows remote callers to specify a class/rotary of channels where they want to be connected.

You can define one or more classes which consist of one or more channels. Each of the PAD channels can be assigned a class ID. You can define a rotary of channels by assigning the same class ID to more than one channel. Defini-tions of rotaries are normally based on operational criteria such as host type, application, speed, and so on.

Explicit Channel Selection

In addition to rotaries, the PAD allows you to route the incoming calls to specific channels. In fact, the PAD allows you to simultaneously support rotaries and explicit channel selection. This is achieved by assigning each channel two different class IDs. One class ID can identify the rotary to which the channel belongs. The second class ID can be used to uniquely identify the channel. If your application requires that a channel belong to two different rotaries, the second class ID can also be used to identify a second rotary.

Disabling Class Selection

The first class ID of the PAD channels is set to 0 at the factory. The second class ID is set to a value equal to the physical channel number (that is, class ID 2 of channel 1 is set to 1, class ID 2 of channel 2 is set to 2, etc.). If your operational requirements can be satisfied with a single rotary and you do not require the added security of subaddressing, you can configure the PAD to only attempt to route an incoming call that has the X.121 sub-address field set to 00. In this case, it is not necessary to reconfigure the class IDs for each channel.

3.4.4.3 Accessing the Command Facility

The PAD also uses the class selection mechanism to route an incoming call to the Command Facility. Such a call will only be accepted if its subaddress is equal to the Command Facility's class ID. This ID is set to 99 at the factory. Refer to paragraph 5.5.9 for instructions on changing the class ID. If you need to disable remote access to the Command Facility, you must set its class ID to 00.

3.4.5 Outgoing Calls

The following paragraphs describe addressing related to outgoing calls.

3.4.5.1 PAD Network Address

You should configure the PAD with the address assigned to you by your Network administration (the DNIC and the NTN, excluding the subaddress field). Refer to paragraph 5.5.6 for configuration. The PAD will typically insert this address in the calling address field of all Call Request Packets forwarded over the Network. Some networks check the validity of this number for each outgoing call. Other networks will clear the call if this address is present. To accommodate these networks, you may restrict the PAD from inserting its address in outgoing Call Request Packets. You do this by using the out call parameter of the trunk (refer to paragraph 5.5.6).

You must, however, configure the PAD's address to:

* Execute remote Terminal-Activated Channel Tests.
* Receive local calls.
* Allow channel selection by incoming calls.
* Allow calls from the PAD to MICOM's optional XCC (X.25 Control Center).

Refer to paragraph 6.4 for a description of Terminal-Activated Channel Tests. Refer to paragraph 3.4.4 for information on the routing of incoming calls.

3.4.5.2   PAD Channels Address

The PAD can also append the originating channel number (1 through 16) to the PAD address. This can be used by your destination to identify the calling party on your PAD (refer to paragraph 5.5.6).

3.4.5.3   Remote Destination Subaddress

Like the remote user who can use subaddressing to call the PAD, a local user can also use subaddressing when placing an outgoing call to another PAD (or to other equipment attached to the Network).

While the PAD uses the subaddress of an incoming call for channel routing purposes, you should investigate the interpretation of that field by other equipment. It can vary.

* Using an X.28 Long Form Connect Command

    When a terminal user enters an X.28 connect command, he can indicate the subaddress digits by separating them from the main address field with a /. For example, the calling destination 12345 and a subaddress 22 can be specified as follows:

    C 12345/22*Calluserdata

* Using an X.28 Abbreviated Connect Command where CALLALAN=12345

    C .CALLALAN/22*Calluserdata

    In the case of an abbreviated command, the 22 will override the subaddress field configured for mnemonic CALLALAN. In both cases, the treatment of the 22 will be based on the method of subaddressing specified in the PAD's configuration (that is, X.121 or call user data method).

- The X.121 Subaddressing Method

  If the X.121 subaddressing method is enabled, the subaddress digits 22 are appended to the main address 12345 and will appear as 1234522 in the called address field of the Call Request Packet.

- The Call User Data Subaddressing Method

  If the call user data (CUD) method is enabled, the subaddress digits 22 are automatically relocated to octets 5 and 6 of the call user data field. This causes any data present in that field to be shifted right by two positions. If no subaddress is specified in the C Command, the fifth and sixth octets will be set to ASCII 00. If you are using CUD subaddressing and your network supports X.121 subaddressing, you can still call a destination that uses X.121 subaddressing. You can achieve this by defining the subaddress as part of your main address field.

  If you need to specify a subaddress greater than two digits, you must use the X.121 method and enter the subaddress digits as part of the main address. Do not use the / between the main address and the subaddress.

3.5 PLACING A CALL

The following paragraphs describe the calling capabilities of the PAD, and the types of Call Connect Request Commands.

3.5.1 Channel Calling Capabilities

A channel may be restricted to either receive or initiate calls, or, it can be allowed to receive and initiate calls. When a user successfully connects to a channel, he can place a call if the channel's call option allows outgoing calls (refer to paragraph 5.5.2).

Note that a PVC channel has no calling capabilities.

3.5.2 Command Port Calling Capabilities

You can also use the Command Port to place an outgoing call. This function allows you to manage (for example, configure and control) remote PADs without using one of your user channels. It will also allow you to initiate diagnostic tests for the X.25 trunk (refer to paragraph 4.5.3). However, you may not receive calls on a device connected to the Command Port.

NOTE: The input to the Command Port will be disabled if the PAD's Command Facility is engaged in a session with a remote caller.

3.5.3 Calling Methods

Each channel can be configured to support one or any combination of the following calling methods for a Call Connect Request Command:

* Long form
* Abbreviated
* Autocall

The Command Port supports both long form and abbreviated calling methods.

3.5.3.1 Long Form

This method requires the user to enter a standard X.28 Call Connect Request Command to establish a virtual call.

[C](facility codes-) [network address] (/subaddress) (*call user data)
                              or
[con](facility codes-) [network address] (/subaddress) (*call user data)

In the above format, square brackets [] indicate required entries and parentheses () indicate optional entries.

The following paragraphs define valid entries in each field of the Call Connect Request Command:

* [C] or [con] -- C followed by a space, or con, are the X.28 Call Connect Request Commands.

* (facility codes-) -- Facility codes are optional entries in the Call Connect Request Command. If included, they may consist of one or more of the following facility indication codes:

R	= Reverse Charge
P	= 128 bytes-packet size negotiation/DATAPAC Priority Call
D	= Throughput Class Negotiation
F	= Fast Select
Gxx	= Closed User Group xx
Txxxx	= RPOA transit network selection; the xxxx is the requested DNIC
C	= Charging information
Nxxxxxxxxxx	= Network user identification; the xxxxxxxxxx is the 10-character NUI string.

The format of facility codes and associated parameter fields for X.25 and other national facilities is as follows:

    $Xcc=pp:pp:....pp = other X.25 facilities
    cc = facility code in hex
    pp = facility parameter field in hex

    $Ncc=pp:pp:....pp = other national facilities
    cc = facility code in hex
    pp = facility parameter field in hex

When present, National facilities must follow the X.25 facilities.

Individual facility codes must be separated by commas. The facility field must be terminated with a hyphen.

- [network address] -- The address field is a required entry in the Call Connect Request Command and specifies the network address of the destination device. It can be up to 15 digits.

- (/subaddress) -- The subaddress can be included if the address field is 13 digits or less. If it is included, it must be two digits to specify additional routing associated with the destination address.

- (* call user data) -- The call user data field is available as an option. If it is included, it must be preceded by an *. Call user data can be up to 12 characters and can have any value.

NOTE: If you do not want the PAD to echo the call user data field, follow the * with the echo suppression character defined by Parameter 109.

The following examples further describe the format of a Long Form Call Connect Request Command.

Example 1

Call Connect Request Command with only the destination network address field:

    C 12345678

Example 2

Call Connect Request Command with the optional subaddress field:

    C 12345678/01

Example 3

Call Connect Request Command with a closed user group facility code, a sub-address field, and call user data:

    C G12-12345678/01*HELLO

The 12 ASCII characters are inserted in octets 5 through 16 of the Call Request Packet's call user data field.

If your PAD is configured for the call user data subaddressing method, the subaddress digits which are preceded by / will be inserted in octets 5 and 6. This shifts your input by two positions. In this case, your input is limited to 10 characters instead of 12.

3.5.3.2 Abbreviated

The Abbreviated Call Connect Request Command method simplifies the calling procedures by using a mnemonic in lieu of the fields described in the long form method. This method saves time and reduces the chances of calling a wrong number. It may also be used to restrict the calls from a given channel to a single or limited number of destinations.

The format of the Abbreviated Call Connect Request Command is as follows:

    [C .][MNEMONIC] (/Subaddress) (*Call User Data)
                        or
    [con.] [MNEMONIC] (/Subaddress) (*Call User Data)

In support of the abbreviated calling method, the PAD allows you to pre-configure up to 40 mnemonics consisting of up to eight alphanumeric characters each (each must consist of a minimum of two characters).

Each mnemonic will act as an index key to an internal configuration table in the PAD (refer to paragraph 5.5.8). The fields of the table include the following:

• The X.25 facilities (to incorporate in the Call Request Packet)

• The remote DTE address

• The remote subaddress

• The Call Request protocol id (using octets 1 through 4 of the call user data field). It is typically set to 01000000 to indicate X.29 support. However, you may modify it to accommodate certain equipment or networks. In the latter case you must enable the protocol id option in the facility field (refer to paragraph 5.5.8).

• The call user data (using octets 5 through 16 of the call user data field)

A Call Connect Request Command, using CALLALAN as a mnemonic, can be reduced to the simple format:

    C .CALLALAN

When an abbreviated call is initiated, the user can override the predefined subaddress and/or the call user data fields.

Example:

    C .CALLALAN/16*UPTO12OCTETS

This override capability dramatically increases the number of destinations which can be reached via the 40 mnemonics. For security reasons, the user cannot override the facilities or protocol id associated with each mnemonic.

3.5.3.3 Autocall

A channel can automatically initiate a call to a predefined destination when a connection is established with the attached device. This is referred to as Autocall on Device Ready (refer to paragraph 5.5.2).

A channel can also initiate a call on detection of a $\overline{CR}$ from the device when the channel connection is established or after a call is cleared. This is referred to as Autocall on $\overline{CR}$.

As with calls using the abbreviated calling method, autocall can be used to restrict access of certain channels to a given destination or to remove the burden of placing a call from the user. This method is also recommended for teleprinters not equipped with a keyboard and devices which cannot generate an X.28 Call Connect Request Command.

For each channel configured for autocall support (refer to paragraph 5.5.2), you must associate a mnemonic defined in the Abbreviated Autocall Table. When the connection is established, the PAD will construct the call using the definition of that mnemonic. If the call attempt fails, the PAD will automatically retry the call. You may associate the same mnemonic to more than one Autocall channel.

NOTE: Following a link restart or PAD power-on, the PAD will automatically place a call on behalf of each channel configured for Autocall on Device Ready if the type of connection is dedicated, and the physical path to the device is established.

3.5.4 Types of Calls

There are different types of calls which can be initiated using a PAD channel: local calls, remote calls, fast select calls, and diagnostic calls.

3.5.4.1 Local Call (Local Switching)

The PAD allows a terminal user to connect locally to another device connected to the same PAD without accessing the X.25 Network. To do this, the Call Connect Request Command must specify the PAD address in the called address field of the X.28 Call Connect Request Command. The user may also specify the class ID of the called channel in the subaddress field of the Call Connect Request Command, that is, after the separator character / (refer to paragraph 3.4.5.3).

You can also initiate a local call using the abbreviated or the autocall method. This is achieved by appropriately configuring one of the address mnemonics. A local call does not use any X.25 virtual circuits and does not generate call accounting information (refer to paragraph 5.10.1 for a discussion of call accounting).

3.5.4.2 Remote Call

The PAD will initiate a call request over its X.25 trunk when the called address in the X.28 Call Connect Request Command does not match the PAD address and there is a free logical channel. Remote calls can be placed to destinations on the same network to which the PAD is connected or to destinations connected to other networks, providing that your network has a gateway to these networks. The PAD is totally transparent to the called address, which can be up to 15 digits long. This satisfies the needs of networks that require 15 digits to place internetwork calls.

Refer to paragraph 4.6 for a description of the service signals used to acknowledge call completion or call clearing.

3.5.4.3 Fast Select Call

The Fast Select call is essentially a call where the user has specified a Fast Select Facility Indication Code in the X.28 Call Connect Request Command.

In this case, the PAD will prompt the user using an X.28 Service Prompt for up to 124 bytes of data (the user can enter 256, but only 124 will be transmitted, and the rest discarded). This fast select data is placed in the call user data (CUD) field of the outgoing Call Request Packet (therefore, if you enter data in the CUD field before entering the fast select data, the data in the CUD field will be ignored).

The response to the Call Request Packet must be a Clear Indication Packet. The Clear Indication Packet can contain up to 128 bytes of data in the call user data field.

This type of call would typically be used for applications requiring only one data packet transmission in each direction. A credit card transaction is an example of this type of call.

3.5.4.4 Diagnostic Call

Channels configured for X.28 extended mode may initiate diagnostic calls. These calls are essentially loopback calls to the channels where the PAD places a call to itself over the Network. A diagnostic call is automatically initiated by the PAD when it detects either one of the following Terminal-Activated Channel Test Commands: TACTR or TACTS. The call is subsequently cleared when the PAD detects a BREAK key.

To place the call to itself, the PAD makes use of the configured PAD network address (refer to paragraph 3.4.5.1). Each call requires two switched virtual circuits. Refer to section 6 for a detailed explanation of the diagnostic calls.

3.6 RECEIVING A CALL

In addition to placing a call, the PAD allows you to receive calls from the X.25 Network. In fact, it can screen incoming calls and reject unauthorized access with no involvement of the attached device. You can configure the PAD to accept or reject incoming calls, based on:

* Security access code (a trunk password).
* Requested facilities.
* Channel availability.
* Device authorization to accept the incoming call.

On accepting an incoming call, the PAD can also adjust the parameters of the calling party to make the call compatible with the attached resource (that is, host port, application, and so on).

3.6.1 Password Protection

As previously stated, there are several ways the PAD can protect your equipment against unauthorized callers. One of these is to restrict callers to only those who have a valid trunk password. This password must be present in octets 5 through 8 (four ASCII characters) of the incoming call's call user data field (if the PAD is configured to support subaddressing using the call user data field, the trunk password must be present in octets 7 through 10). The caller's failure to do this causes the PAD to respond by rejecting the call with diagnostic code 133.

3.6.2 Facilities Requested

The PAD can be configured to reject incoming calls on the basis of the requested facilities. You can specifically reject calls that request any one of the following:

- Reverse charging (collect calls)
- Fast select

Refer to paragraph 3.1.5.

If the call is rejected because of the requested facilities, the diagnostic code in the clear packet will be set to 133.

3.6.3 Channel Availability

When the PAD determines the subaddress value of the incoming call, using the X.121 or call user data field method, it will determine which channels have been assigned a class ID equal to the subaddress. The channels must have incoming or incoming and outgoing call capability.

If no available channel is found, the call is cleared with diagnostic code 134.

If one or more channels meet the above criteria, the PAD will allocate the call to the first free channel in that group. If no free channel is found, the call is cleared with diagnostic code 134.

If the call is routed to a channel configured for a dedicated connection, the call will be accepted only if the following conditions exist:

- The device connected to that channel has its DTR/DSR signal High (refer to paragraph 3.3.5).

- The device profile assigned to that channel specifies fixed speed and parity support. If the channel is defined for auto speed and/or auto-parity support, the channel must be autobauded by the attached device.

- The channel has both incoming and outgoing call capability, and it has not received any input from the attached device in the last four minutes (when the PAD is in X.28 mode, the edit buffer is purged of data after four minutes of inactivity).

If the call is routed to a channel configured for ring-out connection, the call will be accepted when the device responds to ringing. Otherwise, the call is cleared with diagnostic code 133.

3.6.4 Speed Matching

When the PAD detects a Throughput Class Facility in an incoming call, it will decode the throughput class code to determine the speed of the calling device at 75, 150, 300, 600, 1200, 2400, 4800, or 9600 bps.

When the PAD determines the correct speed, it will attempt to find a channel (within the rotary requested) that is configured with a matching speed.

If there are no free channels (a free channel is a channel which is not engaged in a virtual call or EIA handshaking) in the rotary that support the same speed, the PAD will attempt to find a dial-out channel that is configured for autobaud support. If a channel is found, the PAD will establish a physical connection and then transmit the outbound autobaud sequence at the required speed. This action is taken to autobaud the attached device, typically a host computer, with the right speed (refer to paragraph 3.6.5).

If no dial-out, autobaud channel is available or free, the PAD will assign the call to the first free channel in that rotary regardless of its speed.

3.6.5 Outbound Autobaud and Data Forwarding Delay

- Outbound Autobaud

  In installations where the PAD is used as a front end to a data PABX, the channels typically contend with other devices for the host computer ports. In this environment, the host computer ports normally expect an autobaud character sequence when the call is accepted.

  In this case, PAD channels cannot be set for fixed speed. With channels set at fixed speed, the first data character would be passed on to the host where it would be interpreted as the autobaud character. This would result in mismatched speed and call failure.

  The outbound autobaud characteristic allows the PAD to autobaud the host computer before it passes any incoming data from the Network. In this environment, installation of the PAD is transparent to your setup. This feature is also useful when you need to match the speed of the host port with the speed of the calling terminal.

- Data Forwarding Delay

  The PAD will also support host computers that require delay after the EIA connection is established and before any incoming data can be accepted. This delay will be equal to the idle timer value in the device profile, if that value is an even number. Otherwise, the delay will be equal to the idle timer value plus 128 (unless that value is already greater than 128).

3.6.5.1 For Fixed Speed Channel

When an incoming call is routed to a channel configured for dial-out, the channel will establish the physical connection as described in paragraph 3.3.7. Following a successful connection, a delay timer equal to the forwarding idle timer (Parameter 4) is triggered on that channel.

When the timer expires, the channel will start forwarding incoming data.

This will meet the requirements of many computer systems that require a delay after EIA handshaking is completed and before accepting incoming data.

3.6.5.2 For Autobaud Channel

Both outbound autobaud and data forwarding delay for an autobaud channel is processed as previously described. The channel will transmit the autobaud character sequence when the timer expires. The timer is then triggered a second time. When the second timer expires, the channel will start forwarding incoming data.

The speed of the autobaud character sequence is determined by the incoming call's Throughput Class Facility. If the speed is not included in the incoming call, the default value is 9600 bps.

Refer to paragraph 5.5.14 for the definition of the autobaud character sequence.

3.6.6 Service Signal

When an incoming call is accepted and service signals (Parameter 6 of the device profile) are enabled, the channel will transmit the following signal to the attached device:

    (Calling dte address):(facilities code):com[cr,lf]
    (Call user data)[cr,lf]

Fields in parentheses are transmitted if they are present in the incoming call packet. If the PAD is configured for trunk password and/or subaddressing in the call user data field, the forwarded call user data will not contain the trunk password or the two-subaddress bytes.

If service signals are disabled for the channel, none of the above fields will be transmitted. Refer to paragraph 3.7.4.2 for information on forwarding of the call user data field when the service signals are disabled.

3.7 X.28 COMMANDS AND SERVICE SIGNALS

3.7.1 Purpose of X.28 Mode

X.28 specifies the dialogue between a user and the PAD. This dialogue has two components. The first component relates to commands that the attached device can input, while the second component refers to a set of responses called service signals. The dialogue is made possible by a service prompt and a predefined command repertoire. During this dialogue, the user can do the following:

- Alter X.3 parameters
- Initiate a virtual call
- Clear or reset a call in progress
- Inquire about channel status
- Initiate channel connection, terminal, or X.25 trunk tests

3.7.2 Escape to X.28 Mode

Once a connection is established between the user's device and any of the PAD's channels, the user is in X.28 mode. In this mode, the user may enter any X.28 command, including a call, unless the channel is a PVC or is configured for incoming calls only.

When a call is successfully established, the user is in data transfer mode. In this mode, the user may need to escape to X.28 mode to modify the parameters in the Device Profile assigned to the channel or to clear the call.

If you want to be able to modify parameters or to clear a call, set Parameter 1 of the Device Profile to indicate which character should be interpreted by the PAD as an X.28 recall character; or, set Parameter 7 to allow the BREAK key to be used. The BREAK key selection is recommended if the channel supports transparent data (8-bit character) transmission.

When you escape to X.28 mode, you are notified with an X.28 Service Prompt signal. Typically, an * is output to the device. If service signals (Parameter 6) are disabled, the prompt is not generated by the PAD.

3.7.3 X.28 Commands

The MICOM PAD supports all commands defined by the X.28 recommendation. In addition to the standard X.28 commands, the PAD supports a set of commands referred to as X.28 extended commands. These commands enable the user to initiate some special PAD functions and to control the MICOM-enhanced device profile parameters.

Access can be restricted to the standard X.28 commands on a per-channel basis (refer to paragraph 5.5.2).

NOTE: Refer to section 4, User Interface, for the format and function of
         both the standard and the extended X.28 commands that are supported
         by the PAD. Commands can be entered in upper or lower case.

3.7.4 X.28 Service Signals and X.28 Service Prompt

The PAD uses service signals to acknowledge X.28 commands. It also uses the
service signals to inform the user of Network events and/or PAD actions. The
X.28 Service Prompt is generated to confirm to the user that the channel is in
X.28 mode following the detection of an X.28 recall character.

In order to accommodate APL terminals, all service signals are generated in
lower case.

3.7.4.1 Clear and Reset Service Signals

The service signals are generated by the PAD to indicate to the device that
the virtual call has either been cleared or reset.

The clear or reset service signal is generated when a Clear or Reset Indi-
cation Packet is received from the Network. They can also be generated by the
PAD or the destination device. These service signals include a cause field
and, optionally, a 3-digit diagnostic code field. The diagnostic code is only
included if the Network supports diagnostic codes.

A DTE cause field in a clear service signal indicates that the clear or the
reset was caused by the local PAD or the destination device. If the desti-
nation device is another MICOM PAD, diagnostic codes indicate the reason the
clear or reset occurred (see tables 4-5 and 4-6).

3.7.4.2 Control of Service Signals

When the PAD is acting as a frontend for a non-X.25 host computer, all ser-
vice signals and the X.28 prompt should be suppressed by setting Parameter 6
to a value of 0. With this parameter set to suppress service signals, the PAD
will also suppress the Herald and the Bulletin Messages. Responses to X.28
commands are also suppressed.

<u>Call User Data</u>

When you suppress service signals, the incoming call indication message is
suppressed. Consequently, the call user data is not passed through. There
are conditions where you may want to pass call user data when service signals
are suppressed. If your call user data contains a host computer password or
an applications program selection, it is obviously desirable to have this
information forwarded. To support this requirement, the PAD provides an over-
ride mechanism on a per-channel basis (refer to paragraph 5.5.2).

Editing Service Signals

By setting Parameter 19, you can instruct the PAD to issue editing service signals that are appropriate to the device type: visual display terminals, printers, hard-copy terminals, and so on (refer to paragraph 3.2.6.3).

3.8   X.29 SUPPORT

3.8.1   Purpose of X.29 Mode

The MICOM PAD fully supports CCITT Recommendation X.29.   X.29 support provides a mechanism for exchanging control information between the PAD and the destination device. The exchange of these control messages can be transmitted in both directions over the virtual circuit anytime after the virtual circuit is established.

3.8.2   Incoming X.29 Messages

The processing of incoming X.29 messages may include:

* Change (SET) and/or examine (READ) device profile parameters assigned to the physical channel engaged in the current calling session

* Indication of BREAK from the destination device. In an environment where the PAD is used as an X.25 front end, terminals that are connected to remote PADs will typically generate a BREAK to halt host computer transmission. A remote PAD translates this BREAK into an X.29 BREAK Indication Packet. When the BREAK Indication Packet is received by a MICOM PAD, it will cause a physical BREAK to be generated to halt host computer transmission.

* An invitation to clear the call. Upon receipt of this message, the MICOM PAD will issue the appropriate service signal (if enabled) to the attached device and clear the call.

* Parameter indication. The PAD will receive this message when the device connected to the active channel issues an X.29 Read Message (refer to paragraph 3.8.4.2). On receipt of a Parameter Indication Message, the PAD translates it into the equivalent X.28 service signal and forwards the PAR list of parameter references, with their current values, to the attached device.

3.8.3 Outgoing X.29 Messages

The processing of outgoing X.29 messages may include the following:

* On receipt of a Read Message or a Set and Read Message, the MICOM PAD will indicate the value of the parameters assigned to the active channel in an X.29 Parameter Indication Message. Any changes that are made to these parameters with a Set and Read Command or a Set Command are only valid for the duration of the session. Preconfigured values are reinstated at the conclusion of the call.

* BREAK indication message. When a physical BREAK or equivalent BREAK character (specified in Parameter 108 of the Device Profile) is detected, and if the value 4 is specified (in Parameter 7 of the Device Profile), the PAD will transmit an X.29 BREAK Indication Message.

* An invitation to clear. The MICOM PAD will generate an X.29 Invitation to Clear Message when a physical disconnect or clear service signal on a host-type channel is detected.

* Error message. The MICOM PAD will generate an error message when there is an error that prevents decoding of the incoming X.29 message.

* A SET parameter message. In addition to generating a BREAK signal on receipt of a BREAK Indication Packet, the MICOM PAD will issue an X.29 message to set X.3 Parameter 8 of the calling party to 0. This enables the remote PAD to resume output.

3.8.4 Initiation of X.29 Messages

In addition to the outgoing X.29 message previously discussed, the MICOM PAD offers extended X.29 support. This support allows you to implement the following:

* Automatic remote parameters setup
* ASCII-to-X.29 conversion for start-stop host computers

3.8.4.1 Remote Parameters Setup

The PAD allows you to set up the parameters of the calling device when an incoming call is accepted. This is handled by using an X.29 Set Message.

Remote Parameter setup sequences are used to alter the parameters of a calling device when an incoming call is accepted. The PAD allows you to define up to five different remote parameter setup sequences (refer to paragraph 5.5.2). Each sequence can have up to 20 parameter entries and associated values. When you configure an asynchronous channel, you can assign one of these sequences. When an incoming call is accepted, the PAD automatically transmits the sequence assigned to the channel in the form of X.29 Set Messages.

This feature is particularly useful when you expect to receive calls from devices connected using the public asynchronous access ports of your packet data network. The device profiles are typically too general to be used as is. Using the remote parameters setup, you can adjust them without involving the caller.

As previously described, you can define up to five different remote configuration setup sequences. Each one can reference up to 20 parameters. To allow you to control non-X.3 remote parameters, the PAD allows you to define parameters with reference numbers from 1 to 255. These parameters can also be assigned any value from 0 to 255. For example, this value range should give you control of the so-called "national parameters" of some networks' public access ports.

Channels with the same class ID (that is, belong to the same rotary), should typically be assigned the same remote configuration parameters sequence.

3.8.4.2 ASCII-to-X.29 Conversion

MICOM's PADs support a powerful characteristic to enable asynchronous host computers to alter the value of remote PAD parameters dynamically. This complements the Remote Parameter Setup capability previously described. In essence, it allows a non-X.25 host to transmit X.29 messages (Read, Set, Set and Read, and Invitation to Clear) over the Network by issuing the equivalent X.28 ASCII command strings (PAR?, SET, SET?, and CLR).

When these command strings are received, the PAD will translate them into equivalent X.29 messages and transmit them over the Network. This allows applications programs that use an attached PAD to alter the caller's PAD parameters to be compatible with the application requirements (such as, turn echo off for a password entry, and so on).

This conversion capability can be enabled or disabled by setting device profile Parameter 117. This parameter defines which character should be interpreted by the PAD as an X.29 access request (that is, escape character). The device can escape to X.29 mode from data transfer mode only, not from X.28 mode.

NOTE: Also, to forward the access character over the Network requires that the device generates that character twice, that is, the same mechanism required for forwarding the X.28 escape character.

3.8.5 X.29 Service Signals

The PAD's handling of X.29 service signals is as follows.

• X.29 Service Prompt

On detection of an X.29 escape character, the PAD will generate a # service prompt.

- X.29 Command Delimiter

  The CR character must be used as a command delimiter.

- X.29 Exit Command

  To return to data transfer mode from X.29 mode, the user must enter an X.29 escape character, or a CR as a command.

- X.29 Command Acknowledgement

  The LF character will be used by the PAD as an acknowledgement service signal.

3.9 PERMANENT VIRTUAL CIRCUIT OPERATION

The PAD supports concurrent operations of Permanent and Switched Virtual Circuits (PVCs and SVCs).

An SVC is set up dynamically when a device connected to a channel places a call to a remote destination. The PVC is a predefined connection between one of the PVC channels and a destination device over the Network. For that reason, you are required to assign one of the PAD channels for each defined PVC channel (refer to paragraph 5.5.7 for the definition of PVC channels).

3.9.1 Establishment of a PVC

The user can transfer data over a PVC only when there is an operational logical connection between the destination and the PAD channel. Since there is a permanent logical connection, there is no need to place a call and/or place the circuit.

3.9.2 PVC Operational Indication

The PAD will use the com service signal to indicate that a PVC is operational. The PAD assumes the PVC is operational after a link restart. Following a link restart, and when the PAD detects a device not ready condition on a channel configured for PVC operation, the PAD will notify the remote destination device by a Reset DTE 01 (see table 4-6 for Reset Service Signals).

3.9.3 Command Facility Requirements

You may dedicate all the PAD channels to a PVC mode of operation. However, you need to subscribe to and define a single SVC if you want to enable remote access to the PAD's Command Facility. Also, a minimum of two SVCs are necessary to invoke the full TACT diagnostics. For the Command Facility and diagnostic capabilities, two SVCs are required.

3.9.4 Leased Line Emulation for PVCs

Leased line emulation for PVCs can be independently configured for any PAD channel (refer to paragraph 5.5.2). When this option is configured, the handshake signaling described below is used.

The PAD raises DSR, DCD, and CTS when:

- A Reset Packet is received from the Network indicating that the PVC is operational.

- A Reset Indication Packet is received from the remote PAD indicating that the remote device is ready.

The PAD drops DSR, DCD, and CTS when:

- A Reset Packet is received from the Network indicating that the PVC is out-of-order.

- A Reset Indication Packet is received from the remote PAD indicating that the remote device is not ready.

SECTION 4

USER INTERFACE

4.1 TYPICAL USER FUNCTIONS

As a user, you may be most interested in how you can use the PAD to initiate and complete calls over the Network. However, you may occasionally find it necessary to modify or examine operating parameters for a particular call, or to execute channel tests when some unusual calling condition occurs. In addition, you may want to use the PAD's local copy or call transfer capabilities. The information in this section describes the procedures that are required to:

- Establish a connection between your terminal and the PAD.
- Initiate and terminate a call.
- Examine or modify device parameters associated with your channel.
- Invoke test procedures.
- Perform a local copy or call transfer.

In addition, this section describes the PAD service signals. These are messages that the PAD generates in response to user's commands or as a consequence of certain Network events.

4.2 TERMINAL-TO-PAD CONNECTION

To gain access to the PAD, you must first establish a physical connection to one of its channels, followed by a logon sequence (if your channel is configured for autobaud or autoparity).

After you have successfully established a connection between your terminal and the PAD, you may:

- Initiate calls over the Network.

- Initiate calls to other devices connected to the same PAD.

- Initiate local copies.

- Examine or modify device parameters assigned to the channel to which you are connected.

- Initiate diagnostic-type calls.

- Initiate Fast Select calls.

- Receive calls from the Network.

- Receive calls from a device connected to the same PAD.

Your terminal can be connected to the PAD using a dial modem, or be permanently connected using a dedicated arrangement of cables and/or private wire modems.

4.2.1 Dial-In Access Procedures

The connect sequence for dial-in access is as follows:

1. Turn on the terminal and modem.

2. Dial the PAD access number and wait for a high pitched tone.

    a. If you do not hear a tone, hang up and try again.
    b. If you hear a busy signal, try again when the line is free.

3. When you hear the tone, place the receiver in the coupler or press the appropriate pushbutton on the data set.

4. For an autobaud-autoparity access channel, enter the ABR sequence <u>CR</u>.<u>CR</u>. For an autobaud-only access channel, enter <u>CR</u>. For a fixed-speed access channel, do not enter any characters.

5. The PAD will acknowledge a successful connection and prompt you for a command (refer to paragraph 4.3 for acknowledgement messages).

6. Following the prompt, you can examine the parameters assigned to your channel or place a call.

NOTE: You must establish a call within two minutes, or the PAD will drop your terminal connection. The PAD will also drop your connection after four unsuccessful call attempts.

        If you keep getting a busy signal when you dial the PAD access number, consult your Network administrator. A trunk-down condition will cause the PAD's dial-in channels to appear busy.

4.2.2 Dedicated Access Procedures

The connect sequence for dedicated access is as follows:

1. Turn on the terminal. If you are using a private wire modem, turn on the modem.

2. Enter the logon sequence if necessary.

3. The PAD will acknowledge a successful connection and prompt you for a command (refer to paragraph 4.3).

4. Following the prompt, you can examine the parameters assigned to your channel or place a call.

Once you have completed this procedure, you may receive an incoming call if you are not typing a command or have not established a call to another destination.

NOTE: If the PAD does not respond with a User Connect message following the connect sequence for either dial-in or dedicated access arrangements, one of the following conditions may exist:

* Your terminal or your access equipment and/or cables require service.

* The PAD requires service, or the service signals are disabled.

* The PAD is configured for autobaud/autoparity, and it has not been synchronized by the ABR sequence. If this condition is true, press the BREAK key and repeat the ABR sequence.

4.3 USER CONNECT MESSAGES

When you have successfully established a connection between your terminal and the PAD, the PAD will transmit the following messages or prompts:

* Herald Message -- The PAD Herald Message is the equivalent of a greeting or welcome message. The factory setting is: "mb3-x.25 async pad channel nn" (where nn is the channel number to which your terminal is physically connected).

* Bulletin Message -- The Bulletin Message is transmitted immediately following the Herald Message. There is no factory default setting for this message. A Bulletin Message is normally used to send Network notices, such as advance notice of system maintenance shut-down.

* X.28 Service Prompt -- The X.28 Service Prompt is transmitted immediately following the Bulletin Message. The factory setting is an *. The X.28 Service Prompt indicates that the PAD is ready to accept X.28 commands.

As an example of this sequence (when factory default settings have not been changed), the following message indicates that you have completed a successful connection between your terminal and the PAD's Channel 12.

    mb3-x.25 async pad channel 12

    *

You may enter X.28 commands to examine or modify device parameters assigned to your channel for the current calling session, or just proceed to place a call.

4.4 INITIATING A CALL

Depending on the configuration of a particular channel, you may use one of the following calling methods:

- Long Form
- Abbreviated
- Autocall

You must consult your network administrator to determine the calling method(s) that are enabled on your channel.

4.4.1 Long Form Calling Method

Using the Long Form Calling Method, you are required to enter the standard X.28 Call Connect Request Command (either con, or a c followed by a space) and the destination address to establish a virtual call. The format of the command is as follows:

[C](facility codes-) [network address] (/subaddress) (*call user data)
                                  or
[con](facility codes-) [network address] (/subaddress) (*call user data)

NOTE: In the above format, square brackets [ ] indicate required entries
         and parentheses ( ) indicate optional entries.

The following paragraphs define valid entries in each field of the Call Connect Request Command:

- [C] or [con] -- C followed by a space, or con, is the X.28 Call Connect Request Command.

- (facility codes-) -- Facility codes are optional entries in the Call Connect Request Command. If included, they may consist of one or more of the following Facility Indication codes:

  R   = Reverse Charge

  P   = 128 bytes-packet size negotiation/DATAPAC Priority
                Call

  D   = Throughput Class Negotiation

  F   = Fast Select

  Gxx   = Closed User Group xx

  Txxxx   = RPOA transit network selection xxxx

  C   = Charging information

  Nxxxxxxxxxx = Network user identification (NUI)

NOTE: If the PAD has been configured for NUI support (via the NUI Type
          trunk parameter), and you do not enter an NUI facility request, your
          call will be cleared with a diagnostic code of 139 (NUI/password
          required).

The format of facility codes and associated parameter fields for X.25 and
other National facilities is as follows:

    $Xcc = pp:pp:....pp = other X.25 facilities
    cc   = facility code in hex
    pp   = facility parameter field in hex

    $Ncc = pp:pp:....pp = other national facilities
    cc   = facility code in hex
    pp   = facility parameter field in hex

When present, National facilities must follow the X.25 facilities.

Individual facility codes must be separated by commas. The facility field
must be terminated with a -.

* [network address] -- The address field is a required entry in the Call
  Connect Request Command and specifies the network address of the desti-
  nation device. It can be up to 15 digits.

* (/subaddress) -- The subaddress is not required. It can be included if
  the address field is 13 digits or less. If it is included, it must be
  two digits specifying additional routing associated with the destination
  address.

* (*call user data) -- The Call User Data field is optional. If it is
  included, it must be preceded by an *. Call user data can be up to 12
  characters and can have any value.

NOTE: If you do not want the PAD to echo the call user data field, follow
          the * with the echo suppression character defined in Parameter 109.

The following examples further describe the format of the Long Form Call
Connect Request Command.

Example 1

Long Form Call Connect Request Command with only the destination network
address field:

    C 12345678

Example 2

Long Form Call Connect Request Command with the optional subaddress field:

    C 12345678/01

Example 3

Long Form Call Connect Request Command with closed user group facility code, a subaddress field, and call user data:

C G12-12345678/01* HELLO

4.4.2 Abbreviated Calling Method

The Abbreviated Calling Method simplifies the call connect procedure by allowing you to initiate a call with the X.28 Call Connect Request Command (a c followed by a space; or con) and a mnemonic of up to eight alphanumeric characters. The general format of the Abbreviated Call Connect Request Command is as follows:

C .mnemonic
        or
con.mnemonic

where "mnemonic" is an eight-character abbreviated call mnemonic that has previously been defined by your network administrator.

Example

C .CALLALAN

If you need to change the subaddress and/or the call user data fields for the current session, you may also enter the Abbreviated Call Connect Request Command in the format:

C .mnemonic (/subaddress)(*call user data)

Valid entries in the subaddress and call user data fields are described in paragraph 3.5.3.1.

4.4.3 Autocall Calling Method

If you are using a channel that is configured for autocall on device ready, the PAD will automatically initiate a call to a predefined destination. A device is ready when a physical connection is complete and, if applicable, following entry of a logon sequence (refer to paragraph 4.2).

The PAD can also be configured to initiate the call when it receives a carriage return character CR from your terminal. As in autocall on device ready, you must have previously established a connection between your terminal and the PAD (refer to paragraph 4.2).

When the automatic call is accepted by the remote destination device, the PAD will notify you with the message:

com

NOTE: If the destination address is equivalent to the PAD's own configured address, the call will be routed locally to another channel. The subaddress field is used to determine the identity of that channel.

4.5 X.28 COMMANDS

When you establish a connection between your terminal and the PAD, the PAD transmits a Herald Message, possibly a Bulletin Message, and an X.28 Service Prompt to indicate that a successful connection has been established. At this point you may proceed to place a call as described in paragraph 4.4, or you may examine and/or modify parameter values for the duration of the current calling session. You may also enter commands to execute channel tests. The following paragraphs describe valid X.28 command entries that can be used to examine or modify PAD parameter values for the current connect sequence and to execute Terminal-Activated Channel Tests (TACT).

4.5.1 X.28 Parameter Commands

The commands in this group are used to set and read PAD parameter values. Parameters that are modified using the Set Commands will retain their new values for the duration of the calling session only. When you clear the current call, the original values assigned to your channel parameters will be restored. Table 4-1 defines the purpose, format, and PAD response for each of the X.28 Set and Read Commands.

Table 4-1. Device Parameters Commands

Purpose	Command Format	PAD Response
To examine the current value of specified parameters	PAR?nnn.....nnn nnn = 1 thru 22, 100 thru 119	parnnn:yy,.....nnn:yyy nnn = :parameter reference number yyy = :associated value

To examine the current value of all parameters associated with that channel	PAR?	parnnn:yyy,....nnn:yyy
		nnn = :parameter
		       reference number
		yyy = :associated value
		       of a parameter

To modify existing parameter values and read new values	SET?nnn:yyy,...nnn: yyy	parnnn:yyy,...nnn:yyy
To modify parameter values	SETnnn:yyy,...nnn: yyy	CR and LF Characters
To assign a device profile to your channel	PROF n (n=1-24)	CR and LF Characters

NOTES:

All commands must be terminated with a <u>CR</u> or a + character.

When X.28 extended mode is enabled, these commands also apply to MICOM-enhanced parameters 100 through 119.

The values of the following parameters cannot be modified:

* Parameter 11 -- data rate

* Parameter 100 -- bits per character

* Parameter 101 -- parity (can be modified; but not set to autoparity)

* Parameter 117 -- X.29 access character

4.5.2 Miscellaneous Commands

You may issue certain instructions to the Network and/or your PAD (see table 4-2). However, you should fully understand how these commands can affect the applications and equipment to which you are connected.

Table 4-2. Miscellaneous Commands

Purpose	Command Format	PAD Response
To request communications status	STAT	(herald message) (Channel #)[1] (bulletin) (CR, LF) (free/engaged) CR, LF (X.28 prompt) or (free/engaged) (CR, LF) (X.28 prompt)
To clear a virtual call	CLR	clr conf or clr err (in the case of local procedure error)
To reset the virtual call or permanent virtual circuit	RESET	CR, LF (X.28 prompt)
To transmit an Interrupt Packet to the remote device	INT	CR, LF (X.28 prompt)
To exit X.28 command mode	(CR) or PAD recall character	...
[1]If X.28 extended mode is enabled on that channel.		

4.5.3 X.28 Test Commands

The commands described in table 4-3 can be used to execute Terminal-Activated Channel Tests (TACT) from your terminal. When you enter a TACT command, you exit X.28 mode and enter the PAD's test mode.

Table 4-3. Terminal-Activated Channel Test Commands

Purpose	Command Format	PAD Response
To initiate the TERMINAL Loopback Test	TACTT	in tact mode (Refer to paragraph 6.4.2.)
To initiate the LOCAL Loopback Test	TACTL	in tact mode (Refer to paragraph 6.4.1.)
To initiate the SYSTEM Loopback Test	TACTS	tact call placed or clr xxx yyy (Refer to paragraph 6.4.5.)
To initiate the REMOTE Loopback Test	TACTR	tact call placed or clr xxx yyy (Refer to paragraph 6.4.4.)
To terminate any of the TACT tests and return to X.28 mode	(BREAK)	tact mode completed

NOTES:

All TACT commands are enabled in X.28 extended mode only. In addition, these commands cannot be initiated if a virtual call is already in progress on that channel.

X.28 commands must be terminated with CR or a + character.

Refer to section 6 for more detailed information on the Terminal-Activated Channel Tests.

4.6 SERVICE SIGNALS

The PAD may transmit certain messages, called service signals, to your device:

- In response to one of your commands.
- On its own initiative.
- As a result of a Network action.
- As a result of your destination action.

The information in this paragraph describes the normal service signals that you may encounter in the call connect sequence, and the clear and reset messages that may be transmitted when a call is prematurely disconnected. All clear and reset messages include a cause code mnemonic indicating the reason the clear or reset condition occurred. In some cases a diagnostic code will also be included. The diagnostic code provides additional information relative to the clear or reset condition. Table 4-4 describes the content and format of each of the PAD service signals.

Table 4-5 lists all cause mnemonic and diagnostic codes associated with clear service signals. These are always used in reference to virtual circuits.

Table 4-6 lists all cause mnemonic and diagnostic codes associated with reset service signals. Reset signals are most often used in conjunction with permanent virtual circuits.

Table 4-4. X.28 PAD Commands and Service Signals

PAD Service Signals	Explanation
clr (cause mnemonic)[1] (diagnostic code)[2]	See table 4-5.
reset (cause mnemonic)[1] (diagnostic code)[2]	See table 4-6.
err	An illegal X.28 command
com	The call is established.
(calling dte address): (facilities code)[3]: com cr,lf (call user data) cr,lf	Incoming call indication
enter fs data	The X.28 Fast Select Facility is detected. The user at the initiating device may enter up to 124 characters (for the Call Request Packet); the user at the responding device may enter up to 128 characters (for the Clear Request Packet).[4]
* or a user-defined 16-character service prompt	An X.28 recall character (typically control P) is detected.
data lost	PAD discarded data because of buffer overflow.
not found	The mnemonic specified in Abbreviated Call Connect Request Command is not defined, or device profile requested by Prof Command is unavailable.
edit line too long	Edit buffer overflow. You should enter CR twice to recover from this error condition.
inactivity time out	Call has been cleared because of the inactivity timer.
CR page	PAD has initiated a "page wait" condition (after transmitting the number of linefeeds specified by Parameter 22). The PAD will not transmit additional data until the page wait is cancelled (refer to paragraph 3.2.14).

[1]The cause mnemonic consists of three alphabetic characters.
[2]The diagnostic code consists of three numeric characters.
[3]Hexadecimal value
[4]Actually, either user may enter up to 256 characters, but only 124 are transmitted in the Call Request Packet, and only 128 are transmitted in the Clear Request Packet. Other characters entered are discarded.

Table 4-5. Clear Service Signals' Cause Mnemonics and Diagnostic Codes

Cause Mnemonic	Diagnostic Code	Explanation
dte	00[1]	Remote MICOM PAD cleared the call.
	133[1]	Facilities requested are not allowed, or trunk password is invalid at the remote MICOM PAD.
	134[1]	Device connected to requested channel is not ready at the remote MICOM PAD.
	135	Call is cleared by local PAD as a result of a trunk restart.
	136	Trunk is down.
	137	Undefined mnemonic in Abbreviated Call Connect Request Command or for an autocall channel.
	138	There is no free logical channel on your PAD.
	139	NUI/password is required in the facilities field
	140	NUI/password entered is invalid
	142	TACT call is not allowed from your channel.
	146	X.25 Control Center call is already in progress.
	nnn	Generated by other X.25 equipment
occ	xxx	Number is busy.
inv	xxx	Invalid facility request
nc	xxx	Network congestion
der	xxx	Out-of-order
na	xxx	Access barred
np	xxx	Not obtainable
rpe	xxx	Remote procedure error
err	xxx	Local procedure error
nrc	xxx	Reverse charging not subscribed
inc	xxx	Incompatible destination
nfs	xxx	Fast select not subscribed
pad	xxx	The PAD has cleared the call following the receipt of an Invitation to Clear Packet from the remote X.25 equipment.

LEGEND:
xxx = Network-Dependent Diagnostic codes. Consult your Network directory for their significance.
nnn = Destination DTE Diagnostic code.

[1]The values may have different significance when generated by non-MICOM remote equipment.

Table 4-6. Reset Service Signals' Cause Mnemonics and Diagnostic Codes

Cause Mnemonic	Diagnostic Code	Explanation
dte	00^1	PVC was reset.
	01^1	Remote device is not ready (PVC).
	128^1	Received a restart (PVC)
	130	Trunk is down (PVC).
	131	Remote PVC is out-of-order.
	nnn	Generated by other X.25 equipment
der	xxx	PVC is out-of-order.
rpe	xxx	Remote procedure error
err	xxx	Local procedure error
nc	xxx	Network congestion
rop	xxx	Remote DTE is operational (PVC).
nop	xxx	Network is operational (PVC).
inc	xxx	Incompatible destination

LEGEND:
  xxx = Network-Dependent Diagnostic codes. Consult your
        Network directory for their significance.
  nnn = Destination DTE Diagnostic code.

[1]The values may have different significance when generated
 by non-MICOM remote equipment.

4.7 LOCAL COPY

The PAD's Local Copy capability lets a terminal operator (connected to a PAD) define another device connected to the same PAD as a copy device. Typically, that operator would use Local Copy to obtain a hard (printed) copy of screen input or output. However, the copy device does not have to be a printer (for example, it could be another terminal). Throughout this document, the I/O device will be called the master device, and the destination device will be called the copy device.

NOTE: The copy device does not have to be physically connected to the master device. The only requirement is that both the master device and the copy device be connected to the same PAD.

No special configuration is necessary to use Local Copy. However, prior to entering a copy command, make sure the following conditions exist:

- The master device is in the X.28 mode (refer to paragraph 4.5).
- The copy device is in a ready and free state.

NOTE: If you are connected to a PAD's Command Facility while you are engaged in a local copy relationship, you typically would have configured Parameter 13 (Autolf) on the master device to 6 (refer to paragraph 5.5.3). You would have performed this configuration after entry of the password. This configuration would provide for proper formatting on the copy device.

Both the data that is sent from the master device to the network, and the data that is sent from the network to the master device, can be copied to the copy device. Four distinct commands (described in paragraphs 4.7.1 through 4.7.4) allow the master device operator to specify which data paths are to be followed.

After one of these copy commands is entered, it stays in effect until one of the following events takes place (causing the Local Copy to be terminated):

- The call is cleared.

- The Kill Copy (KCOPY) Command (refer to paragraph 4.7.5) is entered at the master device.

- Either the master or copy device physically disconnects.

In the case of a physical disconnect, there are differing results, depending on whether the master or the copy device is physically disconnected:

- If the master device is physically disconnected in the midst of a call, the call is automatically transferred to the copy device (refer to paragraph 4.8, Call Transfer). Input from the copy device is then allowed (of course, this applies only if the copy device has a keyboard).

  Also following a master device disconnect, the inactivity timer of the copy device is activated, to make sure that the copy device will be returned to a ready and free state, after it receives all the output. If the value of Parameter 116 (Inactivity) is equal to 0, the value is automatically changed to a value of 3 (for the duration of the call).

- If the copy device is physically disconnected in the midst of a call, the master device receives a notification message that the copy device is down, and the local copy relationship is terminated.

NOTE: You should not enable Local Copy prior to entering any confidential information (such as a password). If you do enter confidential information while Local Copy is enabled, that information will be copied (echoed) to the copy device.

4.7.1 Local Copy All Input/Output (COPYA) Command

When the master device operator enters COPYAnn (nn = the two-digit port number of the copy device), it causes data from the network to be sent to both the master and copy devices (see figure 4-1).

In addition, any data from the master device is sent to the network and is copied to the copy device. Data from the copy device is always ignored.

NOTE:
ARROWS INDICATE DIRECTION OF DATA FLOW.

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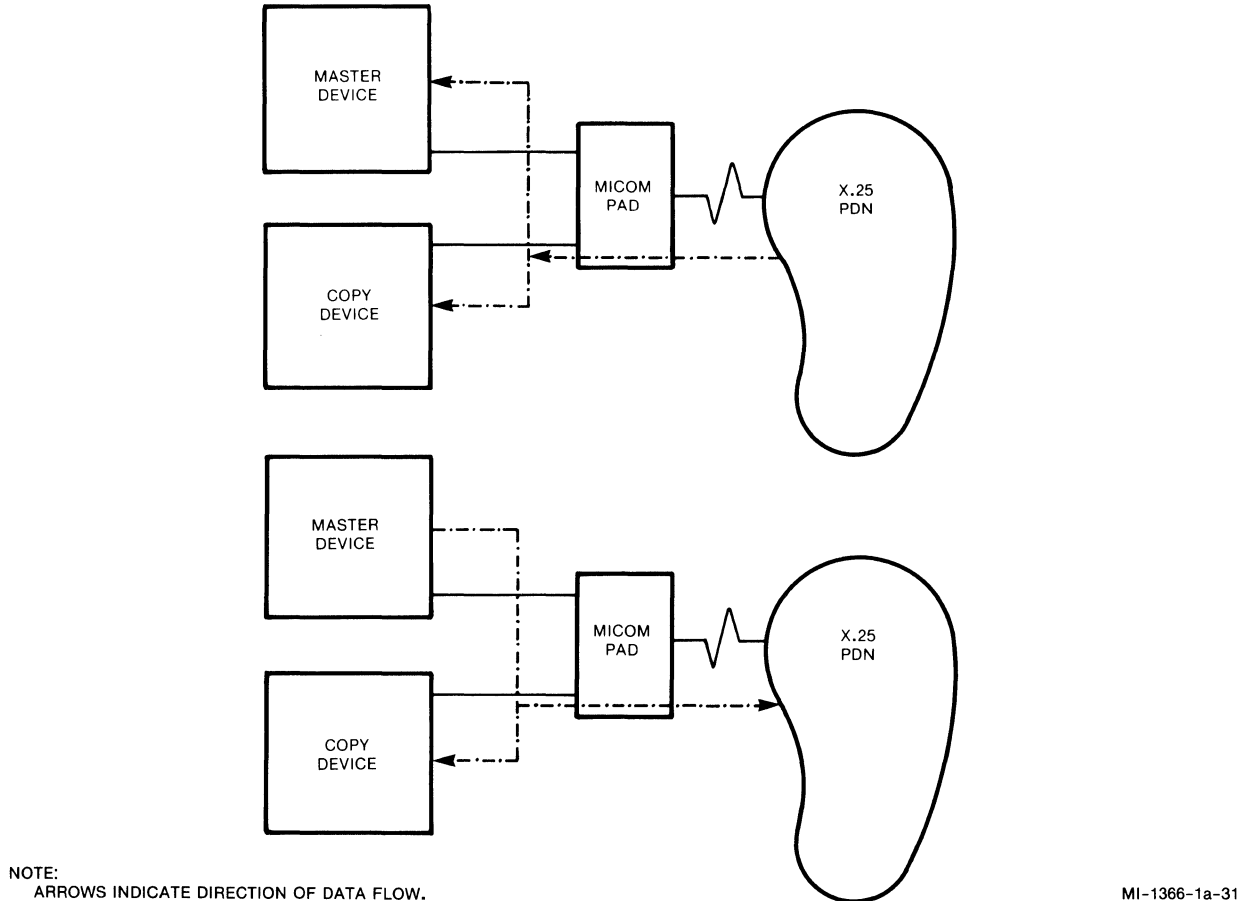
Figure 4-1. Data Flow Related to the Local Copy All Input/Output
(COPYA) Command

4.7.2 Local Copy Host Output (COPYH) Command

When the master device operator enters COPYHnn (nn = the two-digit port number of the copy device), it causes data from the network to be sent to both the master and copy devices (see figure 4-2). Data from the master device is sent to the network only (it is not copied to the copy device). Data from the copy device is always ignored.

NOTE:
ARROWS INDICATE DIRECTION OF DATA FLOW.

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Figure 4-2. Data Flow Related to the Local Copy Host Output
(COPYH) Command

4.7.3 Redirect Output to Copy Device (COPYC) Command

When the master device operator enters COPYCnn (nn = the two-digit port number of the copy device), it causes data from the network to be sent to the copy device, but not to the master device (see figure 4-3). Data from the master device is sent to the network only (it is not copied to the copy device). Data from the copy device is always ignored.

NOTE:
ARROWS INDICATE DIRECTION OF DATA FLOW.

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Figure 4-3. Data Flow Related to the Redirect Output to Copy Device
(COPYC) Command

4.7.4 Redirect Output and Copy Input (COPYI) Command

When the master device operator enters COPYInn (nn = the two-digit port number of the copy device), it causes data from the network to be sent to the copy device, but not to the master device (see figure 4-4). Data from the master device is sent to the network and is copied to the copy device. Data from the copy device is always ignored.

NOTE:
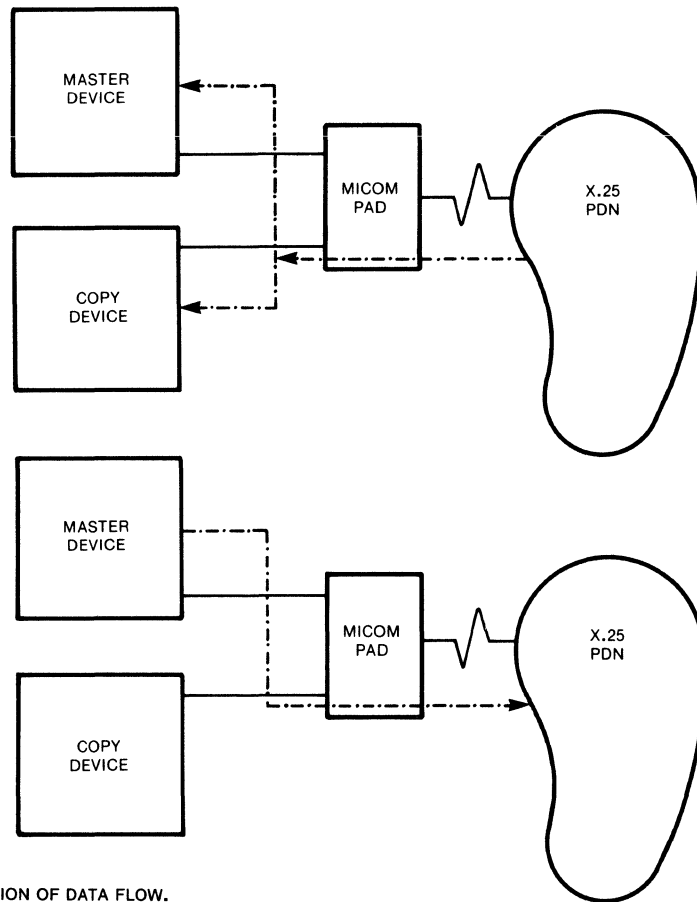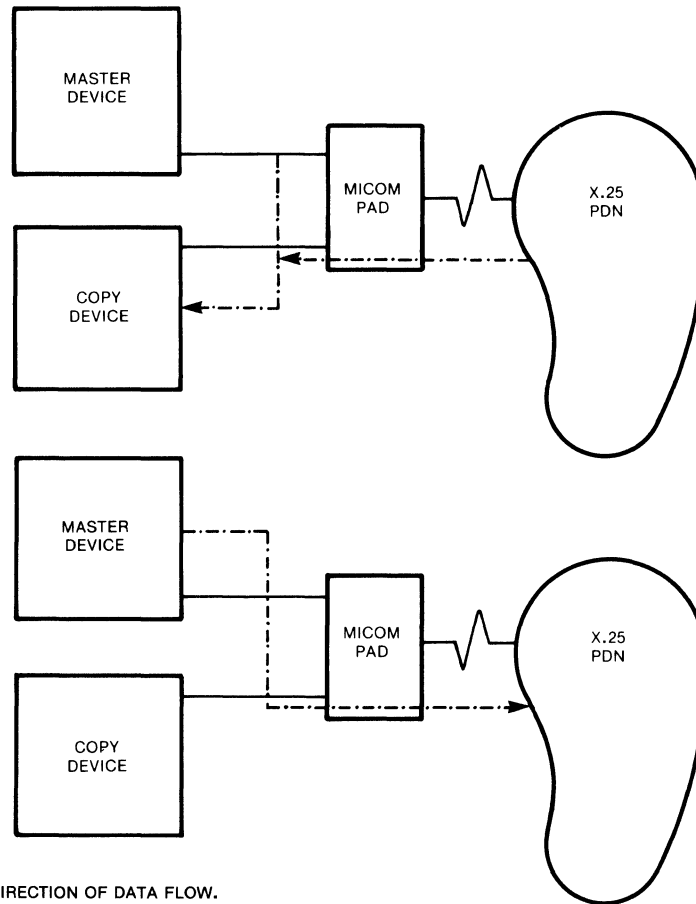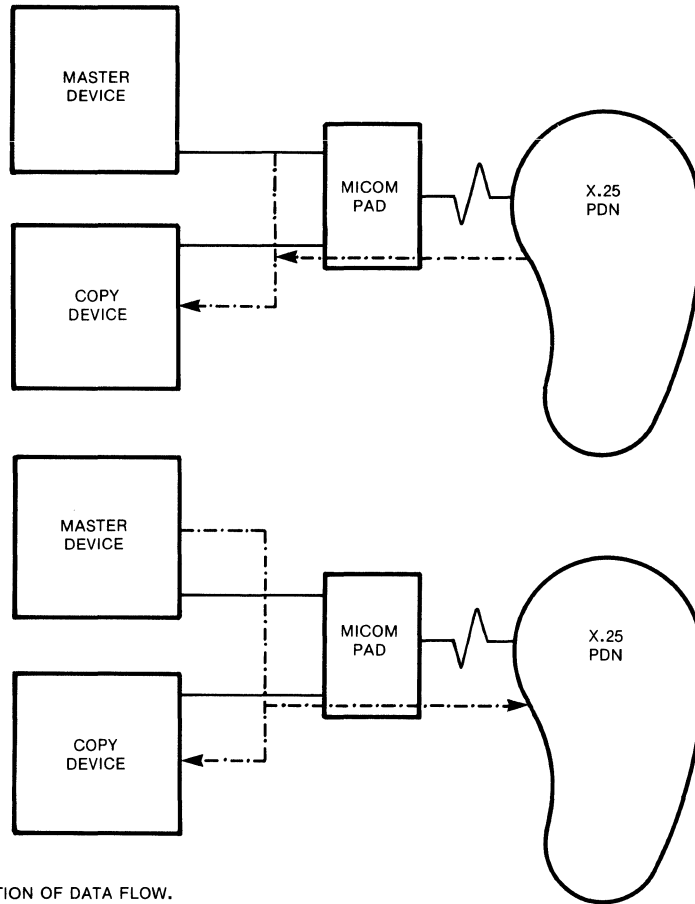ARROWS INDICATE DIRECTION OF DATA FLOW.

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Figure 4-4. Data Flow Related to the Redirect Output and Copy Input
(COPYI) Command

4.7.5 Terminate Local Copy (KCOPY) Command

The master device must be in the X.28 mode (refer to paragraph 4.5) to allow the entry of the Terminate Local Copy Command. When the master device operator enters KCOPY, it causes the local copy relationship to be terminated. Following entry of KCOPY, a message is sent to the copy device, signaling termination.

4.7.6 General Information and Guidelines

The following list summarizes special conditions that you should be aware of when using the PAD's local copy capability.

* Any data entered at the copy device is lost following the initiation of a Local Copy Command.

* Data from the copy device is always ignored (that is, echo is suppressed, and data is not forwarded). The exception is XON/XOFF characters which are recognized from the copy device, causing output to the copy device to be resumed or suspended (of course, this exception applies only to channels that are configured for XON/XOFF flow control, described in paragraph 3.2.8.2).

* A call cannot be transferred to a device that is already engaged in a local copy function. KCOPY must be entered at the master device, before the target device can receive a transferred call (refer to paragraph 4.8 for information on the call transfer capability).

* In most cases, the relationship of the master device to the copy device is independent of the master device's logical connect status. However, if the master device connects and then clears, controls may be dropped and the master device may be reinitiated (depending on how the master device's channel is configured, as described in paragraph 3.3). If controls are dropped and the master device is reinitiated, the Local Copy relationship is terminated.

* X.29 commands and responses are not copied (refer to paragraph 3.8). If an X.29 command is issued while the COPYC Command is active, responses to the X.29 commands are only output to the master device (not to the copy device).

4.8 CALL TRANSFER

The call transfer capability allows a call to be transferred from one device (source) to another device (target) that is connected to the same PAD. As shown in figure 4-5, a typical call transfer application includes the following steps:

1. The source device user places a call to a host computer.

2. After receiving a com service signal, the source device user enters the X.28 recall character (refer to paragraph 5.5.3, Parameter 1).

3. From the X.28 mode, the source device user enters the Call Transfer Command in the format:

   XFERnn

   where nn represents the two-digit port number of the target device.

4. The PAD transfers the call to the user-specified target device, leaving the source device free to place another call.

As shown in figure 4-5, the call transfer capability offers two major advantages:

* After a source device transfers a call, it is free to perform other applications.

* A target device that cannot place a call on its own (for example, a printer), can receive information. That is, a source device connected to the PAD can transfer information to a receive-only target device.

The following requirements must be met prior to entering the XFERnn Command:

* The source device must be engaged in a call, and must be in the X.28 mode (refer to paragraph 4.5). (These requirements were met in steps 1 and 2.)

* The target device must be in a ready and free state.

After the XFERnn Command is entered, some of the profile parameters set for the source device are copied to the target device. The profile parameters that do NOT get copied are: 5, 6, 11, 12, 13, 19, 100, 101, and 105 (see table 3-1 for descriptions of these parameters).

After the profile parameters are copied, the source device is reinitialized, and its profile parameters are restored. The call at the source device is transferred to device nn. Then the source device is logically disconnected and is free to place another call, or to perform another application.

BEFORE CALL TRANSFER

THE RECEIVE ONLY TARGET DEVICE HAS
NO WAY OF COMMUNICATING WITH THE
HOST.
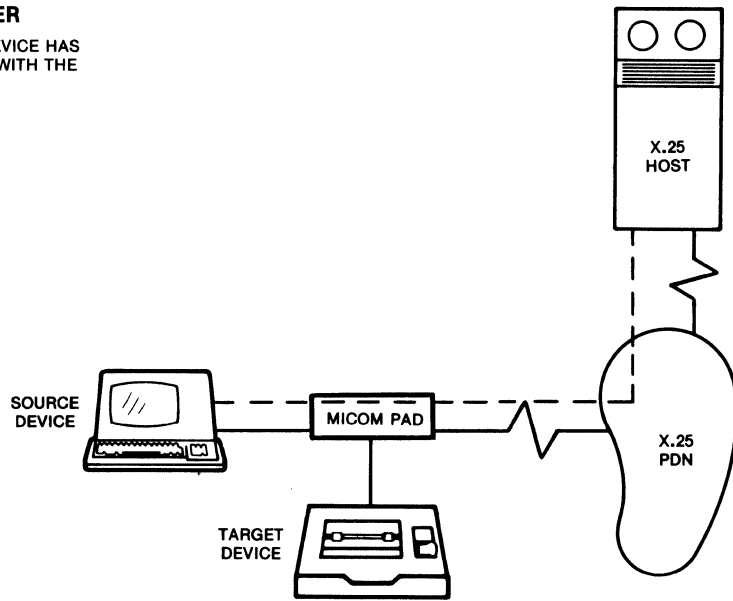
AFTER CALL TRANSFER

THE RECEIVE ONLY TARGET DEVICE CAN
NOW RECEIVE DATA FROM THE HOST.

THE SOURCE DEVICE IS FREE TO PER-
FORM OTHER APPLICATIONS.
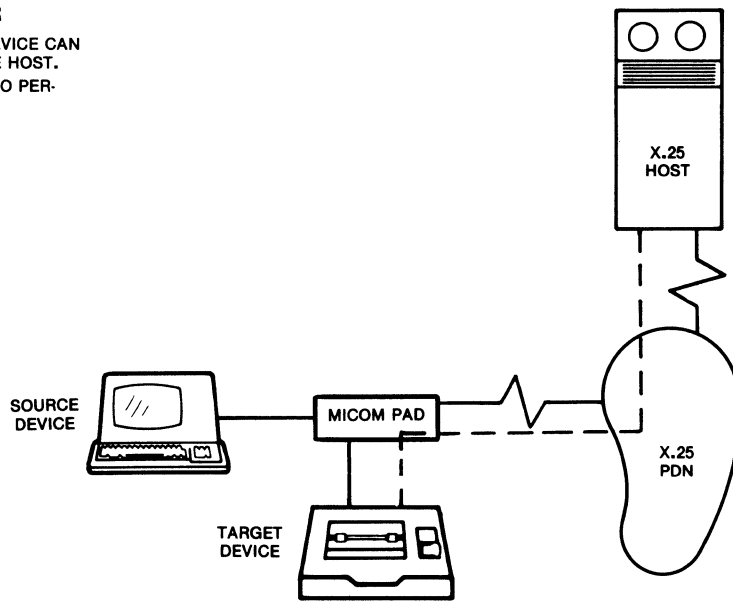
NOTE:
CONNECTIONS TO THE X.25 HOST ARE REPRESENTED BY BROKEN
LINES.

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Figure 4-5. Typical Call Transfer Application

General Information and Guidelines

The following list summarizes special conditions that you should be aware of when using the Call Transfer Command:

- Any data entered at the target device is discarded following the initiation of a Call Transfer Command.

- Any data output to the source device (as it initiates a Call Transfer Command) is discarded.

- A call cannot be transferred to any device that is engaged in a local copy function. The KCOPY Command (refer to paragraph 4.7.5) must be entered at the master device before the target device can receive a transferred call.

4.9 ERROR AND STATUS MESSAGES RELATED TO LOCAL COPY OR CALL TRANSFER

The messages listed in table 4-7 may be sent to the master or source device. Table 4-8 lists messages that may be sent to the copy or target device.

Table 4-7. Master or Source Device Messages

Message	Description
not ready	The copy device specified is not ready.
target busy	The copy device specified is already involved in a call.
copy active – must kill	The master device is already engaged in a local copy function.
done	A Local Copy or Call Transfer request has been initiated.
copy device down	The copy device is physically disconnected.
err – not connected	The source device that is requesting a call transfer is not logically connected.

Table 4-8. Copy or Target Device Messages

Message	Description
local copy active	The master device has been re-initialized.
local copy terminated	The master device has terminated the local copy function.
xfer:com	A call has been transferred to the target device.

SECTION 5

USING THE COMMAND FACILITY

5.1 PURPOSE OF THE COMMAND FACILITY

The Command Facility is a powerful, yet user friendly, software tool that is used to perform PAD administrative and management functions. These functions include the following:

- Configuration

    Selecting the right parameter values is essential to smooth and efficient operation of the PAD. In an effort to anticipate your requirements, MICOM ships a preconfigured PAD (for example, all channels will support dedicated connection and automatic speed and parity detection). If you need to customize your PAD in terms of its channel configurations, trunk parameters, or other preconfigured items, you use the Command Facility.

- Channel control and activity monitoring

    You can monitor and control access to the PAD's channels.

- Trunk status monitoring and control

    You can monitor and control access to the X.25 trunk.

- PAD performance statistics monitoring

    You can monitor the PAD, its channel activity, and its utilization.

- System initialization and CMOS diagnostics

    You can monitor the quality of the X.25 trunk, reset the PAD, and perform configuration memory diagnostics.

- Statistics collection

    You can initiate periodic reporting and can collect event and call accounting information.

This section first introduces you to PAD set-up procedures. It then informs you on how to access and logon to the Command Facility. Detailed step-by-step descriptions of each Command Facility function are also included in this section.

5.2 SETTING UP THE PAD

Before you try to establish any kind of communications with the PAD, review the following checklist to set up your PAD:

1. The power is ON.

2. PAD indicators show normal status, as described in tables 6-1 and 6-2. The CA indicator may be BLINKING, indicating that the configuration memory contains factory settings. If you have not connected your PAD to the PDN, the LD indicator will also be ON, indicating a trunk-down condition.

3. The soft switch selection settings reflect your requirements (see figures 2-10 through 2-12). For example, check the setting of the cold/warm start soft switch selection.

4. If you have reviewed the factory settings and found them acceptable, you may want to update the time and date using the Command Facility logon procedures (refer to paragraph 5.4). You may also have to configure the PAD's Network address (refer to paragraph 5.5.6).

5.3 ACCESSING THE COMMAND FACILITY

You may access the Command Facility locally at the PAD, or from anywhere in the Network. You use one of the following methods:

- Use a dedicated or dial-in connection to the PAD's dedicated Command Port.

- Place a local call from any of the PAD's channels.

- Place a virtual call to the PAD using the X.25 PDN.

5.3.1 Using the Dedicated Command Port

To access the PAD's Command Facility using the dedicated Command Port, you can use direct RS-232-C connections, private wire modems, or dial-in modems configured for auto-answer support. Perform the following procedures:

- Set your terminal to full-duplex and use a data transmission rate not greater than 9600 bps, 7 ASCII-coded bits per character, and any parity type.

- The factory-configured device profile assigned to the Command Port supports autobaud and autoparity recognition. Therefore, you are required to logon using the character sequence CR.CR (unless you have changed the profile).

- You will be greeted with the following Herald Message (unless it has been changed) and with an X.28 Service Prompt:

    mb3-x.25 async pad channel 0

    If this does not occur, enter BREAK and retry. You may now place a call (refer to paragraph 3.5.2) or access the Command Facility by entering <u>CR</u> twice.

- The PAD will prompt you for your password (MX25, unless it has been changed). Refer to paragraph 5.4.

- To disconnect, power-off your device or select item 12, Logout, from the Command Menu.

NOTE: You will not receive the Herald Message or be able to establish dialogue with the Command Port if the Command Facility is being accessed by a remote caller. You will also be disconnected from the Command Port if a remote caller establishes a connection with the Command Facility.

5.3.2   Using One of the PAD's Channels

You can access the PAD's Command Facility by placing a local call from any of the PAD's channels, as follows:

- Set Parameter 13 of your device profile to 4 (refer to paragraph 5.5.3).

- If the PAD configuration memory contains the factory settings, your Call Connect Request Command will be C 00/99. Otherwise, you have to use the PAD address and the Command Port subaddresses that have been configured.

- Your connection will be confirmed with a com service signal. Enter <u>CR</u>.

- The PAD will prompt for your password (MX25, unless it has been changed). Refer to paragraph 5.4.

- After successful connection to the Command Facility, you disconnect by clearing the call (enter clr).

5.3.3   Using the Network

You can place a call to the Command Facility from anywhere in the Network in the same way you place a call to any one of the PAD's channels. Access the Command Facility using the Network as follows:

- An important aspect to watch for is subaddressing. If the PAD contains factory settings, the subaddress will be 99.

- Set Parameter 13 of your device profile to 4 (refer to paragraph 5.5.3).
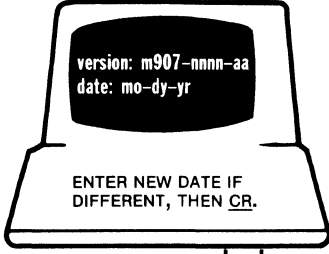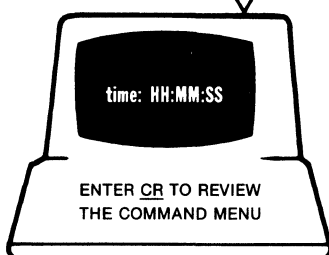
* Once your connection to the Command Facility is confirmed with a com or equivalent service signal, enter CR.

* The PAD will prompt you for your password (MX25, unless it has been changed). Refer to paragraph 5.4.

* After successful connection to the Command Facility, you disconnect by clearing the call (enter clr).

5.4 LOGGING ON TO THE COMMAND FACILITY

To logon to the Command Facility, you must have the key to the Command Facility — the password. You may also use this procedure to change the factory-set password. Following the password, the Command Facility will display the software version, the time, and the date.

NOTE: An additional security capability is provided when you make a plus sign (+) part of the password. To do this, you must place a remote call to the Command Facility. You cannot perform this function from the local Command Port.

Once a part of the password, the + disables local access to the Command Facility (that is, access through the local Command Port). Then, the Command Facility can only be accessed remotely.

PROMPT	SPECIAL INSTRUCTIONS	DEFINITION
password ENTER PASSWORD, THEN <u>CR</u> FS [1] = MX25	IF YOU WANT TO CHANGE PASSWORD, ANSWER PROMPT WITH OLD PASSWORD, SPACE, THEN NEW PASSWORD, THEN <u>CR</u>.	THE PASSWORD FIELD ALWAYS CONSISTS OF FOUR CHARACTERS. IF YOU ARE CONNECTED TO THE COMMAND PORT, YOU MAY PREVENT THE ACTUAL PASSWORD FROM BEING ECHOED. THIS IS DONE BY USING THE ECHO SUPPRESSION CHARACTER DEFINED IN YOUR DEVICE PROFILE.
version: m907-nnnn-aa **date: mo-dy-yr** ENTER NEW DATE IF DIFFERENT, THEN <u>CR</u>.	IF YOU WISH TO CHANGE THE DATE, ENTER NEW DATE IN THIS ORDER: MONTH-DAY-YEAR. BE SURE TO SEPARATE EACH ENTRY WITH A HYPHEN (OR MINUS) SIGN OR WITH A COLON.	THE VERSION IDENTIFIER M907-nnnn-aa REFERS TO THE OPERATING SOFTWARE. aa REFERS TO THE REVISION LEVEL OF SOFTWARE nnnn.
time: HH:MM:SS ENTER <u>CR</u> TO REVIEW THE COMMAND MENU	IF YOU WISH TO CHANGE TIME, ENTER NEW TIME IN THIS ORDER: HOURS:MINUTES:SECONDS.	THIS IS A 24-HR. CLOCK, SO 2 PM IS 14:00:00.

[1] FS = FACTORY SETTING

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5.4.1 Command Menu

Once you have logged on to the Command Facility (refer to paragraph 5.4) you will be presented with a Command Menu. The menu consists of clear descriptions of each of the available administrative functions (see figure 5-1). You can invoke any of the Command Facility management functions by making a selection.

Subsequent menus and data entry prompts guide you through the various PAD administrative functions. This approach greatly simplifies PAD configuration and management tasks, because you do not have to memorize special commands or complex syntax.

```
command menu

1.  configure
2.  busyout
3.  disconnect
4.  reenable
5.  trunk status
6.  trunk down
7.  trunk up
8.  list stats
9.  reset stats
10. reset pad
11. load cmos
12. logout

   select:
```
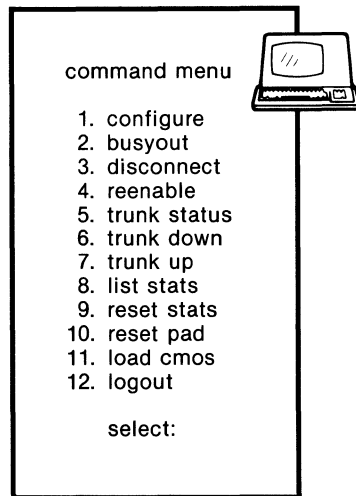
MI-1387-1a-46

Figure 5-1.   Command Menu

5.4.2 Selecting a Command Menu Command

To select a command from the Command Menu, key-in the associated number and CR. If you should make an error in your selection before keying CR, simply backspace and reenter the correct number. You can exit the Command Menu via selection 12. The next time you try to access the Command Facility, you will again be prompted for your password.

Figure 5-2 relates each command to different management functions. Paragraphs that follow figure 5-2 are organized in terms of these management functions, and are referenced in the figure.

Selection	Commands	Configuration 5.5	Channel Control 5.6	Trunk Monitoring and Control 5.7	Performance Statistics 5.8	Monitoring Channel Activity 5.8	System Initialization and Diagnostics 5.9	Call Accounting and Event Reporting 5.10	Exit 5.11
1	configure	•							
2	busyout		•						
3	disconnect		•						
4	reenable		•						
5	trunk status			•					
6	trunk down			•					
7	trunk up			•					
8	list stats				•	•			
9	reset stats				•				
10	reset pad	•[2]					•[3]		•
11	load cmos						•[3]		
12	logout[1]				•				•

[1] YOU MUST LOGOUT IN ORDER TO INITIATE THE PERIODIC OUTPUT OF THE STATISTICS REPORT. REFER TO PARAGRAPH 5.11.
[2] RESETTING THE PAD IS REQUIRED FOLLOWING ANY RECONFIGURATION OF THE TRUNK PARAMETERS (EXCEPT TRUNK PASSWORD).
[3] REFER TO SECTION 6 FOR OTHER TYPES OF DIAGNOSTIC TOOLS AVAILABLE.

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Figure 5-2. Commands and Functions

5.5 CONFIGURATION

As mentioned at the beginning of this section, you may have to change MICOM's preconfigured (default) values to meet your operating requirements. Parameters that you enter are stored in the PAD's nonvolatile configuration memory (CMOS) and then override the PAD's default operating parameters which are stored in the FEATUREPAK cartridge. However, be aware that the default parameters are copied from the FEATUREPAK cartridge back into CMOS:

- If you reset or power-on the PAD, with the cold/warm start selection ON (selection 4 of soft switch group SYS1).

- If the PAD resets itself upon detection of a checksum error or a battery-low condition.

Also be aware that the selections in the soft switch groups SYS1 and SYS2 are not preconfigured (that is, they have no defaults). This is because user requirements related to these selections are so diverse. Before you attempt to use your PAD, be sure that these selections are configured to meet your requirements.

Unlike the SYS1 and SYS2 soft switch groups, the SYS3 soft switch group comes preconfigured. All of its selections are preconfigured to OFF, to accommodate EIA control signal biasing requirements for most PADs.

NOTE: To configure selections in the soft switch groups, you can use the Touch Panel (refer to paragraph 2.4) or the Command Facility (refer to paragraph 5.5.18).

The format of the Configure Menu is shown in figure 5-3.


```
configure menu

 1. channel
 2. profile
 3. special echo
 4. remote par
 5. trunk
 6. svc/pvc
 7. address id
 8. cmdport
 9. herald
10. bulletin
11. prompt
12. stat period
13. host autobaud
14. xcc
15. system par
16. nui
17. soft switches

    select:____
```
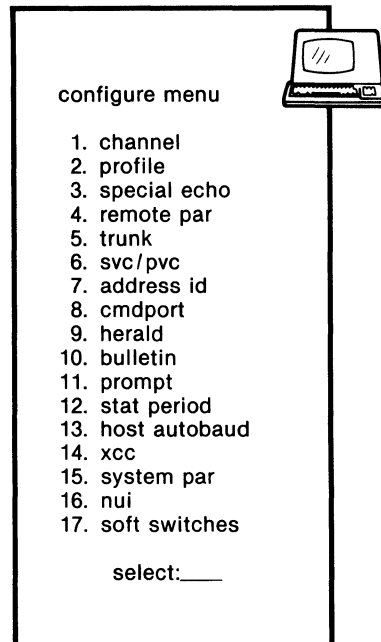
MI-1387-1a-06

Figure 5-3. Configure Menu

From the Configure Menu, you can perform the following PAD configuration functions:

• Configure asynchronous channels

• Define:

  - Device profiles

  - Special echo sequences

  - X.25 trunk parameters

  - Switched and Permanent Virtual Circuits (SVCs and PVCs)

  - Remote DTE IDs for auto and abbreviated calling

  - Command Port profile and Command Facility subaddress

  - Remote Parameter set up sequences

  - NUI (network user identification) and NUA (network user address) strings

- Compose messages for:

    - Herald Message
    - Bulletin Message
    - X.28 Service Prompt

- Set frequency of statistical reports

- Configure host autobaud sequence

- Enable or disable local channel-to-channel calls

- Disable remote terminal-activated channel tests (TACT)

- Configure NUI-NUA support

- Set software (soft) switches

- Set the EIA biasing for user channels

Also from the Configure Menu, you can configure a remote PAD to initiate a call to MICOM's XCC (X.25 Control Center).

5.5.1 Guidelines and Notational Conventions

Format of Configuration Procedure Descriptions

The configuration procedures are formatted as follows:

1. At the left of every page is a terminal showing each successive prompt. Immediately below, in the area of the keyboard, is an instruction. It tells you what the appropriate response is for each prompt. At the right side of the screen is added information, such as a range of possible entries or the number of a parameter in a given sequence.

2. In the center of each page, one of the following items is presented:

    - A graphic illustration of what the battery-backed CMOS memory contains relative to a given prompt

    - A special set of instructions

    - A table of options or standard selections that must be keyed into a table in memory

3. Finally, at the right of every page is a section labeled Definition. It contains a brief explanation of the purpose or function of each prompt, and, where applicable, a cross-reference to paragraphs.

Advancing Through the Prompts

You advance through a prompt sequence by keying CR after each response to a prompt. For any parameter that has a default value, you do not have to respond to the prompt, just press CR. This causes the next prompt to appear. When you have reached the final prompt of a completed sequence, you will see the completion prompt:

Done... the configuration menu will be displayed

Once you enter a prompt sequence, you must complete it; otherwise, the values you have entered will not be retained. For example, if you change a speed value in a device profile and then enter Ctrl-C, the configuration menu returns and the change is cancelled. You must enter the new value and respond to each prompt that follows in a given sequence until the message "done" is displayed.

Input Errors

There are two types of errors that will cause the message "error" to appear:

- Out-of-Range Error -- You have entered a character outside the range of possible values.

- Consistency Check Error -- You have entered a character that is logically inconsistent with some other character already entered. For example, you cannot select the same logical channel number for both an SVC and a PVC.

Notational Conventions

There are several time-saving notational conventions that are used in this section. If you make a note of these conventions, we will not have to repeat procedural steps that are used in each procedural description. They are as follows:

- The symbol for a user-entered carriage return is CR (for a carriage return that is transmitted without user entry, the symbol is a nonunderscored CR).

- Press CR after every entry or response to a prompt.

- Enter Ctrl-B and CR to go back to the previous data entry field.

- Press the backspace key or enter Ctrl-H to move the cursor left one position and delete the character at that position (Ctrl-H may be used, if your keyboard has no backspace key).

- Press CR if you accept the value currently displayed and simply want to continue to the next item.

- Enter Ctrl-Y in any of the following fields to clear the fields: Userdata (Selection 7), Herald (Selection 9), Bulletin (Selection 10), Prompt (Selection 11), or Autobaud Seq (Selection 13).

- Press CR if you want to exit from the Configure Menu.

- Enter Ctrl-C and CR when you want to exit a procedure and return to the menu from which you are working.

- Prompts that require alphanumeric entries are enclosed in brackets: [**]. They indicate parameter values now in effect.

- A prompt may include one or more *. This means that there is no value currently stored for a given parameter. The number of asterisks indicates the length of the field.

  Example:

      channel #: **

  This prompt asks you to enter the number of the asynchronous channel to be defined. The two asterisks indicate the number has not been entered. When it is entered, it can be up to two digits.

- Control characters are entered using the ^X format, where ^ is a caret character and X is the character required (for example, Ctrl-G, BEL, is entered as ^G).

- Enter ^M for CR (refer to paragraph 5.5.14 for an application).

Character Precedence

If the same character is defined for multiple functions during system configuration, the PAD uses the functional priorities listed below. It should be noted that, for implementation reasons, this priority scheme deviates from the CCITT Recommendation.

(highest priority)	1.	XON/XOFF characters (MICOM Parameters 103 and 104)
	2.	PAD recall character (X.3 Parameter 1)
	3.	Character delete character (X.3 Parameter 16)
	4.	Line delete character (X.3 Parameter 17)
	5.	Line display character (X.3 Parameter 18)
	6.	Special echo character (MICOM Parameter 110)
	7.	Echo suppression character (MICOM Parameter 109)
	8.	Break substitution character (MICOM Parameter 108)
	9.	X.29 access character (MICOM Parameter 117)
(lowest priority)	10.	Data forwarding character (X.3 Parameter 3)

5.5.2 Channel
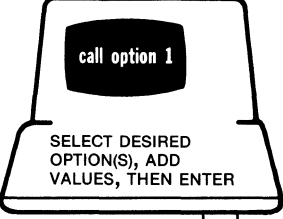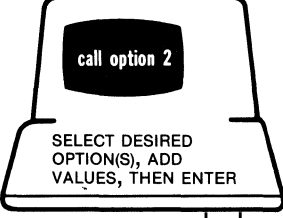
With this selection you can do several important things, one of which is to associate one of the 24 possible device profiles with each channel. The relationship, however, is not one-to-one; you can assign any number of channels to the same device profile. In a later step of channel definition, you can associate a set of device parameters that the PAD will automatically send to a calling device. This is typically done to make a terminal compatible with the host computer that it is calling. In addition, you can pick from among the various call and channel choices; these will define important characteristics about how your PAD handles inbound and outbound calls. And finally, you can set up a simple hierarchical scheme for addressing your channels by associating each channel with two class IDs.

SELECTION 1: CHANNEL

PROMPTS	CMOS	DEFINITION
channel # 1-16 — ENTER THE DESIRED CHANNEL NUMBER ID (1-16).	DEFINED CHANNELS 16 ... 1	THIS ENTRY DESIGNATES THE CHANNEL THAT YOU ARE NOW GOING TO CONFIGURE. THE POSSIBLE VALUES ARE 1 THROUGH 16.
profile 1-24 — ENTER THE PROFILE ASSOCIATED WITH THE CHANNEL.	24 ... 22 X.3 PARAMETERS + 20 MICOM PARAMETERS 1	EACH OF THESE 24 POSSIBLE DEVICE PROFILES INCLUDES 22 X.3 PARAMETERS, PLUS 20 MICOM-ENHANCED PARAMETERS. THEY ARE ASSIGNED TO THE ASYNCHRONOUS CHANNELS TO CONTROL THE OPERATION OF THE ATTACHED EQUIPMENT. ONLY ONE PROFILE CAN BE IN USE FOR ONE ASYNCHRONOUS CHANNEL AT A TIME. HOWEVER, ONE PROFILE COULD BE USED BY MANY CHANNELS WITHOUT RESTRICTION.

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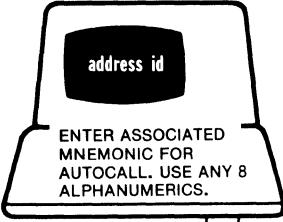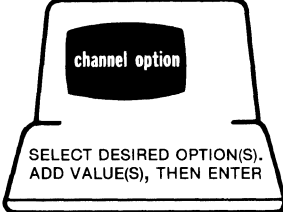| PROMPTS	CMOS		DEFINITION
	CALL #	OPTION	
call option 1	0	ENABLE INCOMING CALLS	ENABLES INCOMING CALLS PAR. 3.5.1
SELECT DESIRED OPTION(S), ADD VALUES, THEN ENTER	1	LONG FORM CALLS	RESTRICTS THIS CHANNEL TO LONG FORM CALLS PAR. 4.4.1
EXAMPLE: IF YOU DESIRE TO ENABLE BOTH LONG FORM AND ABBREVIATED CALLS, ADD 1+2 = 3. ENTER 3.	2	ABBREVIATED CALLS	PERMITS OUTGOING CALLS USING ABBREVIATED ADDRESSING PAR. 4.4.2
	4	AUTOCALL ON DEVICE READY	INITIATES CALL AUTOMATICALLY WHEN EIA AND AUTOBAUD COMPLETED. SEE ADDRESS ID PROMPT. PAR. 4.4.3
	8	AUTOCALL ON CR	INITIATES A CALL UPON DATA ACTIVITY SIGNALED BY A CR PAR. 4.4.3
	16	ALWAYS PASS CALL USER DATA	USED WHEN SERVICE SIGNALS ARE DISALLOWED PAR. 3.7.4.2
	32	INCOMING CALLS BARRED	ALLOWS OUTGOING CALLS ONLY. PAR. 3.5.1
	64	EXTENDED EIA CONTROLS	CONTROLS EIA SIGNALS AFTER A CALL CLEAR, IN CONJUNCTION WITH THE CHANNEL OPTION PROMPT PAR. 3.3.1
	128	CLEAR ON DATA LOSS	CLEARS SVC UPON DATA LOSS. PAR. 3.3.13
	XXX	ANY COMBINATION	
	CALL #	OPTION	
	0	NONE	
call option 2	1	RESERVED	
SELECT DESIRED OPTION(S), ADD VALUES, THEN ENTER	2	RESERVED	
EXAMPLE: IF YOU WANT TO AUTOMATICALLY APPEND THE REVERSE CHARGE FACILITY TO ALL CALLS AND ENABLE HPX SUPPORT, ADD 4 + 16 = 20. ENTER 20.	4	AUTOMATICALLY APPEND REVERSE CHARGE FACILITY	THE REVESE CHARGE FACILITY IS AUTOMATICALLY APPENDED TO EVERY OUTGOING CALL
	8	LEASED LINE EMULATION FOR PVCs	LEASED LINE EMULATION FOR A PVC ENABLES SPECIAL HAND-SHAKE SIGNALING WHEN THIS OPTION IS ENABLED, THE CHANNEL OPTION (BELOW) SHOULD BE SET TO 0. PAR. 3.9.4
	16	HPX SUPPORT	THE HPX OPTION PROVIDES SUPPORT FOR HEWLETT-PACKARD HP-3000 VIEW OR V/3000 SYSTEMS USING TYPE 26xx OR 2622A DISPLAY STATIONS OPERATING WITH TERMINAL TYPE 10. WHEN THE HPX OPTION IS ENABLED, THE PAD EMULATES THE HEWLETT-PACKARD ENQ/ACK PROTOCOL FOR THE CHANNEL.
	XX	ANY COMBINATION	

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SELECTION 1: CHANNEL (continued)
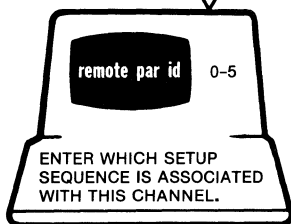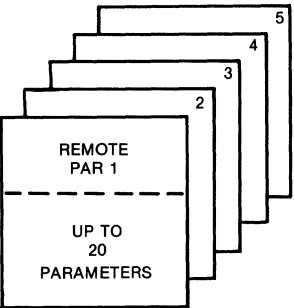
PROMPTS	CMOS	DEFINITION

| | ENTER ANY EIGHT ALPHANUMERIC CHARACTERS.
THE CHARACTERS ENTERED MUST BE DEFINED AS A MNEMONIC WITH SELECTION 7. | THE MNEMONIC ENTERED HERE IS USED TO RETRIEVE THE INFORMATION NEEDED TO MAKE AN AUTOMATIC CALL ON BEHALF OF THE DEVICE.

SKIP THIS ENTRY IF CHANNEL IS NOT AUTOCALL.

PAR. 3.5.3.3 |

address id

ENTER ASSOCIATED MNEMONIC FOR AUTOCALL. USE ANY 8 ALPHANUMERICS.

EXAMPLE: ENTER ADDRESS ID CALLALAN.
THE ADDRESS ASSOCIATED WITH THE MNEMONIC CALLALAN WILL BE DEFINED WITH SELECTION 7.

channel option

SELECT DESIRED OPTION(S). ADD VALUE(S), THEN ENTER

EXAMPLE: IF YOU WANT OPTIONS 1 AND 32, THEN ADD 1 + 32 = 33. ENTER 33.

OPTION #	CONNECTION TYPE	
0	DEDICATED OR DEDICATED WITH EXTENDED EIA CONTROLS ENABLED [1]	PAR. 3.3.5
1	AUTO ANSWER	PAR. 3.3.6
2	RING-OUT OR RING-OUT WITH EXTENDED EIA CONTROLS ENABLED [1]	PAR. 3.3.7
3	AUTO ANSWER	PAR. 3.3.6
4	RING-OUT (WITH SECURITY) OR RAISE DCD (WITH SECURITY) [1]	PAR. 3.3.7.2 PAR. 3.3.7.3
6	RAISE DCD	PAR. 3.3.7.3
8	HOST PORT	TABLE 3-2, PAR. 3.6.5
16	PRIORITY CHANNEL	PAR. 3.3.9
32	ENABLE CALL ACCOUNTING	PAR. 5.10
64	DISABLE X.28 EXTENDED MODE	PAR. 3.7
128	Micro600 LINE INTERFACE OPTION	APPLICABLE WHEN ATTACHED TO A MICOM Micro600 PORT SELECTOR
XXX	COMBINATION [2]	

[1] CALL OPTION 1 VALUE 64, EXTENDED EIA CONTROLS, MUST BE USED WITH THIS CONNECTION TYPE.
[2] OPTION NUMBERS 0 THROUGH 6 CANNOT BE COMBINED WITH EACH OTHER. OPTIONS 8 THROUGH 128 CAN BE COMBINED WITH EACH OTHER, OR WITH ONE OF THE 0 THROUGH 6 OPTIONS.

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PROMPTS	CMOS	DEFINITION
class 1 ENTER DESIRED CLASS/ROTARY ID FOR SUBADDRESS SELECTION.	00-99 POSSIBLE ASSIGNMENTS	WHILE NETWORK ADDRESSES SPECIFY A GIVEN PAD, THE CLASS NUMBER ALLOWS YOU TO SPECIFY ONE OR MORE OF THE PAD'S CHANNELS. PAR. 3.4.4.2
class 2 ENTER 2ND DESIRED CLASS/ROTARY ID FOR SUBADDRESS SELECTION.	00-99 POSSIBLE ASSIGNMENTS	THE ADDITION OF CLASS 2 GIVES YOU A SECONDARY MECHANISM TO ADDRESS THE CHANNEL. PAR. 3.4.4.2
remote par id 0-5 ENTER WHICH SETUP SEQUENCE IS ASSOCIATED WITH THIS CHANNEL. ENTER 0 IF NONE IS REQUIRED.	5 4 3 2 REMOTE PAR 1 - - - - - UP TO 20 PARAMETERS	YOU CAN ASSOCIATE ONE OF FIVE REMOTE PARAMETER SETUP SEQUENCES WITH THE CHANNEL YOU ARE NOW DEFINING. PAR. 3.8.4.1

DONE . . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

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5.5.3 Profile
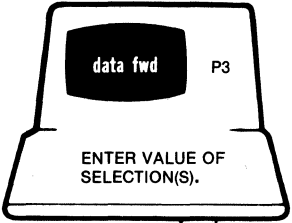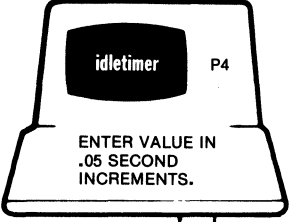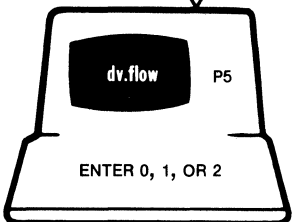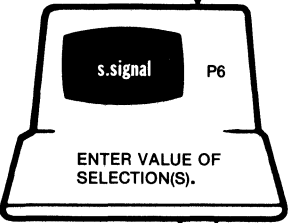
With this procedure, you can define 24 unique device profiles. Each profile contains all 22 parameters defined in CCITT Recommendation X.3 and an additional 20 MICOM-enhanced parameters. By assigning a device profile to a channel, you adapt the channel to the different equipment you may want to connect.

SELECTION 2: PROFILE

PROMPTS	CMOS	DEFINITION
profile 1-24 ENTER A DEVICE PROFILE NUMBER.	22 X.3 PARAMETERS — — — — — — — 20 MICOM-ENHANCED PARAMETERS 24 1 SELECT A PROFILE	YOUR PROFILE SELECTION HERE TELLS THE SYSTEM WHICH OF 24 PROFILES YOU ARE NOW ABOUT TO CONFIGURE. TO HELP YOU DEFINE THE DIFFERENT PARAMETERS, WE HAVE PROVIDED YOU WITH AN ASCII TABLE IN APPENDIX C.
x28acc * P1 ENTER A VALUE FROM 0-126.	0 = NOT POSSIBLE 1 = POSSIBLE BY CHARACTER DLE (CTRL-P) OR . . . 2-126 = DECIMAL VALUE OF ASCII CHARACTER USED TO ACCESS THE X.28 MODE	**PAD RECALL CHARACTER** USING PARAMETER 1, YOU CAN EITHER ALLOW OR DENY X.28 MODE ACCESS VIA AN ASCII CHARACTER. PAR. 3.7.2
echo P2 ENTER 0 OR 1.	0 = DISABLE ECHO 1 = ENABLE ECHO	**ECHO ENABLE** PARAMETER 2 CONTROLS WHETHER OR NOT THE PAD SHOULD ECHO THE RECEIVED CHARACTERS. PAR. 3.2.3.1

NOTE:
   THE * IS USED THROUGHOUT THIS SELECTION TO INDICATE THE PARAMETERS WHICH MUST NOT BE ASSIGNED THE SAME VALUE. THIS ASTERISK DOES NOT, HOWEVER, APPEAR ON THE SCREEN.
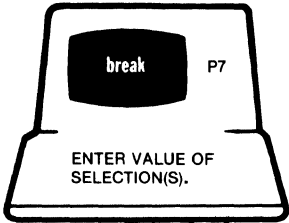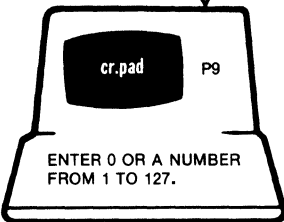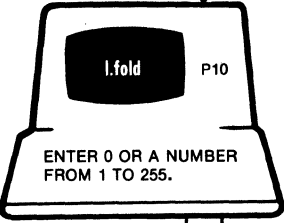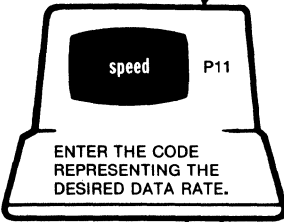
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SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
data fwd P3 ENTER VALUE OF SELECTION(S).	0 = NO DATA FORWARDING [1] 1 = ALPHANUMERIC CHARACTERS 2 = <u>CR</u> 4 = ESC, BEL, ENQ, OR ACK 8 = DEL, CAN, OR DC2 16 = EOT OR ETX 32 = HT, LF, VT, OR FF 64 = OTHER CHARACTERS IN COLUMNS 0 AND 1 OF THE ASCII CHART NOT INCLUDED ABOVE XXX = ANY COMBINATION OF ABOVE VALUES.	**DATA FORWARDING CHARACTERS** PARAMETER 3 DEFINES THE CHARACTER(S) THAT WILL CAUSE A PACKET TO BE SENT. PAR. 3.2.10
idletimer P4 ENTER VALUE IN .05 SECOND INCREMENTS.	0 = IDLETIMER DISABLED 1-255 = INACTIVITY PERIOD MULTIPLIED BY 50 MS (IF PARAMETER 119, TELEX SUPPORT, IS DISABLED) MAXIMUM PERIOD = 12.75 SECONDS = INACTIVITY PERIOD MULTIPLIED BY 200 MS (IF PARAMETER 119 IS ENABLED) MAXIMUM PERIOD = 51 SECONDS	**IDLETIMER** PARAMETER 4 CAUSES FORWARDING UPON EXPIRY OF AN IDLETIMER, UNLESS PARAMETER 15, EDIT, IS ENABLED. PARS. 3.2.4.2, 3.2.6.1, AND 3.2.10
dv.flow P5 ENTER 0, 1, OR 2	0 = PAD DOES NOT USE XON/XOFF FLOW CONTROL 1 = PAD USES XON/XOFF FLOW CONTROL IN DATA TRANSFER MODE ONLY 2 = PAD USES XON/XOFF FLOW CONTROL IN BOTH DATA TRANSFER MODE AND COMMAND MODE	**DEVICE FLOW CONTROL** PARAMETER 5 DETERMINES WHETHER OR NOT THE PAD USES XON/XOFF FLOW CONTROL FOR THE ATTACHED DEVICE, AND IN WHICH MODES. PAR. 3.2.8.2
s.signal P6 ENTER VALUE OF SELECTION(S).	0 = NO PAD MESSAGES OR SERVICE PROMPT 1 = PAD OUTPUTS MESSAGES ONLY 4 = PAD OUTPUTS SERVICE PROMPTS ONLY 5 = PAD OUTPUTS PROMPTS AND MESSAGES	**SERVICE SIGNAL CONTROL** PARAMETER 6 ALLOWS YOU TO TURN OFF PAD MESSAGES AND/OR PAD SERVICE PROMPTS. PARS. 3.2.6.3, 3.3.14, AND 3.7.4.2
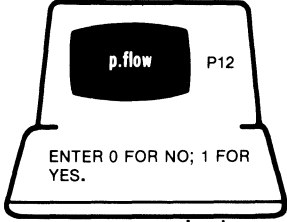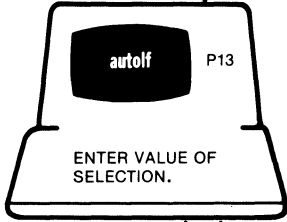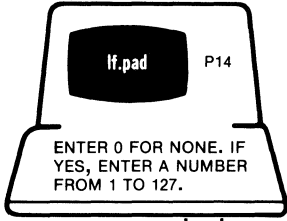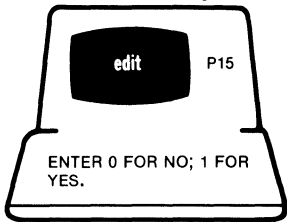
[1] DATA WILL STILL BE FORWARDED UPON DETECTION OF A <u>CR</u>, UNLESS YOU ALSO SET PARAMETER 15 EQUAL TO 0 (EDITING DISABLED).

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PROMPTS	CMOS	DEFINITION
break P7 ENTER VALUE OF SELECTION(S). 1	0 = NO ACTION 1 = INTERRUPT PACKET SENT 2 = RESET PACKET SENT 4 = INDICATION OF BREAK PAD MESSAGE 8 = ESCAPE TO X.28 MODE 16 = DISCARD OUTPUT TO DEVICE XX = SELECT ANY COMBINATION OF VALUES BY ADDING THEM.	**BREAK SIGNAL SUPPORT** PARAMETER 7 DETERMINES THE ACTION OF THE PAD UPON DETECTION OF A BREAK SIGNAL FROM THE DEVICE. PAR. 3.2.9
cr.pad P9 ENTER 0 OR A NUMBER FROM 1 TO 127.	0 = NONE 1-127 = NUMBER OF PADDING CHARACTERS AFTER CR	**CARRIAGE RETURN PADDING** PARAMETER 9 CAUSES THE PAD TO OUTPUT A SPECIFIED NUMBER OF NULL CHARACTERS FOLLOWING THE TRANSMISSION OF A CR TO THE DEVICE. PAR. 3.2.7.1
l.fold P10 ENTER 0 OR A NUMBER FROM 1 TO 255.	0 = NONE 1-255 = NUMBER OF CHARACTERS THAT TRIGGER LINEFOLDING	**LINE FOLDING** PARAMETER 10 ALLOWS YOU TO SELECT HOW MANY CHARACTERS WILL BE OUTPUT TO THE TERMINAL BEFORE THE PAD AUTOMATICALLY INSERTS A CR. PAR. 3.2.7.2
speed P11 ENTER THE CODE REPRESENTING THE DESIRED DATA RATE.	0 = 110 bps 1 = 134.5 bps 2 = 300 bps 3 = 1200 bps 4 = 600 bps 5 = 75 bps 6 = 150 bps 7 = 1800 bps 8 = 200 bps 9 = 100 bps 10 = 50 bps 11 = . . . 2 12 = 2400 bps 13 = 4800 bps 14 = 9600 bps 32 = AUTOBAUD (110-9600 bps, EXCEPT 134.5 bps)	**DATA RATE** PARAMETER 11 ALLOWS YOU TO SELECT THE CHANNEL DATA RATE. PAR. 3.2.2

1 PARAMETER 8 IS NONCONFIGURABLE.
2 SELECTION OF THIS VALUE, OR ANY VALUE NOT DEFINED ABOVE, WILL RESULT IN A PROFILE ERROR MESSAGE AT THE CONCLUSION OF THE DEVICE PROFILE CONFIGURATION.
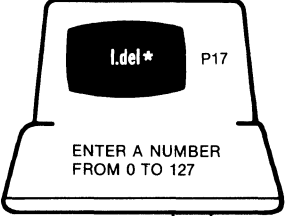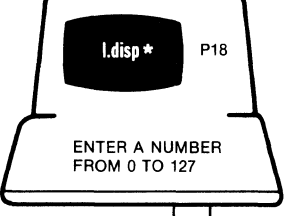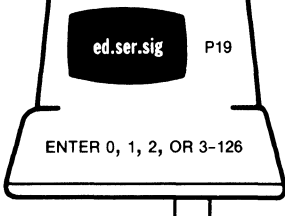
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PROMPTS	CMOS	DEFINITION
p.flow P12 ENTER 0 FOR NO; 1 FOR YES.	0 = DEVICE CANNOT EXERCISE FLOW CONTROL OVER PAD. 1 = DEVICE CAN EXERCISE FLOW CONTROL USING XON/XOFF CHARACTERS.	**PAD FLOW CONTROL** PARAMETER 12 DETERMINES WHETHER OR NOT THE TERMINAL USES XON/XOFF TO EXERCISE FLOW CONTROL OVER THE PAD. PAR. 3.2.8, PAR. 3.3.5.2, AND PAR. 3.3.6.3
autolf P13 ENTER VALUE OF SELECTION.	0 = NO LINE FEED INSERTION 1 = LF AFTER CR FROM REMOTE DTE 2 = LF AFTER CR SENT TO REMOTE DTE 3 = LF AFTER CR FROM OR TO REMOTE DTE 4 = LF AFTER CR WHEN ECHOING 5 = LF AFTER CR TO DEVICE WHEN ECHO OR REMOTE DTE SENDS CR 6 = PAD TRANSMITS LF WHEN ECHO-ING OR TRANSMITTING CR. 7 = PAD TRANSMITS LF AFTER ALL CRS	**LINE FEED INSERTION** PARAMETER 13 CAUSES THE PAD TO IN-SERT AN LF CHARACTER INTO THE DATA STREAM ON DETECTION OF CR. PAR. 3.2.7.3
lf.pad P14 ENTER 0 FOR NONE. IF YES, ENTER A NUMBER FROM 1 TO 127.	0 = NO LINE FEED PADDING 1-127 = NUMBER OF PADDING NULLS AFTER LINE FEED	**LINE FEED PADDING** PARAMETER 14 CAUSES THE PAD TO OUT-PUT A SPECIFIED NUMBER OF NULL CHARACTERS FOLLOWING THE TRANSMISSION OF AN LF TO THE DEVICE. PAR. 3.2.7.1
edit P15 ENTER 0 FOR NO; 1 FOR YES.	0 = NO EDITING 1 = EDITING ENABLED	**EDIT** PARAMETER 15 DENIES OR PERMITS THE USE OF EDITING CHARACTERS DEFINED BY PARAMETERS 16, 17, AND 18. PAR. 3.2.6

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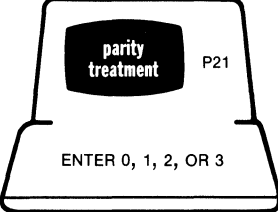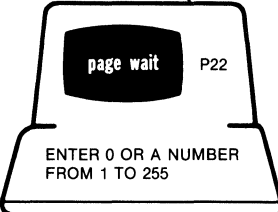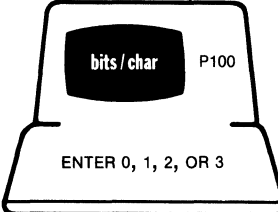
SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
c.del ★ P16 ENTER A NUMBER FROM 0 TO 127	0-127 = DECIMAL VALUE OF CHARACTER USED FOR CHARACTER DELETE	**CHARACTER DELETE** PARAMETER 16 SPECIFIES THE ASCII CHARACTER THAT THE DEVICE USES TO REQUEST A CHARACTER DELETION SERVICE.
l.del ★ P17 ENTER A NUMBER FROM 0 TO 127	0-127 = DECIMAL VALUE OF CHARACTER USED FOR LINE DELETE	**LINE DELETE** PARAMETER 17 SPECIFIES THE ASCII CHARACTER THAT THE DEVICE USES TO REQUEST A LINE DELETION SERVICE.
l.disp ★ P18 ENTER A NUMBER FROM 0 TO 127	0-127 = DECIMAL VALUE OF CHARACTER USED FOR LINE DISPLAY	**LINE DISPLAY** PARAMETER 18 SPECIFIES THE ASCII CHARACTER THAT THE DEVICE USES TO REQUEST THE PAD TO DISPLAY THE CURRENT INPUT.
ed.ser.sig P19 ENTER 0, 1, 2, OR 3-126	0 = NO EDITING SERVICE SIGNALS WILL BE SENT. 1 = THE CHARACTER \ WILL BE SENT FOR A CHARACTER DELETION. THE CHARACTERS XXX CR LF WILL BE SENT FOR A LINE DELETION. 2 = THE CHARACTERS BS SPACE BS WILL BE SENT FOR A CHARACTER DELETION. FOR A LINE DELETION, BS SPACE BS WILL BE SENT N TIMES, WHERE N EQUALS THE NUMBER OF CHARACTERS IN THE LINE. 3-126 = THE DEFINED ASCII CHARACTER WILL BE SENT FOR A CHARACTER DELETION. THE CHARACTERS XXX CR LF WILL BE SENT FOR A LINE DELETION.	**EDITING SERVICE SIGNALS** PARAMETER 19 SPECIFIES THE CHARACTER(S) TRANSMITTED AS EDITING SERVICE SIGNALS FOR CHARACTER DELETIONS AND FOR LINE DELETIONS. REFER TO PARAMETER 6. PAR. 3.2.6.3
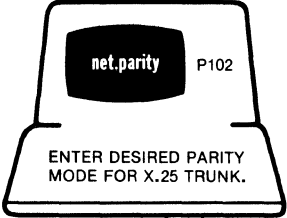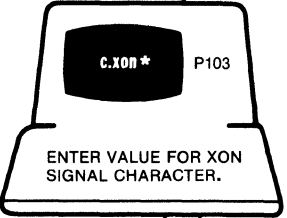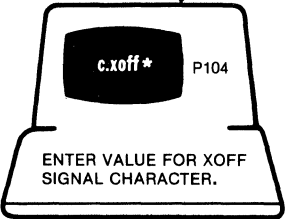
MI-1387-1a-12

PROMPTS	CMOS	DEFINITION
echomask P20 ENTER VALUE OF SELECTION(S).	0 = NO ECHOMASK (ALL CHARACTERS ARE ECHOED) 1 = NO ECHO OF CR 2 = NO ECHO OF LF 4 = NO ECHO OF VT, HT, OR FF 8 = NO ECHO OF BEL OR BS 16 = NO ECHO OF ESC OR ENQ 32 = NO ECHO OF ACK, NAK, STX, SOH, EOT, ETB, OR ETX 64 = NO ECHO OF THE EDITING CHARACTERS DEFINED BY PARAMETERS 16, 17, AND 18 128 = NO ECHO OF CHARACTERS WITH A DECIMAL VALUE OF 31 OR BELOW EXCEPT CR, LF, VT, HT, FF, BEL, BS, ESC, ENQ, ACK, NAK, STX, SOH, EOT, ETB, ETX, AND DEL XXX = ANY COMBINATION OF THE ABOVE VALUES	**ECHOMASK** WHEN PARAMETER 2, ECHO, IS ENABLED, PARAMETER 20 ALLOWS YOU TO MASK (SUPPRESS) THE ECHOING OF SELECTED CHARACTERS. PAR. 3.2.3.2
parity treatment P21 ENTER 0, 1, 2, OR 3	0 = DISABLE PARITY CHECKING; DISABLE PARITY GENERATION 1 = ENABLE PARITY CHECKING 2 = ENABLE PARITY GENERATION 3 = ENABLE PARITY CHECKING; ENABLE PARITY GENERATION	PARAMETER 21 WORKS IN COMBINATION WITH PARAMETER 101, DEVICE PARITY. WHEN PARAMETER 21 IS SET TO 0, PARAMETER 101 IS DISABLED. WHEN PARAMETER 21 IS SET TO 1, 2, OR 3, PARAMETER 101 SPECIFIES THE PARITY THAT IS CHECKED, GENERATED, OR BOTH. PAR. 3.2.1
page wait P22 ENTER 0 OR A NUMBER FROM 1 TO 255	0 = DISABLE PAGE WAITS 1-255 = THE NUMBER OF LINEFEEDS THE PAD WILL TRANSMIT BEFORE INITIATING A PAGE WAIT CONDITION	PARAMETER 22 ALLOWS YOU TO ENABLE PAD PAGE WAITS AND TO SPECIFY WHEN THEY WILL OCCUR. PAR. 3.2.14
bits / char P100 ENTER 0, 1, 2, OR 3	0 = 5 bits 1 = 6 bits 2 = 7 bits 3 = 8 bits	PARAMETER 100 DETERMINES THE NUMBER OF BITS PER CHARACTER, EXCLUDING THE PARITY BIT. PAR. 3.2.1
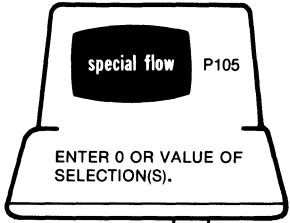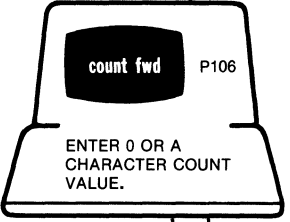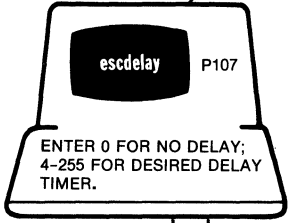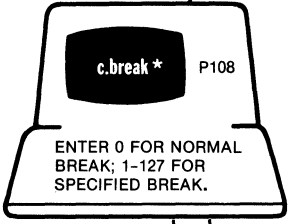
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PROMPTS	CMOS	DEFINITION
dv.parity P101 ENTER DESIRED PARITY MODE.	0 = TRANSPARENT PARITY 1 = SPACE 2 = MARK 3 = EVEN 4 = ODD 5 = AUTO PARITY AS DETERMINED BY AUTOBAUD SEQUENCE PAR. 3.2.1	PARAMETER 101 SPECIFIES THE PARITY THAT THE PAD USES IN COMMUNICATING WITH THE DEVICE. REFER TO PARAMETER 21.
net.parity P102 ENTER DESIRED PARITY MODE FOR X.25 TRUNK.	0 = PASS DATA AS RECEIVED 1 = SPACE 2 = MARK 3 = EVEN 4 = ODD PAR. 3.2.1.5	PARAMETER 102 SPECIFIES THE PARITY THAT THE PAD USES OVER THE X.25 TRUNK.
c.xon ★ P103 ENTER VALUE FOR XON SIGNAL CHARACTER.	0 = IGNORED 1-127 = DECIMAL VALUE OF ASCII CHARACTER FOR XON	PARAMETER 103 SPECIFIES THE CHARACTER VALUE TO BE USED FOR THE XON SIGNALING CHARACTER. REFER TO PARAMETERS 5 AND 12.
c.xoff ★ P104 ENTER VALUE FOR XOFF SIGNAL CHARACTER.	0 = IGNORED 1-127 = DECIMAL VALUE OF ASCII CHARACTER FOR XOFF	PARAMETER 104 SPECIFIES THE CHARACTER VALUE TO BE USED FOR THE XOFF SIGNALING CHARACTER. REFER TO PARAMETERS 5 AND 12.
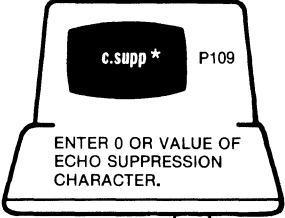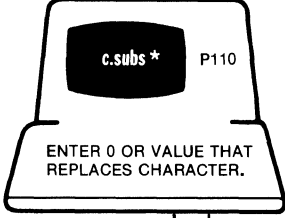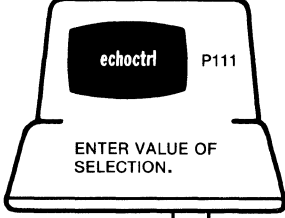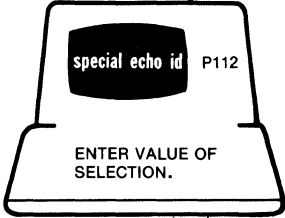
MI-1387-1a-19
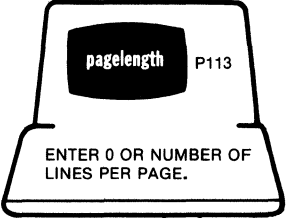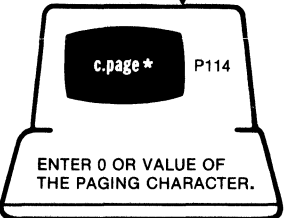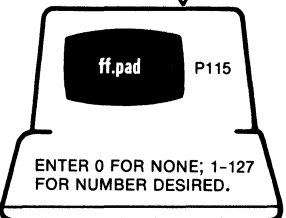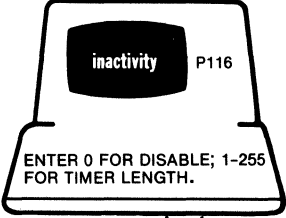
PROMPTS	CMOS	DEFINITION
special flow P105 ENTER 0 OR VALUE OF SELECTION(S).	0 = NONE 1 = DEVICE CAN FLOW CONTROL PAD WITH RTS. 2 = PAD CAN FLOW CONTROL DEVICE WITH CTS. 4 = PAD ISSUES BEL CHARACTER TO DEVICE IN CTS FLOW CONTROL X = ANY COMBINATION	PARAMETER 105 SPECIFIES WHETHER OR NOT THE ATTACHED TERMINAL CAN EXERCISE FLOW CONTROL USING REQUEST-TO-SEND OR WHETHER THE PAD CAN EXERCISE FLOW CONTROL OVER TERMINAL USING CLEAR-TO-SEND NOTE THAT PARAMETER 105 ALWAYS APPLIES TO BOTH DATA TRANSFER AND COMMAND MODES. PAR. 3.2.8.1
count fwd P106 ENTER 0 OR A CHARACTER COUNT VALUE.	0 = NO FORWARDING ON CHARACTER COUNT [1] 8-255 = NUMBER OF CHARACTERS THAT WILL TRIGGER DATA FORWARDING	PARAMETER 106 SPECIFIES FORWARDING ON A CHARACTER COUNT RATHER THAN ON A PACKET. IT IS IGNORED IF PARAMETER 15, EDIT, IS ENABLED. REFER TO SELECTION 5, PKTSIZE PROMPT. PAR. 3.1.8.3
escdelay P107 ENTER 0 FOR NO DELAY; 4-255 FOR DESIRED DELAY TIMER.	0 = NO SPECIAL HANDLING [2] 4-255 = THE FORWARDING DELAY TIME AFTER ESC INPUT, SELECTED IN .05 SECOND INCREMENTS	PARAMETER 107 ENABLES FORWARDING AN ESC SEQUENCE IN A SINGLE PACKET BY DELAYING THE FORWARDING OF AN ESC CHARACTER. PARS. 3.2.3.3 AND 3.2.10.2
c.break * P108 ENTER 0 FOR NORMAL BREAK; 1-127 FOR SPECIFIED BREAK.	0 = NORMAL BREAK SIGNAL 1-127 = DECIMAL VALUE OF AN ASCII CHARACTER TO BE INTERPRETED BY THE PAD AS A BREAK KEY	PARAMETER 108 ALLOWS YOU TO SIMULATE A BREAK SIGNAL USING A REGULAR CHARACTER KEY. PAR. 3.2.9.1

[1] ENTERING CHARACTER COUNT VALUES 1 THROUGH 7 IS NOT RECOMMENDED.
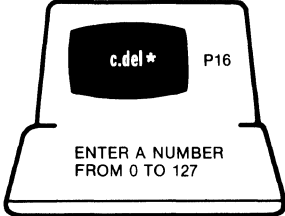[2] ENTERING CHARACTER COUNT VALUES 1 THROUGH 3 IS NOT RECOMMENDED.

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SELECTION 2: PROFILE (continued)
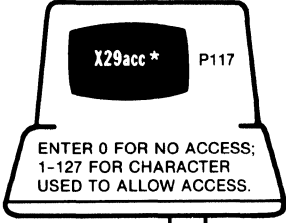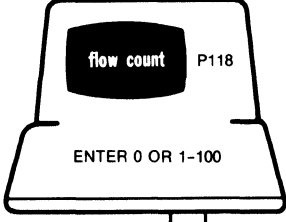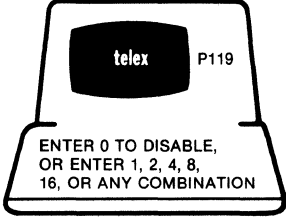
PROMPTS	CMOS	DEFINITION
c.supp ★ P109 ENTER 0 OR VALUE OF ECHO SUPPRESSION CHARACTER.	0 = DISABLE MECHANISM 1-127 = DECIMAL VALUE OF THE ASCII CHARACTER USED TO TRIGGER THE ECHO SUPPRESSING MECHANISM	PARAMETER 109 DEFINES THE CHARACTER THE DEVICE MAY USE FOR TEMPORARY ECHO SUPPRESSION. SEE PARAMETER 110. PAR. 3.2.3.4
c.subs ★ P110 ENTER 0 OR VALUE THAT REPLACES CHARACTER.	0 = NO CHARACTER IS ECHOED. 1-127 = DECIMAL VALUE OF ASCII CHARACTER USED FOR SUBSTITUTION CHARACTER	PARAMETER 110 DEFINES THE SUBSTITUTION CHARACTER USED IN ECHO SUPPRESSION. THIS CHARACTER WILL BE DISPLAYED IF IT IS NOT SUPPRESSED BY PARAMETER 20, ECHOMASK. PAR. 3.2.3.4
echoctrl P111 ENTER VALUE OF SELECTION.	0 = DEVICE INPUT PRIORITY	PAR. 3.2.4.2
	1 = NO PRIORITY	PAR. 3.2.4.3
	2 = COMPUTER OUTPUT PRIORITY	PAR. 3.2.4.1
	4 = SYNCHRONIZE LOCAL FIELD WITH INCOMING DATA FORMATTING SCREENS.	PAR. 3.2.5
	X = SELECTIVE COMBINATION	
special echo id P112 ENTER VALUE OF SELECTION.	0 = DISABLE 1-3 = ECHO SEQUENCE ID ASSOCIATED WITH THAT DEVICE PROFILE (REFER TO SELECTION 3, SPECIAL ECHO)	PARAMETER 112 ALLOWS, OR DISALLOWS, THE USE OF SPECIAL ECHO CHARACTERS. PAR. 3.2.3.5

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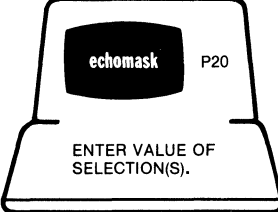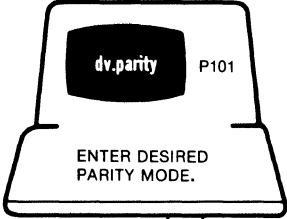| PROMPTS	CMOS	DEFINITION
pagelength P113 ENTER 0 OR NUMBER OF LINES PER PAGE.	0 = NO AUTOPAGE FEED 1-255 = NUMBER OF LINES PER PAGE	PARAMETER 113 DETERMINES THE NUMBER OF LINES PER PAGE FOR THE AUTOPAGING FUNCTION (REFER ALSO TO PARAMETER 114). PAR. 3.2.7.4
c.page * P114 ENTER 0 OR VALUE OF THE PAGING CHARACTER.	0 = IGNORED 1-127 = DECIMAL VALUE OF THE CHARACTER TO TRIGGER THE PAGE FUNCTION	PARAMETER 114 DETERMINES THE PSEUDO "FORM FEED" CHARACTER WHICH TRIGGERS THE PAGING. PAR. 3.2.7.4
ff.pad P115 ENTER 0 FOR NONE; 1-127 FOR NUMBER DESIRED.	0 = NO FORM FEED PADDING 1-127 = NUMBER OF PADDING NULLS THAT FOLLOW A FORM FEED CHARACTER	FF PADDING CAUSES THE PAD TO OUTPUT A SPECIFIED NUMBER OF NULL CHARACTERS FOLLOWING THE TRANSMISSION OF AN FF CHARACTER TO THE DEVICE. PAR. 3.2.7.1
inactivity P116 ENTER 0 FOR DISABLE; 1-255 FOR TIMER LENGTH.	0 = NO DISCONNECTION ON INACTIVITY 1-255 = TIMER VALUE IN 1 MINUTE INCREMENTS	PARAMETER 116 CAUSES THE PAD TO CLEAR A CALL BASED ON AN INACTIVITY PERIOD. PAR. 3.2.13

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SELECTION 2: PROFILE (continued)
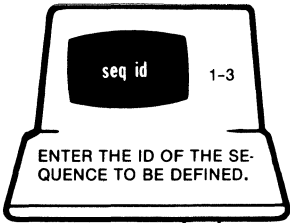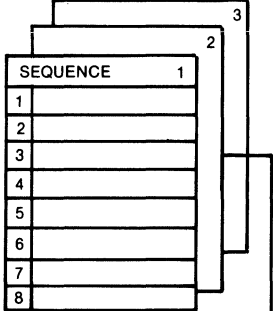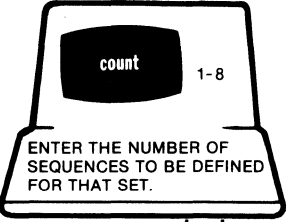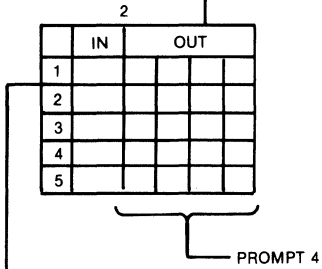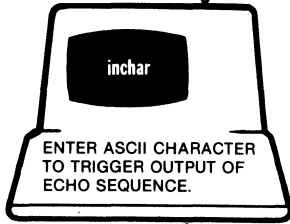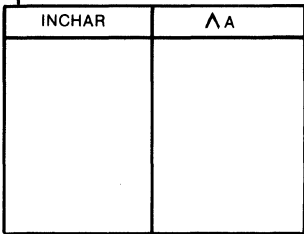
PROMPTS	CMOS	DEFINITION
X29acc * P117 ENTER 0 FOR NO ACCESS; 1-127 FOR CHARACTER USED TO ALLOW ACCESS.	0 = X.29 ACCESS DISALLOWED 1-127 = DECIMAL VALUE OF ASCII CHARACTER TO ENABLE X.29 ACCESS	PARAMETER 117 SPECIFIES THE CHARACTER ENABLING ENTRY OF X.29 COMMANDS. PAR. 3.8.4.2
flow count P118 ENTER 0 OR 1-100	0 = NORMAL BUFFER ALLOCATION 1-100 = EACH CHANNEL WILL BE ALLOWED THE ENTERED NUMBER OF PHYSICAL BUFFERS IF TOTAL BUFFER UTILIZATION IS 50 PERCENT OR LESS. IF TOTAL BUFFER UTILIZATION IS OVER 50 PERCENT, EACH CHANNEL WILL BE ALLOWED EITHER THE ENTERED NUMBER OF BUFFERS, OR SEVEN BUFFERS — WHICHEVER IS LESS.	PARAMETER 118 ENABLES YOU TO OVERRIDE THE PAD's NORMAL BUFFER ALLOCATION. PAR. 3.2.15
telex P119 ENTER 0 TO DISABLE, OR ENTER 1, 2, 4, 8, 16, OR ANY COMBINATION	0 = DISABLE TELEX SUPPORT 1 = ENABLE TELEX SUPPORT (i.e., ENABLE BAUDOT-TO-ASCII AND ASCII-TO-BAUDOT CONVERSION) 2 = IF NO DATA ACTIVITY HAS OCCURRED FOR TEN SECONDS (NEITHER TRANSMIT NOR RECEIVE), THE PAD WILL SEND A LETTER SHIFT TO THE TERMINAL ONE SECOND BEFORE TRANSMITTING DATA, TO TURN THE MOTOR ON. 4 = THE STRING CR LF FIGS V EQUALS THE END-OF-MESSAGE, AND IS TRANSLATED AS AN ASCII ETX. 8 = FIGS H EQUALS THE END-OF-MESSAGE, AND IS TRANSLATED AS AN ASCII ETX. 16 = NNNN EQUALS THE END-OF-MESSAGE, AND IS TRANSLATED AS AN ASCII ETX. xx = ANY COMBINATION. FOR EXAMPLE, ENTER 19 (1 + 2 + 16) TO ENABLE TELEX SUPPORT, ENABLE THE MOTOR ON FUNCTION, AND USE NNNN AS THE END-OF-MESSAGE.	PARAMETER 119 ALLOWS YOU TO ENABLE AND CONFIGURE THE PAD's TELEX SUPPORT. APPENDIX E

DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

MI-1387-1a-18

5.5.4 Special Echo Sequences

With this procedure, you can define up to three sets of special echo sequences. Each set can contain eight sequences of one-to-four special echo characters. One associates these multi-echo sets with one or more device profiles (refer to paragraph 3.2.3.5, Parameter 112).
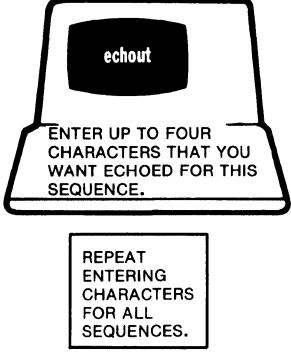
Special Echo is enabled only if profile Parameter 2 (Echo) is set to 1.

SELECTION 3: SPECIAL ECHO

PROMPTS	CMOS	DEFINITION
seq id 1-3 ENTER THE ID OF THE SE-QUENCE TO BE DEFINED.	EXAMPLE: 2 SEQUENCE 1 1 2 3 4 5 6 7 8	THE IDENTIFICATION NUMBER THAT YOU SELECT IS THE ONE USED IN PARAMETER 112 OF THE DEVICE PROFILE.
count 1-8 ENTER THE NUMBER OF SEQUENCES TO BE DEFINED FOR THAT SET.	EXAMPLE: SELECT FIVE SEQUENCES FOR SET 2. 2 IN OUT 1 2 3 4 5 PROMPT 4	THE COUNT NUMBER YOU SELECT TELLS THE PAD HOW MANY SEQUENCES WILL BE IN THIS SET. THE PAD WILL CON-TINUE TO ASK FOR INCHAR AND ECHOUT SEQUENCE UNTIL COUNT IS REACHED.
inchar ENTER ASCII CHARACTER TO TRIGGER OUTPUT OF ECHO SEQUENCE.	INCHAR ∧ A EXAMPLE: SOH[1] CHARACTER	INCHAR IS USED TO TRIGGER THE OUT-PUT OF THE ECHO SEQUENCE.

[1]REFER TO PARAGRAPH 5.5.1.

MI-1289-27

PROMPTS	CMOS	DEFINITION
echout ENTER UP TO FOUR CHARACTERS THAT YOU WANT ECHOED FOR THIS SEQUENCE. REPEAT ENTERING CHARACTERS FOR ALL SEQUENCES.	EXAMPLE: TO ECHO "A A CR LF" IN RESPONSE TO AN SOH CHARACTER INCHAR: ∧ A ECHOUT: A / A / ∧ M / ∧ J	WITH THIS SELECTION, YOU DEFINE THE CHARACTERS THAT WILL BE TRIGGERED BY INCHAR.
DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-21

5.5.5 Remote Parameters

With this selection, you can define up to five remote parameter setup sequences. Each can have up to 20 parameters. The PAD, upon call connection, will send these parameters to the caller using an X.29 message. The PAD, therefore, gives you the ability to adjust the parameters of any calling device (refer to paragraph 3.8.4.1).

Each of these setup sequences may be associated with a PAD channel (refer to the Remote Par Id Prompt in paragraph 5.5.2).
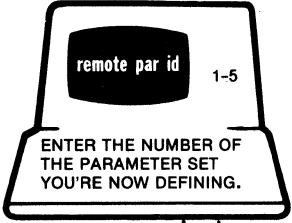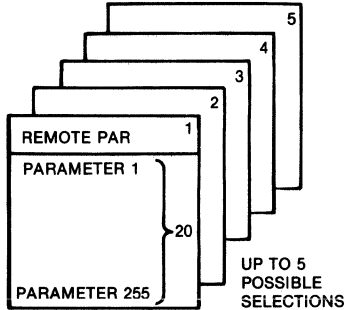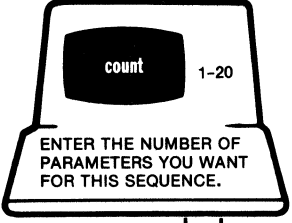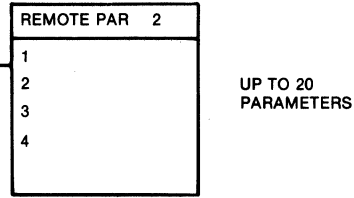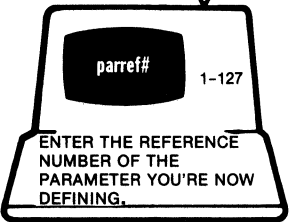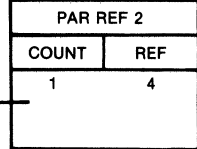
Entering a National Parameter Separator

If you want to enter MICOM-enhanced parameters as well as standard CCITT parameters, you must enter a National Parameter Separator between the two types of parameters (see table 3-1). When you use a National Parameter Separator, it affects the Count, Parref, and Parval Prompts of Selection 4.

In certain cases, the Count Prompt must be incremented by one to accommodate the National Parameter Separator. For example, to enter two CCITT parameters and two MICOM-enhanced parameters, you enter a Count value of five, not four. The third Parref-Parval pair is for the National Parameter Separator. This case is illustrated in the Parval section of the figure that follows.
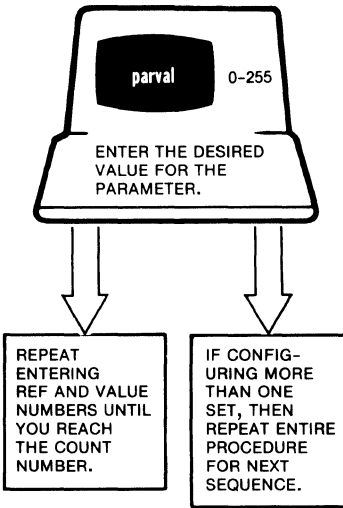
The total number of combined CCITT and MICOM-enhanced parameters cannot exceed 19. With a Count value equal to 20, this leaves one Parref-Parval pair for the National Parameter Separator.

SELECTION 4: REMOTE PAR

PROMPTS	CMOS	DEFINITION
remote par id 1-5 ENTER THE NUMBER OF THE PARAMETER SET YOU'RE NOW DEFINING.	EXAMPLE: REMOTE PARAMETER SEQUENCE 2 IS SELECTED. 5 4 3 2 REMOTE PAR 1 PARAMETER 1 20 PARAMETER 255 UP TO 5 POSSIBLE SELECTIONS	THE REMOTE PARAMETER IDENTIFICATION NUMBER TELLS THE PAD LOGIC WHICH OF THE FIVE POSSIBLE SETUP SEQUENCES YOU NOW WISH TO DEFINE. THIS IS THE ID USED FOR REMOTE PAR ID IN THE ASYNCHRONOUS CHANNEL CONFIGURATION.
count 1-20 ENTER THE NUMBER OF PARAMETERS YOU WANT FOR THIS SEQUENCE.	EXAMPLE: 4 PARAMETERS ARE SELECTED FOR REMOTE PAR 2. REMOTE PAR 2 1 2 3 4 UP TO 20 PARAMETERS	THE COUNT NUMBER ENTERED REFERS TO THE TOTAL NUMBER OF PARAMETERS TO BE AUTOMATICALLY SENT TO THE CALLING PAD. THUS, THIS NUMBER WILL DETERMINE HOW MANY PROMPTS WILL DISPLAY FOR THE REFERENCE NUMBER AND VALUE OF EACH PARAMETER.
parref# 1-127 ENTER THE REFERENCE NUMBER OF THE PARAMETER YOU'RE NOW DEFINING.	REFERENCE NUMBER ALLOWED = 1-127[1] EXAMPLE: PARAMETER REFERENCE NUMBER 4 IS SELECTED. PAR REF 2 | COUNT	REF
1	4		THE NUMBER REFERENCES THE PARAMETER OF THE REMOTE PAD. YOU SHOULD DEFINE THE NUMBERS IN ASCENDING ORDER.

[1] THE VALUES OF PARAMETERS 11, 100, 101, AND 117 CANNOT BE CHANGED (REFER TO PARAGRAPH 4.5.1).

MI-1387-1a-55

PROMPTS	CMOS	DEFINITION

PROMPTS:

parval   0-255
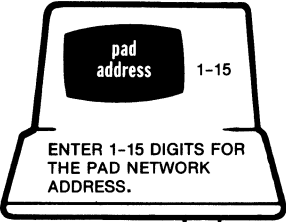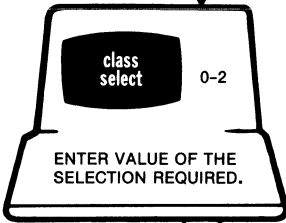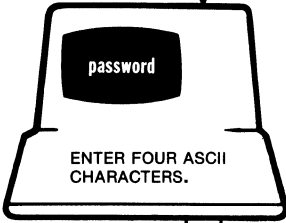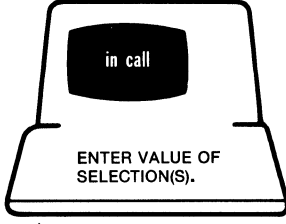
ENTER THE DESIRED VALUE FOR THE PARAMETER.

REPEAT ENTERING REF AND VALUE NUMBERS UNTIL YOU REACH THE COUNT NUMBER.

IF CONFIG-URING MORE THAN ONE SET, THEN REPEAT ENTIRE PROCEDURE FOR NEXT SEQUENCE.

CMOS:

EXAMPLE: THIS IS HOW A TABLE OF COUNT, PARREF, AND PARVAL MIGHT LOOK FOR ONE DEFINED SEQUENCE[1].

COUNT	PARREF	PARVAL
HOW MANY?	WHICH NUMBER?	WHAT VALUE?
5	4	5
	7	4
	0	0
	114	2
	116	1

VALUES ALLOWED = 0-255

DEFINITION:

THE PARAMETER VALUE (PARVAL) IS THE ACTUAL VALUE FOR EACH PARAMETER YOU HAVE SELECTED.

DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.
[1] A NATIONAL PARAMETER SEPARATOR, CONSISTING OF PARREF EQUAL TO ZERO AND PARVAL EQUAL TO ZERO MUST BE ENTERED BEFORE ENTERING THE FIRST MICOM-ENHANCED PARAMETER.

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5.5.6 Trunk
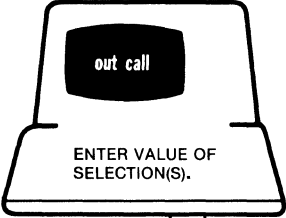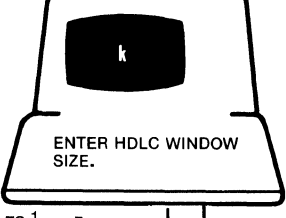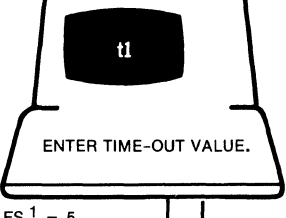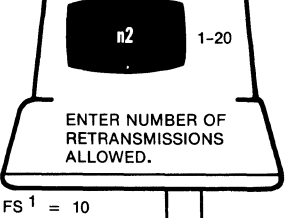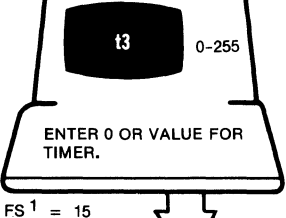
With this procedure, you can define the trunk parameters. This includes parameters at the link, frame, and packet levels. Besides these, you will select among various options affecting call establishment and NUI—NUA support.

SELECTION 5: TRUNK
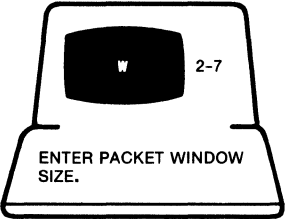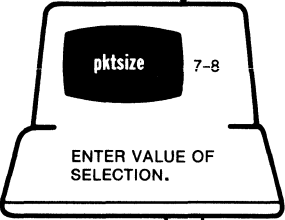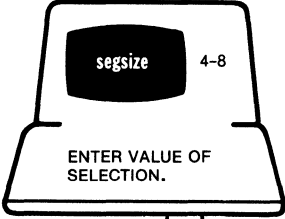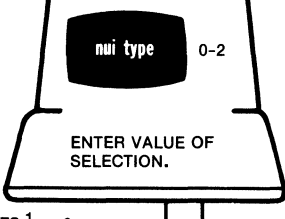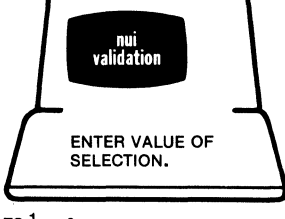
PROMPTS	CMOS	DEFINITION
pad address 1-15 ENTER 1-15 DIGITS FOR THE PAD NETWORK ADDRESS. FS¹ = 00		THIS IS THE PAD NETWORK ADDRESS. NUMBER USED FOR: — A CALLING ADDRESS: PAR. 3.4.5.1 — DETERMINING THE CLASS IN AN INCOMING CALL: PAR. 3.4.4.1 — DETERMINING A LOCAL VS REMOTE CALL: PAR. 3.5.4.1 — TACT DIAGNOSTICS CALLS: PAR. 3.5.4.4
class select 0-2 ENTER VALUE OF THE SELECTION REQUIRED. FS¹ = 1	0 = USE OF CALL USER DATA 1 = USE OF X.121 SUBADDRESS FIELD 2 = DISABLE CLASS SELECTION	THIS SELECTION DETERMINES THE WAY IN WHICH THE PAD LOOKS AT AN INCOMING CALL ADDRESS, TO DETERMINE PORT SELECTION. PAR. 3.4.4
password ENTER FOUR ASCII CHARACTERS. FS¹ = (NONE)	STORE FOUR ASCII CHARACTERS IN CMOS FOR PASSWORD.	THE TRUNK PASSWORD ALLOWS ONLY SELECTED USERS TO ADDRESS THE PAD. PAR. 3.1.9

PROMPTS	CMOS	DEFINITION
in call ENTER VALUE OF SELECTION(S). FS¹ = 0	0 = NO IN CALL OPTIONS ENABLED	THIS SELECTION DETERMINES HOW THE PAD HANDLES AN INCOMING CALL
	1 = ACCEPT REVERSE CHARGE	PAR. 3.6.2
	2 = TRUNK PASSWORD REQUIRED	PAR. 3.6.1
	4 = ACCEPT FAST SELECT	PAR. 3.6.2
	8 = ALLOW USE OF LGN = 0 LCN = 0	PAR. 3.1.3.2
	16 = RESTART IF INCOMING CALLS ARE ON UNDEFINED LOGICAL CHANNEL	PAR. 3.1.3.2
	XX = ANY COMBINATION	

¹ FS = FACTORY SETTING

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PROMPTS	CMOS	DEFINITION
out call — ENTER VALUE OF SELECTION(S). $FS^1 = 0$		THIS SELECTION DETERMINES THE CHARACTERISTICS OF THE CALL REQUEST AND CALL ACCEPT PACKET.
	0 = CALL PACKET WITH CALLING ADDRESS FIELD 1 = NO CALLING ADDRESS	PAR. 3.4.5.1
	2 = APPEND CHANNEL NUMBER TO CALLING ADDRESS	PAR. 3.4.5.2
	4 = 1980 CALL ACCEPT PACKET WITH OPTION FIELDS	USED FOR NETWORKS WHICH REQUIRE THE EXTENDED CALL ACCEPT PACKET.
	8 = ALL CALLS REVERSE CHARGE	PAR. 3.1.4.3
	16 = USE PACKET NEGOTIATION	PAR. 3.1.8
	32 = USE WINDOW NEGOTIATION	PAR. 3.1.8.2
	XX = ANY COMBINATION	
k — ENTER HDLC WINDOW SIZE. $FS^1 = 7$	$K = 1$ TO 15^2	PAR. 3.1.2
t1 — ENTER TIME-OUT VALUE. $FS^1 = 5$	T1 = 1 TO 15 SECONDS	PAR. 3.1.2
n2 1-20 — ENTER NUMBER OF RETRANSMISSIONS ALLOWED. $FS^1 = 10$	N2 = 1 TO 20 RETRIES	PAR. 3.1.2
t3 0-255 — ENTER 0 OR VALUE FOR TIMER. $FS^1 = 15$	0 = TRUNK ASSURANCE PROCEDURE IS DISABLED; THE PAD IS PASSIVE AND WILL NOT INITIATE AN SABM/UA SEQUENCE IF A SYSTEM RESET OCCURS. 1-255 = INACTIVITY PERIOD IN SECONDS, AFTER WHICH TRUNK ASSURANCE PROCEDURE WILL BEGIN. THE PAD IS ACTIVE AND WILL INITIATE AN SABM/UA SEQUENCE IF A SYSTEM RESET OCCURS.	MUST BE SET TO 0 OR TO A VALUE GREATER THAN PARAMETER T1. PARS. 3.1.2, 3.1.6.1, AND 3.1.7

[1] FS = FACTORY SETTING
[2] VALUES 8 THROUGH 15 ARE VALID ONLY IF THE PAD IS ENABLED FOR EXTENDED FRAME SEQUENCING (SOFT SWITCH GROUP SYS1, SELECTION 7).

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PROMPTS	CMOS	DEFINITION
w 2-7 — ENTER PACKET WINDOW SIZE. FS[1] = 2	W = 2 TO 7	PAR. 3.1.2
pktsize 7-8 — ENTER VALUE OF SELECTION. FS[1] = 7	7 = 128-BYTE PACKETS 8 = 256-BYTE PACKETS	PARS. 3.1.2 AND 3.1.5
segsize 4-8 — ENTER VALUE OF SELECTION. FS[1] = 6	4 = 16-BYTE SEGMENTS 5 = 32-BYTE SEGMENTS 6 = 64-BYTE SEGMENTS 7 = 128-BYTE SEGMENTS 8 = 256-BYTE SEGMENTS	PAR. 3.1.2
nui type 0-2 — ENTER VALUE OF SELECTION. FS[1] = 0	0 = NO NUI SUPPORT REQUIRED 1 = DCS VERSION OF NUI-NUA 2 = CHANNEL PASSWORD PROTECTION	PAR. 3.1.10
nui validation — ENTER VALUE OF SELECTION. FS[1] = 0	0 = DO NOT VALIDATE NUI 1 = VALIDATE NUI 2 = CLEAR CALL IF VALIDATION FAILS 4 = STRIP NUI FROM FACILITIES FIELD IF VALIDATION PASSES x = ANY COMBINATION OF 1, 2, AND 4	PAR. 3.1.10

DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

[1] FS = FACTORY SETTING

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5.5.7 Switched Virtual Circuit and Permanent Virtual Circuit

With this procedure, you can define the settings for the Logical Group Numbers (LGNs) and the Logical Channel Numbers (LCNs) (refer to paragraph 3.1.3). You can do this for each switched virtual circuit (SVC) and each permanent virtual circuit (PVC) selected. You may choose any mix of assignments so long as the sum does not exceed the number of asynchronous channels plus two (that is, a possibility of 18 for a 16-channel PAD).
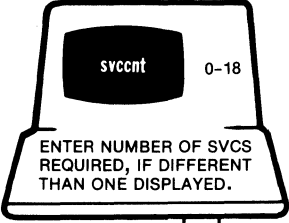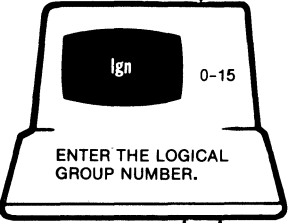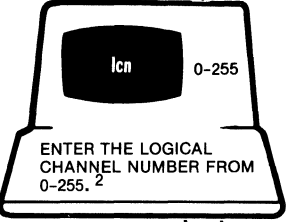
NOTE: If the combined total number of SVCs and PVCs is greater than 18, the PAD automatically assigns a value of 2 to the number of SVCs (see the Svccnt and Pvccnt Prompts in the figure that follows).

You may want to define more SVCs than channels:

* If you want to guarantee access to the Command Facility from the network while all channels are active.

* If your PAD is managed by MICOM's XCC (X.25 Control Center).
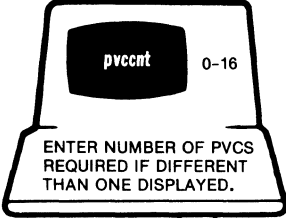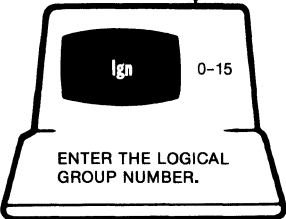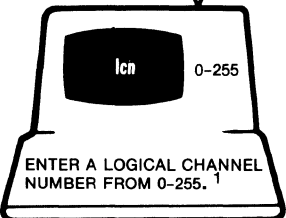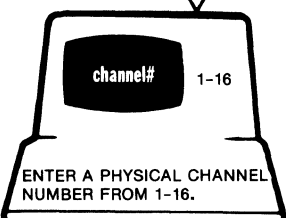
NOTE: Entering Ctrl-C and a CR before you respond to the Pvccnt Prompt cancels the previous input and causes re-display of the Configure Menu. After you respond to the Pvccnt Prompt, entering Ctrl-C and a CR causes the Configure Menu to be re-displayed but does NOT cancel the previous input.

SELECTION 6: SVC/PVC

PROMPTS	CMOS	DEFINITION
svccnt 0–18 ENTER NUMBER OF SVCS REQUIRED, IF DIFFERENT THAN ONE DISPLAYED. FS[1] = 18	VALUES = 0 TO N + 2 WHERE N = NUMBER OF CHANNELS	THIS SELECTION DETERMINES THE NUMBER OF TIMES BOTH THE LGN AND LCN PROMPTS WILL BE DISPLAYED. PAR. 3.1.3.2
lgn 0–15 ENTER THE LOGICAL GROUP NUMBER. FS[1] = AS PER CONFIGURATION SHEETS IN APPENDIX A	LGN = 0–15	THIS IS A PART OF THE SWITCHED VIRTUAL CIRCUIT IDENTIFICATION. ITS VALUE MUST BE COMPATIBLE WITH YOUR NETWORK.
lcn 0–255 ENTER THE LOGICAL CHANNEL NUMBER FROM 0–255. [2] FS[1] = 0 THRU N + 1. REFER TO APPENDIX A	LCN = 0–255	THE LCN IS ALSO A PART OF THE SVC ID.

[1] FS = FACTORY SETTING
[2] ALWAYS ENTER LCNs IN ASCENDING NUMERICAL ORDER.

PROMPTS	CMOS	DEFINITION
pvccnt 0-16 ENTER NUMBER OF PVCS REQUIRED IF DIFFERENT THAN ONE DISPLAYED.	VALUES = 0 TO N WHERE N = NUMBER OF CHANNELS	THIS SELECTION DETERMINES THE NUMBER OF TIMES BOTH THE LGN AND LCN PROMPTS WILL BE DISPLAYED. PAR. 3.1.3.1
lgn 0-15 ENTER THE LOGICAL GROUP NUMBER.	VALUE = 0-15	THIS IS A PART OF THE PERMANENT VIRTUAL CIRCUIT IDENTIFICATION. ITS VALUE MUST BE COMPATIBLE WITH YOUR NETWORK.
lcn 0-255 ENTER A LOGICAL CHANNEL NUMBER FROM 0-255. [1]	VALUE = 0-255	THE LCN IS ALSO A PART OF THE PVC ID. NOTE: THE LGN AND LCN OF A PVC MUST BE DIFFERENT FROM THOSE OF AN SVC.
channel# 1-16 ENTER A PHYSICAL CHANNEL NUMBER FROM 1-16.	VALUE = 1 TO N WHERE N = NUMBER OF PAD CHANNELS	THIS IS THE CHANNEL TO BE ASSOCIATED WITH THE SELECTED PVC.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		
[1] ALWAYS ENTER LCNs IN ASCENDING NUMERICAL ORDER.		

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5.5.8 Address ID

With this procedure you can define up to 40 mnemonics associated with autocalling channels and/or for use by those using abbreviated addressing. One uses autocalling/abbreviated addressing to routinely make calls to the same DTE, or to restrict a user to calling one or more of a selected number of destinations.

This procedure allows you to define the X.25 facilities, the address, the subaddress, the call user data field and also, if required, the protocol id of the Call Request Packet (refer to paragraphs 3.5.3.2 and 3.5.3.3). Each time you make this selection, before prompting you for entries, the Command Facility will display all 40 mnemonics to inform you of mnemonics already defined.

Example:

MNEMONICS:	01:CALLBILL	02:*******	03:CALLNY	04:*******	05:ABCD1234
	06:*******	07:CALLASIA	08:*******	09:BOM952	10:*******
	11:*******	12:*******	13:GREG001	14:GREG007	15:GREG007C
	16:*******	17:*******	18:*******	19:*******	20:*******
	21:*******	22:NY579C	23:*******	24:*******	25:*******
	26:761R108	27:*******	28:*******	29:CALLJOAN	30:*******
	31:*******	32:A5CALL3	33:A1CALL2	34:MEX76910	35:*******
	36:CALLJOE3	37:CALLJOE9	38:*******	39:*******	40:CALLALAN
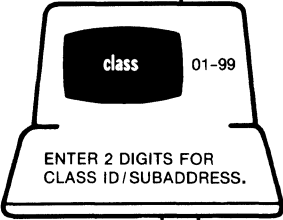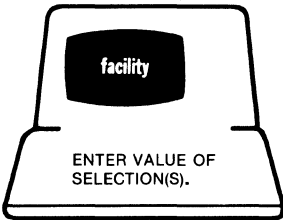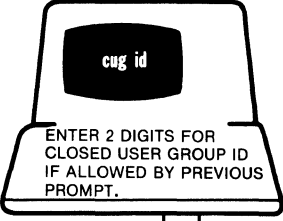
******* = NOT DEFINED

SELECTION 7: ADDRESS ID

PROMPTS	CMOS	DEFINITION
entry id 1-40 ENTER MNEMONIC ID 1-40. SEE ABOVE.	CALLALAN ******* CALLBILL 40 1	
mnemonic ENTER FROM TWO TO EIGHT CHARACTERS FOR A MNEMONIC OR <u>CR</u>.	MNEMONIC = TWO TO EIGHT ALPHANUMERIC CHARACTERS CALLJOE1 20	A MNEMONIC ASSOCIATED WITH AN AUTOCALL CHANNEL CAN ALSO BE USED FOR ABBREVIATED CALLING. YOU CAN DELETE A MNEMONIC BY ENTERING CTRL-Y.
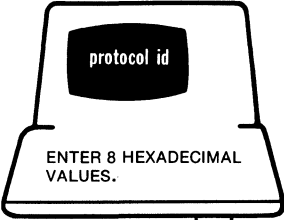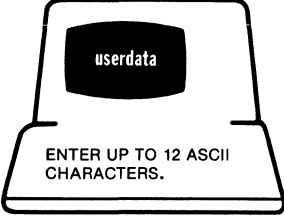
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PROMPTS	CMOS	DEFINITION
address — ENTER FROM 1 TO 15 DIGITS FOR REMOTE DESTINATION ADDRESS.	REMOTE DTE ADDRESS = 1 TO 15 DIGITS. CALLJOE1 REMOTE ADDRESS	UP TO 15 DIGITS
class 01-99 — ENTER 2 DIGITS FOR CLASS ID/SUBADDRESS.	CLASS = 2 DIGITS CALLJOE1 REMOTE ADDRESS CLASS ID/SUBADDRESS	**IF X.121 METHOD** THE 2 DIGITS WILL BE APPENDED TO ABOVE ADDRESS. NOTE THAT IF THE ADDRESS CONTAINS 15 OR 14 DIGITS, THESE 2 DIGITS WILL BE IGNORED. **IF CALL USER DATA METHOD** THE 2 DIGITS WILL BE RELOCATED TO OCTETS 5 AND 6 OF THE CUD FIELD.
facility — ENTER VALUE OF SELECTION(S).	0 = NO FACILITY 1 = REVERSE CHARGING 4 = CLOSED USER GROUP 8 = 128 BYTE PACKET NEGOTIATION 16 = THROUGHPUT CLASS 32 = NONSTANDARD PROTOCOL ID 64 = APPEND CLASS (SUBADDRESS) TO CALLED ADDRESS xxx = ANY COMBINATION	
cug id — ENTER 2 DIGITS FOR CLOSED USER GROUP ID IF ALLOWED BY PREVIOUS PROMPT.	CUG ID = 2 DIGITS CALLJOE1 REMOTE ADDRESS CLASS ID/SUBADDRESS FACILITIES CUG ID	THE CUG ID IS A 2-DIGIT NUMBER USED TO IDENTIFY A CLOSED USER GROUP ON YOUR NETWORK.

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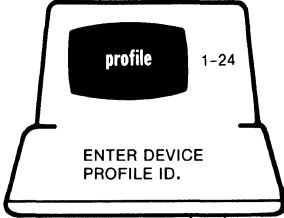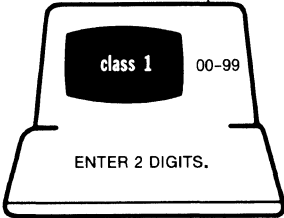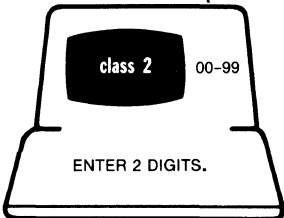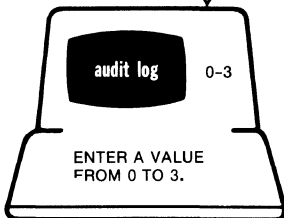
PROMPTS	CMOS	DEFINITION
protocol id ENTER 8 HEXADECIMAL VALUES.	8 HEXADECIMAL VALUES CALLJOE1 REMOTE ADDRESS CLASS ID/SUBADDRESS FACILITIES CUG ID CUD FIELD 1-4	THIS IS A NON-STANDARD PROTOCOL ID. THE EIGHT VALUES ARE INSERTED IN OCTETS 1, 2, 3, AND 4 OF THE CALL USER DATA FIELD OVERRIDING THE STANDARD VALUE 01000000 WHICH IS TYPICALLY USED BY THE PAD WHEN PLACING A CALL.
userdata ENTER UP TO 12 ASCII CHARACTERS.	"Λx" NOTATION TO ENTER CONTROL CHARACTERS CALLJOE1 REMOTE ADDRESS CLASS ID/SUBADDRESS FACILITIES CUG ID CUD FIELD 1-4 CUD FIELD 5-16	IF YOU ARE USING CALL USER METHOD FOR SUBADDRESSING, YOUR ENTRY WILL BE INSERTED IN OCTETS 7 THRU 16, i.e., ALLOWING YOU A MAXIMUM OF 10 CHARACTERS INSTEAD OF 12. ENTER CTRL-Y TO CLEAR THIS FIELD.

DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

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5.5.9 Command Port

This procedure associates a device profile with the Command Port and associates a subaddress (class) with the Command Facility. The profile is needed to adapt the Command Port to the characteristics of the attached device. The class definition (Class 1 and Class 2) is needed to allow access to the Command Facility from the Network or from MICOM's XCC (X.25 Control Center). You may also want to define whether the Command Port and/or the XCC will be used for logging events and per-call accounting information.
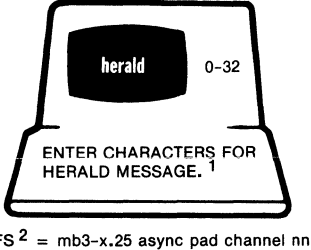
SELECTION 8: CMDPORT

PROMPTS	CMOS	DEFINITION
profile 1-24 ENTER DEVICE PROFILE ID.	SELECT 1 OF 24 DEVICE PROFILES.	THIS STEP IS TO ASSOCIATE ONE OF 24 POSSIBLE DEVICE PROFILES WITH THE COMMAND PORT.
class 1 00-99 ENTER 2 DIGITS. FS [1] = 99	00 = ACCESS FROM NETWORK NOT ALLOWED NN = ANY 2 DIGITS (MUST BE DIFFERENT FROM CHANNELS CLASS IDS)	THIS STEP IS TO ASSIGN THE COMMAND FACILITY A CLASS ID SO IT CAN BE ACCESSED BY AN X.25 CALL. PAR. 3.4.4.3
class 2 00-99 ENTER 2 DIGITS. FS [1] = 98	00 = ACCESS FROM X.25 CONTROL CENTER NOT ALLOWED NN = ANY 2 DIGITS (MUST BE DIFFERENT FROM CHANNELS CLASS IDS AND FROM VALUE OF PREVIOUS PROMPT)	THIS STEP IS TO ASSIGN THE COMMAND FACILITY A CLASS ID SO IT CAN BE ACCESSED BY MICOM'S X.25 CONTROL CENTER.
audit log 0-3 ENTER A VALUE FROM 0 TO 3. FS [1] = 0	0 = DISABLE TO BOTH X.25 CONTROL CENTER AND THE COMMAND PORT 1 = ENABLE TO COMMAND PORT 2 = ENABLE TO X.25 CONTROL CENTER 3 = BOTH 1 AND 2	THIS SELECTION ENABLES OR DISABLES LOGGING CALL ACCOUNTING AND EVENTS INFORMATION TO THE COMMAND PORT AND/OR THE X.25 CONTROL CENTER. PARS. 5.10.1 AND 5.10.2

DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

[1] FS = FACTORY SETTING

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5.5.10 Herald Message

In this procedure you can define the Herald Message (refer to paragraph 3.3.14.1).

SELECTION 9: HERALD
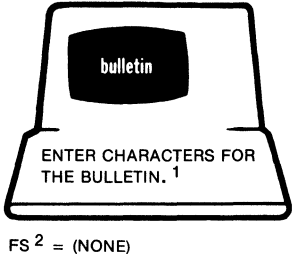
PROMPTS	CMOS	DEFINITION
herald 0-32 ENTER CHARACTERS FOR HERALD MESSAGE. [1] FS [2] = mb3-x.25 async pad channel nn	0-32 ASCII CHARACTERS	THE HERALD MESSAGE IS THE PAD'S WAY OF SAYING "HERE IS" WHEN A DEVICE CONNECTS TO ANY ONE OF THE PAD'S CHANNELS. YOU MAY TURN IT OFF ON CERTAIN CHANNELS VIA PARAMETER 6 OF THE DEVICE PROFILE.

DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.

[1] IF YOU MAKE A MISTAKE AND WISH TO CLEAR THE FIELD, ENTER CTRL-Y.
[2] FS = FACTORY SETTING

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5.5.11 Bulletin Message

In this procedure you can define the Bulletin Message (refer to paragraph 3.3.14.2).

SELECTION 10: BULLETIN
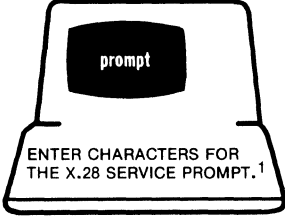
PROMPTS	CMOS	DEFINITION
bulletin ENTER CHARACTERS FOR THE BULLETIN. [1] FS [2] = (NONE)	ENTER UP TO 120 ASCII CHARACTERS.	THE BULLETIN CAN BE USED AS AN INFORMATION MESSAGE.

DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.
[1] IF YOU MAKE A MISTAKE AND WISH TO CLEAR THE FIELD, ENTER CTRL-Y.
[2] FS = FACTORY SETTING

MI-1366-1a-27

5.5.12 X.28 Service Prompt

In this procedure you can define the prompt that is displayed when the user is in X.28 mode (refer to paragraph 3.7.2).

SELECTION 11: PROMPT
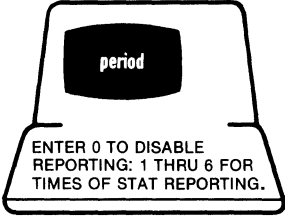
PROMPTS	CMOS	DEFINITION
ENTER CHARACTERS FOR THE X.28 SERVICE PROMPT.[1] FS[2] = *	ENTER UP TO 16 ASCII CHARACTERS.	THE SERVICE PROMPT ADVISES THE USER THAT HE MAY ENTER AN X.28 COMMAND.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED. [1] IF YOU MAKE A MISTAKE AND WISH TO CLEAR THE FIELD, ENTER CTRL-Y. [2] FS = FACTORY SETTING		

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5.5.13 Stat Period

In this procedure you will define how often the PAD will output the Performance Statistics Report to the Command Port. Refer to paragraph 5.8 for a description of this report.

SELECTION 12: STAT PERIOD

PROMPTS	CMOS	DEFINITION
ENTER 0 TO DISABLE REPORTING: 1 THRU 6 FOR TIMES OF STAT REPORTING.	VALUES 0 = DISABLE 1, 2, 3. . .6 = 10 TO 60 MINUTES IN 10-MINUTE INCREMENTS	YOU MAY STILL REQUEST STATISTICS ON DEMAND, EVEN IF YOU DISABLE PERIODIC REPORTING. NOTE THAT THE COUNTERS ARE RESET TO 0 AFTER EACH PERIODIC REPORT. YOU MUST LOGOUT TO INITIATE PERIODIC REPORTING (REFER TO PARAGRAPH 5.11).
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

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5.5.14 Host Autobaud
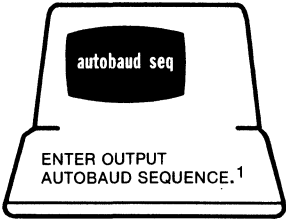
With this procedure, you can select up to four ASCII character(s) that will be output to the host for autobaud purposes.

For a CR.CR autobaud sequence enter:

^M.^M

Each ^M entry equals a carriage return.

SELECTION 13: HOST AUTOBAUD

PROMPTS	CMOS	DEFINITION
autobaud seq ENTER OUTPUT AUTOBAUD SEQUENCE.[1] FS[2] = CR	UP TO 4 ASCII CHARACTERS	THE SEQUENCE WILL BE OUTPUT TO HOST WHEN AUTOBAUD IS ENABLED. TO FUNCTION, THE CHANNEL OPTION MUST BE SET TO RING OUT. ALSO, THE CHANNEL MUST BE SET TO ABR. A CHANNEL WILL OUTPUT THIS SEQUENCE UPON AN INCOMING CALL IF: • IT IS SET TO AUTOBAUD. • IT IS SET FOR RING-OUT. PARS. 3.6.4 AND 3.6.5
DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED. [1] IF YOU MAKE A MISTAKE AND WISH TO CLEAR THE FIELD, ENTER CTRL-Y. [2] FS = FACTORY SETTING		

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5.5.15 X.25 Control Center

NOTE: One PAD must be physically attached to the XCC (X.25 Control Center) to give the XCC access to the X.25 PDN (see figure 1-9). This PAD is referred to here as the local PAD. Other PADs (those managed by the XCC) are referred to as remote PADs. Configuration of a local PAD is described in appendix D. Configuration of remote PADs is described in the following paragraphs.

A PAD that is managed by the XCC can be configured to place a call to the XCC in order to:
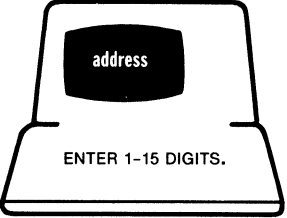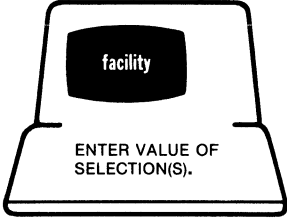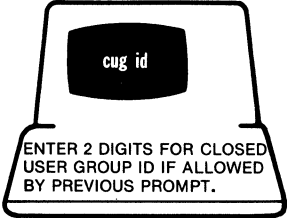
* Request a downline load of operating parameters (CMOS update).
* Report call accounting and event data.

If you expect your PAD to call the XCC to request a CMOS update or to report call accounting and event data:

* The PAD Address field in trunk configuration (refer to paragraph 5.5.6) must contain your PAD's own DTE address. The reason for this is that the XCC will verify that the address is included in its device address table before it accepts a call.

* The entry in the Class Select field in trunk configuration (refer to paragraph 5.5.6) must be compatible with the local XCC PAD and with all other PADs to be managed by the XCC. In addition, the Class Select field option 2 (Disable Class Select) should not be used in conjunction with the XCC.

* The Channel Option field in channel configuration (refer to paragraph 5.5.2) must include the value of 32, for each channel that is to report call accounting and event data.

* The CMDPORT configuration (refer to paragraph 5.5.9) must be completed correctly. For example, for channels enabled to report call accounting and event data, the value entered for the Audit Log Prompt must not be equal to 0.
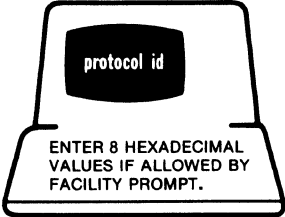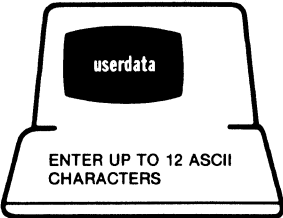
After meeting the above requirements, select item 14 (xcc) from the Configure Menu. The following prompts will be displayed (where necessary, these prompts are described in more detail, following the illustrations).

SELECTION 14: XCC

PROMPTS	CMOS	DEFINITION
address ENTER 1-15 DIGITS.	DTE ADDRESS OF THE X.25 CONTROL CENTER = 1-15 DIGITS	UP TO 15 DIGITS

facility
ENTER VALUE OF
SELECTION(S).
	0 = NO FACILITY
	1 = REVERSE CHARGING
	4 = CLOSED USER GROUP
	8 = 128 BYTE PACKET
	   NEGOTIATION
	32 = NON-STANDARD
	   PROTOCOL ID
	xx = COMBINATION	

cug id ENTER 2 DIGITS FOR CLOSED USER GROUP ID IF ALLOWED BY PREVIOUS PROMPT.	CUG ID = 2 DIGITS	THE CUG ID IS A 2-DIGIT NUMBER USED TO IDENTIFY A CLOSED USER GROUP.

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PROMPTS	CMOS	DEFINITION
protocol id ENTER 8 HEXADECIMAL VALUES IF ALLOWED BY FACILITY PROMPT.	8 HEXADECIMAL VALUES	THIS IS A NON-STANDARD PROTOCOL ID. THE EIGHT VALUES ARE INSERTED IN OCTETS 1, 2, 3, AND 4 OF THE CALL USER DATA FIELD OVER-RIDING THE STANDARD VALUE 01000000 WHICH IS TYPICALLY USED BY THE PAD WHEN PLACING A CALL.
userdata ENTER UP TO 12 ASCII CHARACTERS	UP TO 12 ASCII CHARACTERS. Λx NOTATION TO ENTER CONTROL CHARACTERS	IF YOU ARE USING CALL USER METHOD FOR SUBADDRESSING, YOUR ENTRY WILL BE INSERTED IN OCTETS 7 THROUGH 16, i.e., ALLOWING YOU A MAXIMUM OF 10 CHARACTERS INSTEAD OF 12. ENTER CTRL-Y TO CLEAR THIS FIELD.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

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Descriptions of XCC Prompts

Address Prompt   If X.121 subaddressing is being used on the local XCC PAD, the last two digits of the Address field should represent the class/rotary assigned to the PAD channels that are connected to the XCC (that is, 97, as shown in appendix D).

Facility Prompt   This value must be equal to 4, or be added to 4, if you enter anything other than CR for the CUG ID Prompt. For example, if you wanted to combine Facility values 1, 8, and 32, your entry would be 1 + 8 + 32 + 4, or 45.

This value must be equal to or greater than 32, if you enter anything other than CR for the Protocol Id Prompt.

Userdata Prompt   If call user data subaddressing is being used (refer to paragraph 5.5.6), enter the XCC subaddress ID. The local XCC PAD will interpret positions 1 and 2 of the Userdata field as the requested class rotary.

If XCC access requires a trunk password, enter it in positions 1 through 4 for X.121 subaddressing, or in positions 3 through 6 for call user data subaddressing.
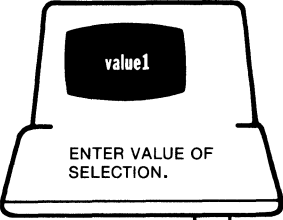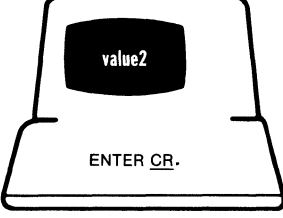
5.5.16 System Parameters

Selection 15 from the Configure Menu allows you to enable or disable local channel-to-channel calls, and to enable or disable remote loopback tests over the X.25 composite connection. This Configure Menu selection is called System Par, because it affects all channels on a PAD (the effect is system-wide).

When local switching is enabled, one terminal user can connect locally to another terminal user that is connected to the same PAD, without accessing the X.25 PDN.

Users connected to the PAD can be allowed or disallowed the ability to activate remote loopback tests. Refer to section 6 for information on these and other PAD diagnostic tests.

SELECTION 15: SYSTEM PAR

PROMPTS	CMOS	DEFINITION
value1 ENTER VALUE OF SELECTION.	0 = ENABLE LOCAL SWITCHING BETWEEN CHANNELS 1 = DISABLE LOCAL SWITCHING BETWEEN CHANNELS 2 = DISABLE TACTR AND TACTS ON CHANNELS 4 = RESERVED X = COMBINATION	
value2 ENTER CR.	THIS VALUE IS RESERVED.	
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

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5.5.17 Network User Identification
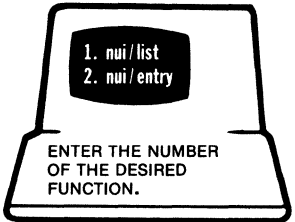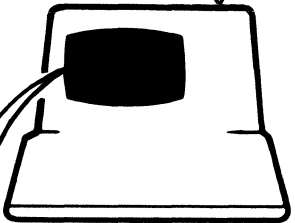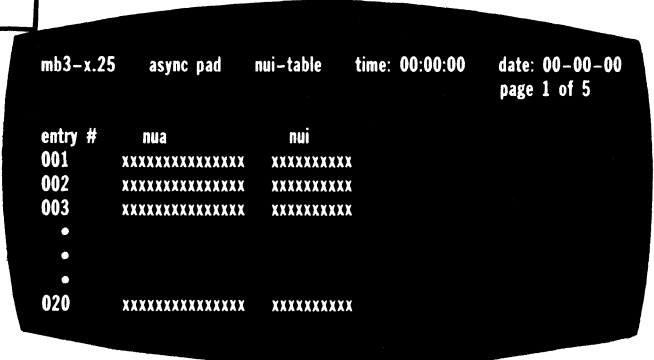
You may ensure that only authorized calls are placed from user channels with the PAD's Network User Identification (NUI) function.   Selection 16 on the Configure Menu allows you to define (or redefine) from 1 to 100 NUI strings and corresponding Network User Address (NUA) strings. You may also display the NUI-NUA table, which lists all existing NUI and NUA strings.

When selection 16 is entered, a submenu with two choices is displayed. Selection number 1, NUI/LIST, displays the NUI-NUA table. This table is divided into five "pages" with 20 entries each. One page is displayed at a time: press CR to display the next sequential page in the table.

Selection number 2 on the submenu, NUI/ENTRY, allows you to define (or redefine) new NUI and NUA strings. When selected, you will be prompted for the entry number in the NUI-NUA table that you wish to define. You are then prompted to enter the new NUA and NUI.
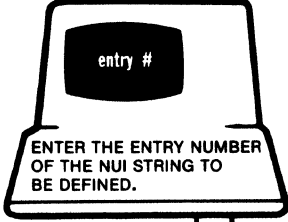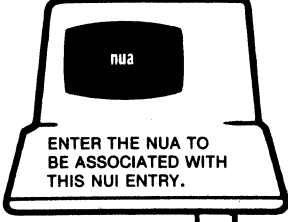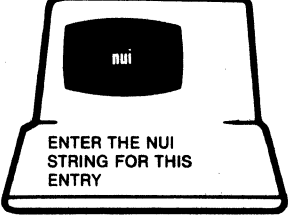
Refer to paragraph 3.1.10 for a complete discussion of NUIs and NUAs.

PROMPTS	CMOS	DEFINITION
1. nui / list 2. nui / entry ENTER THE NUMBER OF THE DESIRED FUNCTION.	ENTER A 1 TO LIST ALL NUI STRINGS DEFINED IN MEMORY. ENTER A 2 TO DEFINE A NEW NUI STRING.	PAR. 3.1.10
IF 1 IS ENTERED:		THE NUI-NUA TABLE CONSISTS OF 5 "PAGES" OF 20 ENTRIES EACH. ENTER A <u>CR</u> TO VIEW THE NEXT PAGE. PAR. 3.1.10

```
mb3-x.25    async pad    nui-table    time: 00:00:00    date: 00-00-00
                                                        page 1 of 5

entry #    nua              nui
001        xxxxxxxxxxxxxxx   xxxxxxxxxx
002        xxxxxxxxxxxxxxx   xxxxxxxxxx
003        xxxxxxxxxxxxxxx   xxxxxxxxxx
  •
  •
  •
020        xxxxxxxxxxxxxxx   xxxxxxxxxx
```

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PROMPTS	CMOS	DEFINITION
IF 2 IS ENTERED: entry # ENTER THE ENTRY NUMBER OF THE NUI STRING TO BE DEFINED.	ENTER ANY NUMBER FROM 1-100.	THE NUMBER ENTERED WILL BE THE ENTRY NUMBER OF THE NEW NUI-NUA IN THE NUI-NUA TABLE. PAR. 3.1.10
nua ENTER THE NUA TO BE ASSOCIATED WITH THIS NUI ENTRY.	ENTER 1-15 NUMERIC DIGITS.	THE NUA IS INSERTED INTO THE CALL REQUEST PACKET AS THE CALLING ADDRESS IF: • THE NUI TYPE TRUNK PARAMETER = 1 (REFER TO PAR. 5.5.6) • THE CORRESPONDING NUI IS ENTERED INTO THE FACILITIES FIELD OF THE CONNECT COMMAND. PAR. 3.1.10
nui ENTER THE NUI STRING FOR THIS ENTRY	ENTER UP TO 10 ALPHANUMERIC CHARACTERS. THE FOLLOWING CHARACTERS ARE NOT ALLOWED: SPACE DELETE – , + CR	THE NUI MUST BE ENTERED INTO THE FACILITIES FIELD OF THE CONNECT COMMAND IF THE NUI TYPE TRUNK PARAMETER IS NON-ZERO (REFER TO PAR. 5.5.6). PAR. 3.1.10

DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

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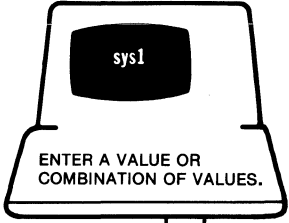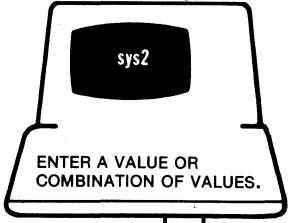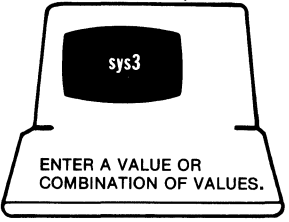
5.5.18 Soft Switches

As described in paragraph 2.4.2, you can set some of the PAD's operating parameters using the Touch Panel. This paragraph explains the other method for setting operating parameters, using the PAD's Command Facility. To use the Command Facility method, select item 17 from the Configure Menu.

The first prompt that appears is SYS1 (which relates to the SYS1 soft switch group) and the second prompt is SYS2 (which relates to the SYS2 soft switch group). The SYS3 prompt, which relates to the SYS3 soft switch group, lets you change the EIA control signal bias for user channels.

Within each soft switch group, there are eight selections. Each selection has a numerical value. For example, selection 6 has a numerical value of 32. You enter a value, or a sum of values, to turn a selection or selections ON. Refer to paragraph 2.4.1 for a discussion of how the PAD stores operating parameters.

SELECTION 17: SOFT SWITCHES

PROMPTS	CMOS	DEFINITION

sys1
 	
ENTER A VALUE OR COMBINATION OF VALUES.
	0 = ALL SELECTIONS ARE OFF
	1 = RESERVED
	2 = SELECTION 2 (INTERNAL [1] OR
	           EXTERNAL [2] CLOCK)
	4 = RESERVED
	8 = SELECTION 4 (WARM [1] OR
	           COLD [2] START)
	16 = SELECTION 5 (STANDARD [1] OR EXTENDED [2]
	           PACKET SEQUENCING)
	32 = SELECTION 6 (KDD DISABLED [1] OR
	           ENABLED [2])
	64 = SELECTION 7 (STANDARD [1] OR EXTENDED [2]
	           FRAME SEQUENCING)
	128 = SELECTION 8 (TRUNK DTE [1] OR DCE [2])
	xxx = COMBINATION
		SELECTING A VALUE OR COMBINATION OF VALUES CAUSES RELATED SELECTIONS TO GO ON.
		
		PAR. 2.4

sys2
 	
ENTER A VALUE OR COMBINATION OF VALUES.
	0 = ALL SELECTIONS ARE OFF
	1 = SELECTION 1
	2 = SELECTION 2
	4 = SELECTION 3 } LOGICAL GROUP NUMBER
	8 = SELECTION 4
	16 = SELECTION 5 (X.121 [1] OR CALL USER
	           DATA [2] SUBADDRESSING)
	32 = SELECTION 6 (BLOCK MODE DISABLED [1]
	           OR ENABLED [2])
	64 = SELECTION 7 (X.25 PACKET SIZE NEGOTIA-
	           TION [1] OR DATAPAC PRIORITY [2])
	128 = RESERVED
	xxx = COMBINATION
		SELECTING A VALUE OR COMBINATION OF VALUES CAUSES RELATED SELECTIONS TO GO ON.
		
		PAR. 2.4

sys3
 	
ENTER A VALUE OR COMBINATION OF VALUES.
	0 = ALL SELECTIONS ARE OFF
	1 = RESERVED
	2 = RESERVED
	4 = RESERVED
	8 = RESERVED
	16 = RESERVED
	32 = SELECTION 6 (BIAS OFF [1] OR ON [2] FOR
	           CHANNELS 1-4)
	64 = SELECTION 7 (BIAS OFF [1] OR ON [2] FOR
	           CHANNELS 5-10)
	128 = SELECTION 8 (BIAS OFF [1] OR ON [2] FOR
	           CHANNELS 11-16)
	xxx = COMBINATION
		SELECTING A VALUE OR COMBINATION OF VALUES CAUSES RELATED SELECTIONS TO GO ON.
		
		PAR. 2.4

DONE. . . . .THE CONFIGURATION MENU WILL BE DISPLAYED.

[1] FOR THIS SELECTION, DO NOT ENTER THE RELATED VALUE. FOR EXAMPLE, FOR TRUNK DTE (IN SYS1), DO NOT ENTER 128 BY ITSELF OR IN COMBINATION WITH OTHER VALUES.

[2] FOR THIS SELECTION, ENTER THE RELATED VALUE. FOR EXAMPLE, FOR BLOCK MODE ENABLED (IN SYS2), ENTER 32 BY ITSELF OR IN COMBINATION WITH OTHER VALUES.

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5.6 CHANNEL CONTROL

With these commands you can do the following:

- Busy-out a channel
- Disconnect a call in progress and busy-out the channel
- Put a channel back in service

The following presentation explains the action, reason, and effect of various selections:

Command Menu Selection	Select from Menu		
	2. busyout	3. disconnect	4. reenable
Prompts	channel #: [**] __	channel #: [**] __	channel #: [**] __
The reason for selection	To put a channel out of service To protect an unused channel from unauthorized access	Same as busyout	To cancel the busyout or the disconnect action
The effect of selection	If a call is in progress, the command will not take effect until the call is cleared. This action causes a dial-in channel to raise its BO lead. This causes a dial-in modem to take the phone line off-hook. The PAD will not accept calls on dedicated or dial-in channels that are busied-out until they are reenabled.	This selection is identical to busyout, except the command takes effect immediately.	This causes EIA leads to be scanned again. For dial-in channels, the Busy Out (BO) lead will be lowered. The PAD will accept calls from, or route calls to, the channel.

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5.7 TRUNK MONITORING AND CONTROL

With these commands you can do the following:

* Inquire about trunk status
* Logically disconnect the trunk from the X.25 PDN
* Reenable X.25 trunk operation

The following presentation explains the action, reason, and effect of various selections:

Command Menu Selection	Select from Menu		
	5. trunk status	**6. trunk down**	**7. trunk up**
Prompts	trunk up or trunk down	initiated	initiated
The reason for selection	To inquire if both the frame and packet level are operational	To logically disconnect the trunk	To cancel the trunk-down action
The effect of selection		In this state, the PAD responds with a DM to any incoming command until the trunk is up. The **LD** indicator will go ON. **NOTE** This action is invalidated upon RESET or power down.	The PAD will try to establish the link using the LAPB setup procedure. The **LD** indicator will go OFF once the packet level is reestablished.

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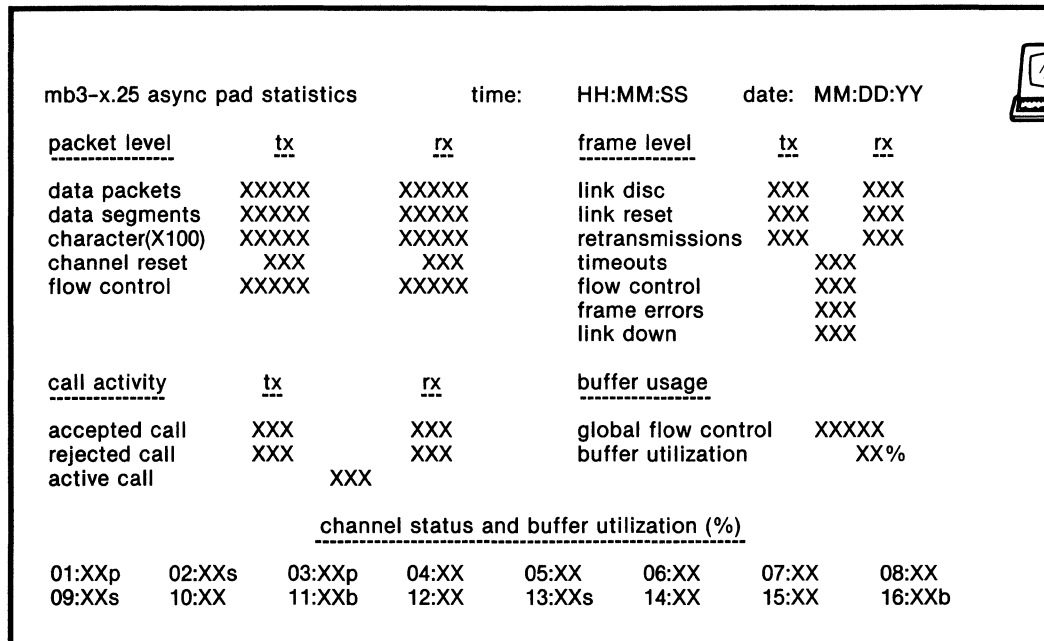
5.8 PERFORMANCE STATISTICS AND CHANNEL ACTIVITY

You may review, on demand, the Performance Statistics Report shown in figure 5-4 and defined in table 5-1. The same report can also be generated periodically by the PAD using the Command Port (refer to paragraph 5.5.13).

The Performance Statistics Report allows you to:

- Monitor the PAD utilization.
- Monitor the Network usage.
- Monitor the X.25 trunk performance.
- Monitor channel activity and status.

Command Menu Selection	Select from Menu	
	8. list stats	**9. reset stats**
Prompts	See screen below	are you sure? (y/n) done
The reason for selection	To retrieve PAD statistics report	To reset all the counters to zero

```
mb3-x.25 async pad statistics          time:   HH:MM:SS    date:  MM:DD:YY

packet level        tx          rx          frame level      tx      rx
-------------       --          --          -------------     --      --

data packets        XXXXX       XXXXX       link disc         XXX     XXX
data segments       XXXXX       XXXXX       link reset        XXX     XXX
character(X100)     XXXXX       XXXXX       retransmissions   XXX     XXX
channel reset       XXX         XXX         timeouts                  XXX
flow control        XXXXX       XXXXX       flow control              XXX
                                            frame errors              XXX
                                            link down                 XXX


call activity       tx          rx          buffer usage
-------------       --          --          ------------

accepted call       XXX         XXX         global flow control      XXXXX
rejected call       XXX         XXX         buffer utilization        XX%
active call               XXX

              channel status and buffer utilization (%)
              -----------------------------------------

01:XXp      02:XXs      03:XXp      04:XX     05:XX     06:XX     07:XX     08:XX
09:XXs      10:XX       11:XXb      12:XX     13:XXs    14:XX     15:XX     16:XXb
```

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Figure 5-4. Format of the Performance Statistics Report

Table 5-1. Definition of the PAD Performance Statistics Report

Counter	Range of Values	Description
Data Packets	0 to 65,535	This is the number of data packets received and transmitted over the X.25 trunk.
Data Segments	0 to 65,535	A segment is a defined fraction of the packet size. It can be 16, 32, 64, or 128 octets. It cannot however, exceed the packet size.
Character (X100)	0 to 65,535	This is the number of data characters the PAD receives or transmits over the X.25 trunk.
Channel Reset	0 to 65,535	This is the number of Reset Packets received and transmitted over the X.25 trunk.
Flow Control	0 to 65,535	This is the combined number of RNR Packets transmitted and window blocks experienced without receipt of packet transmission authorization.
Link Disc	0 to 255	This is the number of times a PAD sends or receives a disk frame. The LINK DISC (TX) counter counts how many times the PAD initiates a DISC/UA sequence. The receive counter counts how many times the Network initiates a DISC/UA sequence.
Link Reset	0 to 255	This is the number of times the PAD performs an SABM/UA sequence.
Retransmissions	0 to 255	This is the number of frames retransmitted because of CRC errors or T1 expirations. This is added to the number of frames.
Timeouts	0 to 255	This is the number of times the T1 timer expired.
Flow Control	0 to 255	This is the number of RNR frames received or transmitted.

Counter	Range of Values	Description
Frame Errors	0 to 255	This is the number of times the PAD receives bad frame check sequences (CRC).
Link Down	0 to 255	This is the number of times the link assurance procedure failed. Bringing the link down using the Trunk Down Command (selection 6 from the Command Menu) does not increment this counter.
Accepted Call	0 to 255	(TX) This is the number of times the PAD receives a Call Accept Packet in response to a Call Request Packet. (RX) This is the number of times the PAD sends a Call Accept Packet in response to an incoming call packet.
Rejected Call	0 to 255	(TX) This is the number of times the PAD receives a Clear Indication Packet in response to a Call Request Packet. (RX) This is the number of times the PAD sends a Clear Request Packet in response to an incoming call packet.
Active Call	0 to 255	This is the number of SVCs now in use. It includes all SVCs in call setup, data transfer, and clear-pending states.
Global Flow Control	0 to 65,535	This is the number of times the system exercises flow control on all asynchronous channels because the buffer utilization exceeded 62.5 percent.
Buffer Utilization	00 to 99	Total buffer use (instantaneous) = $$\frac{\text{Total Number of Buffers in Use} \times 100}{\text{Total Buffer Pool Size}}$$

Table 5-1. Definition of the PAD Performance Statistics Report
(continued)

Counter	Range of Values	Description
Channel Status	(blank)	blank = Channel is free.
	**	** = Channel is not installed, or I/O serial chip is defective.
	p	p = PVC is enabled for that channel.
	s	s = SVC is in progress.
	b	b = Channel is busied-out or logically disconnected.
	1	1 = Channel is engaged in a local connection.
	c	c = Copy is active.
Channel Buffer Utilization	00 to 25	The percentage of channel buffer use for each channel (instantaneous) = $$\frac{\text{No. of Buffers Assigned to Channel} \times 100}{\text{Total Buffer Pool Size}}$$

5.9 SYSTEM INITIALIZATION

System Initialization commands allow you to:

* Simulate the action of a hardware Reset switch, thus causing PAD reinitialization.

* Initialize CMOS memory.

* Check the integrity of the CMOS memory.

The following presentation explains the action, meaning, and effect of various selections:

	Select from Menu	
Command Menu Selection	**10. reset pad**	**11. load cmos**
Prompts	are you sure? (y/n)	are you sure? (y/n) logout
The reason for selection	Use this command to reinitialize or to cold-start the PAD. Use the command to restart the trunk.	Use this command to cause the PAD to request a total update of its CMOS (from the X.25 Control Center).
The effect of selection	Calls will be cleared. The previously set soft switch selections take effect.[1] If soft switch group SYS1, selection 4 is ON (COLD start), the factory default values will be reinstated. The **CA** indicator will BLINK.	After executing LOAD CMOS, the PAD will place a call to the X.25 Control Center and request the CMOS update.

[1] Except the LGN/LCN numbering and the subaddressing method. Refer to paragraph 2.4.2.

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5.10 CALL ACCOUNTING AND EVENT REPORTING

In addition to providing performance statistics (refer to paragraph 5.8), the PAD can be configured to provide you with call accounting and events information, in the format shown in figure 5-5.

5.10.1 Call Accounting

* A channel user can obtain call accounting information at the conclusion of a call. You enable this feature on a per-channel basis using the channel option (refer to paragraph 5.5.2).

* If enabled, the user will receive this information after his X.28 clear service signal, provided that the service signals are not disabled. Local calls, however, do not generate call accounting information.

* You can also obtain, using the Command Port, the call accounting records of all calls handled by the PAD. You enable this using the Command Port audit log (refer to paragraph 5.5.9).
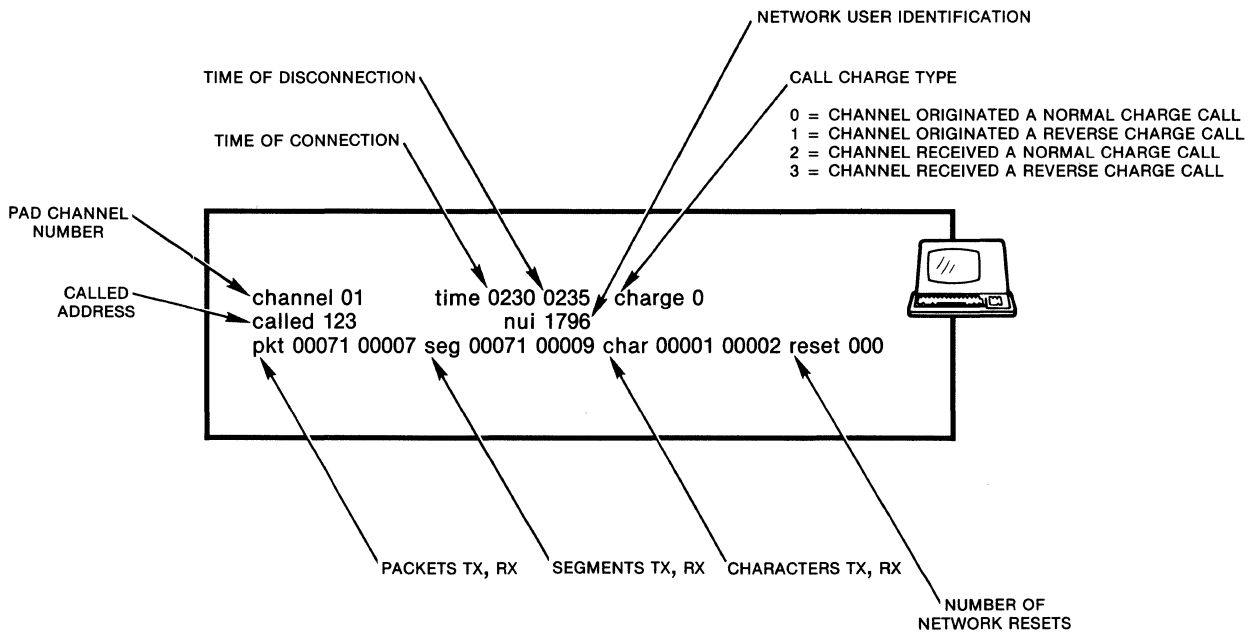
MI-1387-1a-29

Figure 5-5. Call Accounting Record

5.10.2 Event Reporting

If you enable the Command Port Audit Log parameter, the PAD will also output to the Command Port the following events information.

* trunk down   hh:mm
* trunk up   hh:mm

where hh:mm depicts the time the event took place, in hours and minutes.

5.11 EXIT THE COMMAND FACILITY

To exit the Command Facility, you enter the Logout Command.

	Select from Menu
Command Menu Selection	**12. logout**
Prompt	logout
The reason for selection	To exit the Command Facility
The effect of selection	Allows the periodic output of the statistics report Enables the output of the call accounting records via the Command Port Enables the output of the events via the Command Port The Command Facility becomes accessible only to authorized users.

MT-1229-2-19

SECTION 6

DIAGNOSTICS AND TROUBLESHOOTING

A Self Test, indicators, and four Terminal-Activated Channel Tests (TACT) are provided for diagnostic maintenance of the PAD. These are described in paragraphs 6.1 through 6.4. In addition, paragraph 6.5 describes ways that an operator or an experienced technician can troubleshoot problems.

6.1 SELF TEST

The PAD executes a Self Test at system initialization and any time the system is reset. The Self Test checks the operation of all system memory. When power is first turned on or the Reset keys are pressed, the system status display on the base module momentarily FLASHES. At the conclusion of the Self Test (which takes five to ten seconds), a number of indicator states are possible (refer to paragraph 6.3 for descriptions of the indicators).

6.2 DIAGNOSTIC LEVELS OFFERED BY THE PAD

The PAD offers you many levels of diagnostics:

- Performance Reports -- which help you foresee problems before they actually cause your PAD to be out-of-service.

  You can have these reports on-demand or at fixed user-selectable intervals. In using these statistics for diagnostic purposes, you want to pay particular attention to the following:

    - Link Disc
    - Link Resets
    - Retransmissions
    - Time-Outs
    - Frame Errors
    - Link Loss

- Commands -- to check the integrity of the configuration CMOS memory, the battery, and to reset the PAD.

- Indicators -- for system and channel status.

- Tests -- the Terminal-Activated Channel Tests (TACT) can be initiated from the Command Port or from any of the PAD channels. These tests help to pinpoint any problems in the user or the Network connections.

Performance reports and commands are available through the Command Facility (refer to paragraphs 5.8 and 5.9). Refer to paragraph 6.3 for a description of the indicators. TACT is described in paragraph 6.4.

6.3 INDICATORS

After plugging in your PAD, some of the indicators will be visible through the front panel (see figure 6-1). When you press a Touch Panel key during configuration of the PAD, the indicators monitor the configuration (refer to paragraph 2.4.2). During operation of the PAD, these indicators monitor system status and channel data activity. Each expansion module has its own channel activity indicators. The significance of each indicator is described in tables 6-1 and 6-2. Table 6-3 shows the correlation of indicators to PAD modules.
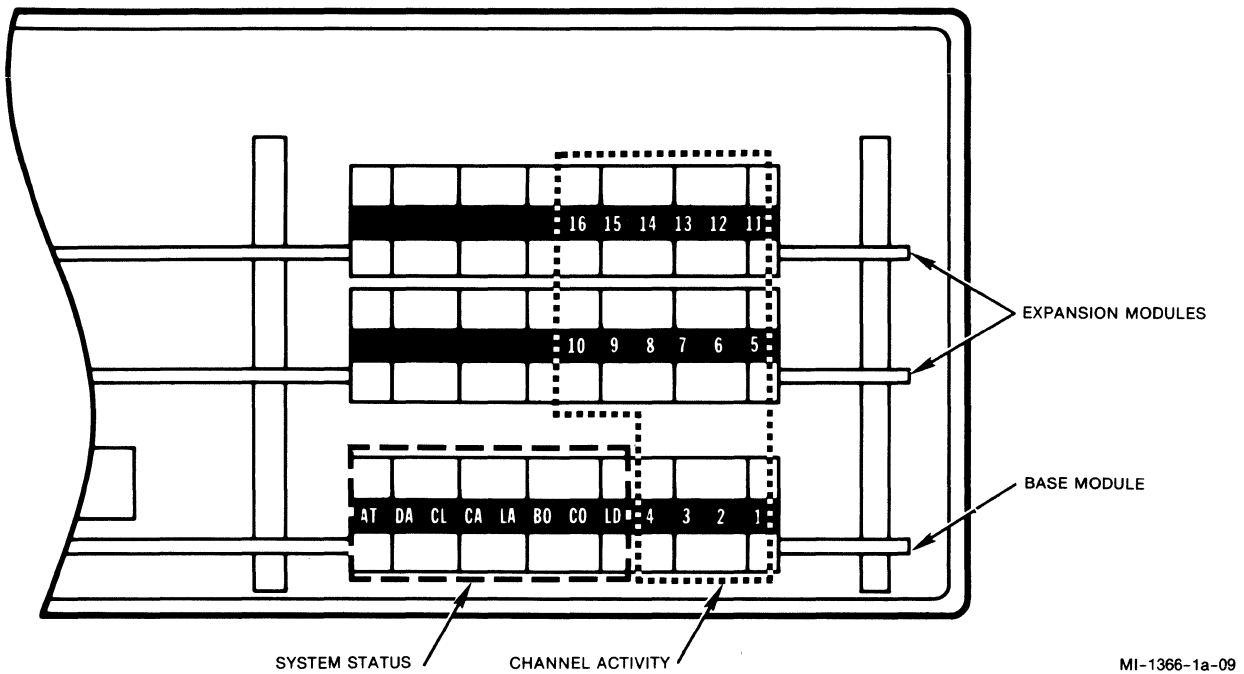
Figure 6-1. Indicators

NOTE: During normal operating conditions, the AT indicator is ON, and all other indicators are OFF (except the channel indicators, which may be FLASHING). During configuration of system parameters, these indicators reflect soft switch selection settings (see table 2-1).

Table 6-1. System Indicators on the Base Module

Indicators	ON	OFF	FLASHING
AT Active Mode	Normal operation	Undefined problem	Undefined problem
DA (Not used)	Undefined problem	Normal operation	Undefined problem
CL Channel Loopback	Undefined problem	Normal operation	TACT REMOTE and SYSTEM Tests active
CA Checksum Alarm	CMOS or battery problem	Normal operation	Cold start performed[1]
LA Link Alarm	Undefined problem	Normal operation	Retransmission on link (to PDN)
BO Buffer Overflow	PAD is discarding data.	Normal operation	Over 62.5 percent buffer utilization
CO Self Test Failure	When CA is also ON and AT is also OFF, it indicates a bad FEATUREPAK cartridge.[2] When CA and AT are also OFF, it indicates a RAM error.	Normal operation	A fault is detected in the CMOS RAM.
LD Link Down	Link is down.	Normal operation	Undefined problem

NOTE:
   If all indicators are ON, the PAD is in a constant reset condition (call MICOM Customer Service). If all indicators are OFF, there is no power to the unit, or there is an undefined problem. See table 6-4 to determine the nature of the problem.

[1]When the CMOS memory becomes corrupted, the PAD will automatically reload into CMOS the factory-set configuration values, regardless of the cold/warm start soft switch setting.
[2]If the FEATUREPAK cartridge is corrupted, the status of the indicators is random — they may all be FLASHING (call MICOM Customer Service).

Table 6-2. Channel Indicators on a Base or Expansion Module

Indicators	ON	OFF	FLASHING
1, 2, 3, etc. Channel Activity	Constant data activity for Idle mode	Normal operation mode	Normal operation for transmit/receive

Table 6-3. Indicators on PAD Modules

PAD Model	Number of Expansion Modules	Display Locations	Display Functions
MB3XX0-4	0	Base Module	System status conditions Data activity of channels 1-4
MB3XX0-10	1	Base Module	System status conditions Data activity of channels 1-4
		Expansion Module	Data activity of channels 5-10
MB3XX0-16	2	Base Module	System status conditions Data activity of channels 1-4
		1st Expansion Module	Data activity of channels 5-10
		2nd Expansion Module	Data activity of channels 11-16

6.4 TACT

During normal operation, the PAD is connected to a variety of data communications equipment, such as, cables, modems, lines, and data terminals. When a problem occurs, it is desirable to quickly find its origin. To this end, MICOM provides the user with a diagnostic capability called Terminal-Activated Channel Test (TACT). TACT offers simple and easy-to-understand tests that can be performed using the dedicated Command Port or using any of the PAD's channels.

A user can initiate any one of four different TACT tests using the MICOM X.28 extended commands (these commands are invalid when an SVC is in progress or when the channel is defined for PVC operation). The tests are:

- LOCAL Loopback
- TERMINAL Loopback
- REMOTE Loopback
- SYSTEM Loopback

The LOCAL and TERMINAL Loopback Tests are local (between the PAD and the attached device). The REMOTE and SYSTEM Loopback Tests are remote. They make use of the X.25 trunk, which must be operational (that is, connected to a PDN or to another MICOM PAD).

These tests are initiated by the commands: TACTL, TACTT, TACTR, and TACTS, respectively. The tests are nondisruptive; that is, they may be performed while other channels are engaged in active sessions. Any of the tests can be terminated at any time by pressing the BREAK key.

Refer to paragraph 4.5.3 for descriptions of TACT Commands.

6.4.1 TACT LOCAL Loopback Test

The TACTL Command activates this test of a local channel, to check for channel reliability. The PAD acknowledges this test request with an "in-tact mode" service signal. All data the PAD receives from the device is transmitted back to the device. The X.25 trunk is not used in this test. Figure 6-2 illustrates the format of this test.


```
*tactl

in tact mode
abababababababababababababababababababababababababababababababababab
tact complete

*
```

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Figure 6-2. PAD User Dialogue for the TACT LOCAL Loopback Test

6.4.2 TACT TERMINAL Loopback Test

You use the TACTT Command to activate this loopback test of a local termi-
nal. The PAD acknowledges the test request with an in-tact mode service
signal. It then starts transmitting a continuous stream of fox messages to
the device until the PAD detects a BREAK signal. This is a stress test for
the device and channel connection. Figure 6-3 shows a sample fox message that
is displayed when using the TERMINAL Loopback Test.


```
*tactt

in tact mode
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789

tact complete

*
```
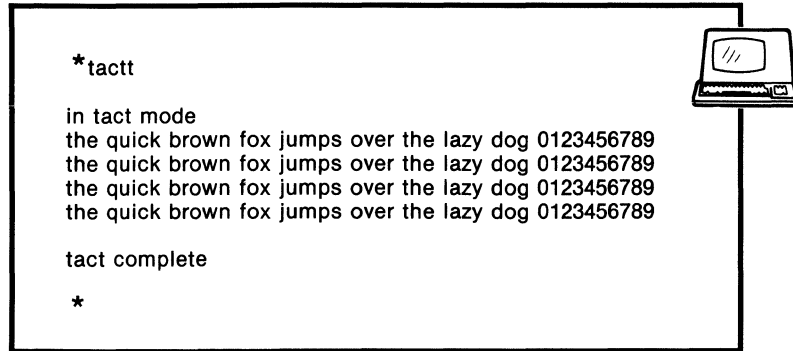
MI-1387-1a-47

Figure 6-3. PAD User Dialogue for the TACT TERMINAL Loopback Test

6.4.3 Test Equipment Setup for the TACT LOCAL and the TACT TERMINAL Loopback Tests

Figure 6-4 shows the equipment setup to test a local unit.

MICOM PAD
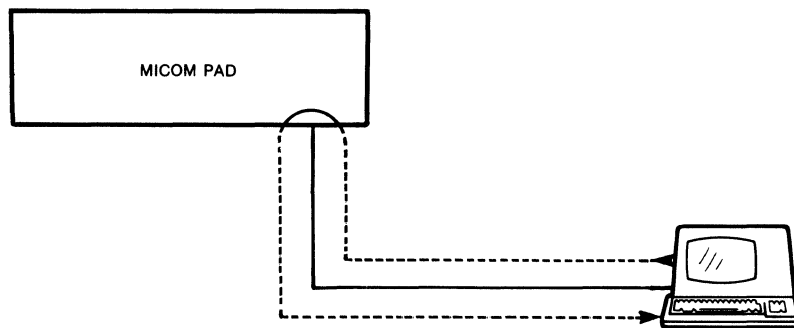
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Figure 6-4. Equipment Setup for the TACT LOCAL and TERMINAL Loopback Tests

6.4.4 TACT REMOTE Loopback Test

You use the TACTR Command to activate this loopback test of a remote chan-
nel. The test demonstrates the reliability of the connection to the Network.
On detecting this command, the PAD issues a call request over the X.25 trunk,
using its own address as the destination address. It is signaled to the user
by the tact call placed service message.

On detecting the incoming test call, the PAD routes the call to the request-
ing channel. This creates a loopback path through the Network's node. It is
signalled to the user by the com service message. If the call attempt fails,
a regular clear service signal notifies the user. Once the com message is
displayed, all data generated at the device is transmitted through this
loopback path back to the device.

Figure 6-5 is the format of the user/PAD dialogue used to test the remote
unit.
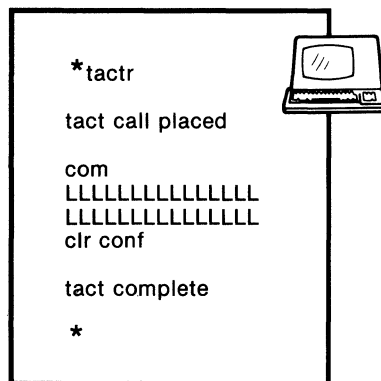
Figure 6-5. PAD User Dialogue for the TACT REMOTE Loopback Test

6.4.5 TACT SYSTEM Loopback Test

You use the TACTS Command to activate this loopback test. It causes a path to be set up between the terminal, the PAD, and the PDN X.25 node. It does so in the manner described in paragraph 6.4.4 (REMOTE Loopback Test). The PAD then sends a continuous stream of fox messages that pass through the trunk, the node, and then back to the device. The test demonstrates the reliability of the connection to the Network and of the system as a whole. The test is terminated when the PAD detects a BREAK signal. Figure 6-6 shows the format of the user/PAD dialogue for this test.


```
*tacts

tact call placed

com
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789
the quick brown fox jumps over the lazy dog 0123456789

clr conf

tact complete

*
```

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Figure 6-6. PAD User Dialogue for the TACT SYSTEM Loopback Test

6.4.6 Test Equipment Setup for the TACT REMOTE and the TACT SYSTEM Loopback
        Tests

Figure 6-7 shows you the equipment setup for a test of the remote unit.
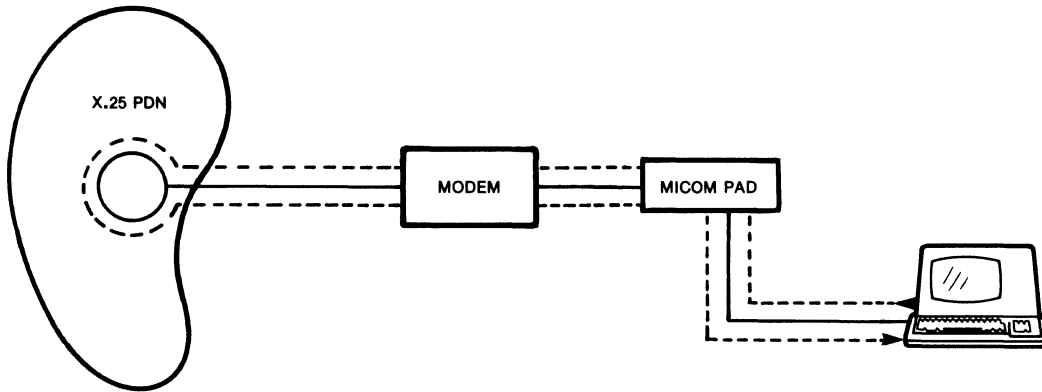
MI-1387-1a-50

Figure 6-7. Equipment Setup for the TACT REMOTE and SYSTEM Loopback Tests

NOTE: The TACTR and TACTS Commands initiate a loopback test through the
          Network. They therefore require two switched virtual circuits.

6.5 OPERATOR TROUBLESHOOTING

Table 6-4 lists a few problems that you might experience, and provides some items to check for each problem.

Table 6-4. Troubleshooting

Problem	Probable Cause	Items to Check
The unit does not operate when power is applied (fan does not operate).	Loss of power	Remove power cord plug from wall outlet for about two minutes. Reinsert plug in outlet. This resets the PAD power supply (tripped by a voltage surge). After disconnecting the power supply, test the fuse (see figure 1-3). Replace the fuse if necessary, and investigate the cause of failure. Test the ac wall outlet.
The unit does not operate when power is applied (fan is operating, but indicators on the base module do not go ON).	The problem is in the base module or power supply.	Simultaneously touch both Reset keys. If AT indicator is still OFF, replace base module or call MICOM Customer Service. Reseat the outside connectors of the base module. Test the base module by trying a spare base module in its place. Test the power supply by trying a spare power supply in its place.
All indicators are ON.	System is in a constant reset condition.	Make sure that the FEATUREPAK cartridge is installed properly. If all indicators are still ON, replace the base module or call MICOM Customer Service.
AT indicator on the base module is OFF.	Undefined	Simultaneously touch both Reset keys. If AT indicator is still OFF, replace base module or call MICOM Customer Service.

Table 6-4. Troubleshooting (continued)

Problem	Probable Cause	Items to Check
CO indicator is FLASHING.	Fault condition in the base module CMOS RAM	Replace the base module or call MICOM Customer Service.
AT and CA indicators on the base module are OFF. CO indicator is ON.	Fault condition in the base module RAM	Replace the base module or call MICOM Customer Service.
CO and CA indicators on the base module are ON. AT indicator is OFF.	Fault condition in the FEATUREPAK cartridge	Replace the FEATUREPAK cartridge. Replace the base module or call MICOM Customer Service.
CO indicator on the base module is ON; other indicators may be ON or FLASHING.	Hardware problem in the base module	Simultaneously touch both Reset keys. If CO is still ON, replace the base module or call MICOM Customer Service.
LD is ON.	Link is down.	Run TACTR or TACTS. If LD stays ON, call MICOM Customer Service.
BO indicator on the base module is ON.	High error rate on the link caused a buffer overflow.	Run TACTR or TACTS. Check the base module's LA indicator. LA FLASHING indicates retransmissions.
CL indicator on the base module is FLASHING.	TACTR/TACTS are active.	Enter BREAK to terminate the test and return the operation to the normal mode.
CA indicator is FLASHING.	CMOS RAM is corrupted, and PAD is reloading factory-set configuration values into CMOS.	Under normal conditions, the CA indicator keeps FLASHING, unless you change factory-set values. If you change the factory-set values, and the CA indicator continues to FLASH, check the value of the cold/warm start selection of soft switch group SYS1 (see figure 2-10).
BO and CO indicators on the base module are ON.	Problem with FEATUREPAK cartridge	Call MICOM Customer Service.

APPENDIX A

CONFIGURATION SHEETS

The configuration sheets summarize all the parameters that can be configured using the Command Facility. You should prepare these sheets carefully and completely before any configuration changes are implemented. Keep a copy of these sheets for future reference. Keep another copy in close proximity to the PAD.
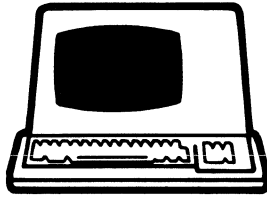
COMMAND FACILITY
COMMAND MENU

configure menu

1. channel
2. profile
3. special echo
4. remote par
5. trunk
6. svc/pvc
7. address id
8. cmdport
9. herald
10. bulletin
11. prompt
12. stat period
13. host autobaud
14. xcc
15. system par
16. nui
17. soft switches

select:

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SELECTION 1

ASYNCHRONOUS CHANNELS

RS-232-C CABLES	CHANNEL	PROFILE	CALL OPTION 1	CALL OPTION 2	ADDRESS ID MNEMONIC	CHANNEL OPTION	CLASS 1	CLASS 2	REMOTE PAR/ID
		1-24	TABLE 1	TABLE 2		TABLE 3	00-99	00-99	
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								

SELECTION 2

SELECTION 7

SELECTION 4

TABLE 1 — CALL OPTION 1

0	=	Enable incoming calls
1	=	Long form calls
2	=	Abbreviated calls
4	=	Auto call on "device ready"
8	=	Auto call on CR
16	=	Always pass call user data
32	=	Incoming calls barred
64	=	Extended EIA controls
128	=	Clear on data loss, if SVC. Reset if PVC
xxx	=	Any combination

TABLE 2 — CALL OPTION 2

0	=	None
1	=	Reserved
2	=	Reserved
4	=	Automatically append reverse charge facility
8	=	Leased line emulation for PVCs
16	=	HPX support
xx	=	Any combination

TABLE 3 — CHANNEL OPTION

0	=	Dedicated or Dedicated with extended EIA controls enabled [1]
1	=	Support auto answer modems
2	=	Ring-out or Ring-out with extended EIA controls enabled [1]
3	=	Auto answer
4	=	Ring-out (with security) [2] or Raise DCD (with security) [1,2]
6	=	Raise DCD
8	=	Host port
16	=	Priority channel
32	=	Enable call accounting
64	=	Disable X.28 extended mode
128	=	Micro600 line interface option
xxx	=	Combination of values [3]

[1] WHEN THIS CONNECTION TYPE IS SELECTED, EXTENDED EIA CONTROLS MUST BE ENABLED. TO ENABLE EXTENDED EIA CONTROLS, ENTER CALL NUMBER 64 (EXTENDED EIA CONTROLS) IN RESPONSE TO THE CALL OPTION 1 PROMPT.

[2] SEE TABLE 3-2 FOR AN EXPLANATION OF "SECURITY."

[3] OPTION NUMBERS 0 THROUGH 6 CANNOT BE COMBINED WITH EACH OTHER. OPTION NUMBERS 8 THROUGH 128 CAN BE COMBINED WITH EACH OTHER, OR WITH ONE OF THE 0 THROUGH 6 OPTIONS.

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SELECTION 2

PROFILE	x28acc	echo	data fwd	idletimer	dv flow	s.signal	break	discard output	cr pad	l.fold	speed	p.flow	autolf	lf pad	edit	c.del	l.del	l.disp	ed. ser. sig	echomask	parity treatment	page wait
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	(SEE [1])							N/A								(SEE [1])	(SEE [1])	(SEE [1])				
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						
21																						
22																						
23																						
24																						
	1	1	2	0	1	5	21		4	80	32	1	4	4	1	8	24	18	2	190	3	0
	0	0	0	20	0	0	0		0	0	12	0	0	0	0	0	0	0	1	255	0	0

◄——— Default Profile 1, 3 through 24 (Terminal Profile)

↖ Default Profile 2 (Host Computer Profile)

NOTE:
   SEE FACING PAGE FOR POSSIBLE PARAMETER VALUES.

[1] THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE.

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SELECTION 2 (continued)

PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
1	X28acc		0 = Not possible 1 = Possible by character DLE (Ctrl-P) or . . . . 2-126 = Decimal value of ASCII character used to access the X.28 mode.
2	echo		0 = Disable echo 1 = Enable echo
3	data fwd		0 = No data forwarding 4 = ESC, BEL, ENQ, or ACK 32 = HT, LF, VT, or FF 1 = Alphanumeric characters 8 = DEL, CAN, or DC2 64 = All other characters in columns 0 2 = CR 16 = EOT or ETX and 1 of the ASCII chart. XXX = Any combination of above values.
4	idletimer		0 = No idle timer 1-255 = Inactivity period multiplied by 50 ms (If parameter 119, telex, is disabled). Maximum period is 12.75 seconds. = Inactivity period multiplied by 200 ms (If parameter 119, telex, is enabled). Maximum period is 51 seconds.
5	dv flow		0 = PAD does not use XON/XOFF flow control. 1 = PAD uses XON/XOFF flow control in data transfer mode only. 2 = PAD uses XON/XOFF flow control in both data transfer mode and command mode.
6	s.signal		0 = No PAD messages or service prompt 4 = PAD outputs service prompt only 1 = PAD outputs messages only 5 = PAD outputs prompt and messages.
7	break		0 = No action 2 = Reset packet sent 8 = Escape to X.28 mode 1 = Interrupt packet sent 4 = Indication of break PAD message 16 = Discard output to device XX = Any combination of above values
9	cr pad		0 = None 1-127 = Number of padding characters after CR.
10	l.fold		0 = No linefolding 1-255 = Number of characters that trigger linefolding
11	speed		0 = 110 bps 3 = 1200 bps 6 = 150 bps 9 = 100 bps 12 = 2400 bps 32 = Autobaud (110-9600 1 = 134.5 bps 4 = 800 bps 7 = 1800 bps 10 = 50 bps 13 = 4800 bps bps, except 134.5 2 = 300 bps 5 = 75 bps 8 = 200 bps 14 = 9600 bps bps)
12	p.flow		0 = Device cannot exercise flow control over PAD 1 = Device can exercise flow control using XON/XOFF characters.
13	autolf		0 = No line feed insertion 4 = LF after CR when echoing 6 = PAD transmits LF when echoing 1 = LF after CR from remote DTE 5 = LF after CR to device when echo or transmitting CR 2 = LF after CR sent to remote DTE remote DTE sends CR 7 = PAD transmits LF after all CR 3 = LF after CR from or to remote DTE
14	lf pad		0 = No line feed padding 1-127 = number of nulls padding after line feed.
15	edit		0 = No editing 1 = Editing enabled
16	c.del		0-127 = Decimal value of character used for character delete
17	l.del		0-127 = Decimal value of character used for line delete
18	l.disp		0-127 = Decimal value of character used for line display.
19	ed.ser.sig		0 = No editing service signals will be sent 1 = The character \ will be sent for a character deletion. The characters xxx CR LF will be sent for a line deletion. 2 = The characters BS space BS will be sent for a character deletion. For a line deletion, BS space BS will be sent n times, where n equals the number of characters in the line. 3-126 = The defined ASCII character will be sent for a character deletion. The characters xxx CR LF will be sent for a line deletion.
20	echomask		0 = No echomask (all characters are echoed) 16 = No echo of ESC or ENQ 128 = No echo of characters with a 1 = No echo of CR 32 = No echo of ACK, NAK, decimal value of 31 or below 2 = No echo of LF STX, SOH, EOT, ETB, or ETX except CR, LF, VT, HT, FF, BEL, 4 = No echo of VT, HT, or FF 64 = No echo of the editing BS, ESC, ENQ, ACK, NAK, STX, 8 = No echo of BEL or BS characters defined by SOH, EOT, ETB, ETX, and DEL. parameters 16, 17, and 18 XXX = Any combination
21	parity treatment		0 = Disable parity checking; Disable parity generation 2 = Enable parity generation 1 = Enable parity checking 3 = Enable parity checking; Enable parity generation
22	page wait		0 = Disable page waits 1-255 = The number of linefeeds the PAD will transmit before initiating a page wait condition.

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SELECTION 2 (continued)

	bits/char	dv.parity	net.parity	c.xon	c.xoff	special flow	count fwd	escdelay	c.break	c.supp	c.subs	echoctrl	special echo id	pagelength	c.page	ff pad	inactivity	X29acc	flow count	telex	PROFILE
	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	
				(SEE [1])	(SEE [1])				(SEE [1])	(SEE [1])	(SEE [1])				(SEE [1])			(SEE[1])			
																					1
																					2
																					3
																					4
																					5
																					6
																					7
																					8
																					9
																					10
																					11
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																					16
																					17
																					18
																					19
																					20
																					21
																					22
																					23
																					24
	2	5	0	17	19	0	0	0	0	26	42	0	0	0	0	0	0	0	0	0	
	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

MICOM ENHANCED PARAMETERS

Default
Profile 1, 3 through 24
(Terminal Profile)

Default
Profile 2
(Host Computer Profile)

See
Selection 3

NOTE:
  SEE FACING PAGE FOR POSSIBLE PARAMETER VALUES.

[1] THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE.

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SELECTION 2 (continued)

PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
100	bits/char		0 = 5 bits 1 = 6 bits 2 = 7 bits 3 = 8 bits
101	dv.parity		0 = Transparent parity 2 = Mark 4 = Odd 1 = Space 3 = Even 5 = Auto parity as determined by auto-baud sequence
102	net.parity		0 = Pass data as received 2 = Mark 4 = Odd 1 = Space 3 = Even
103	c.xon		0 = ignored 1-127 = Decimal value of ASCII character for XON
104	c.xoff		0 = ignored 1-127 = Decimal value of ASCII character for XOFF
105	special flow		0 = None 2 = PAD can flow control device with CTS x = Any combination 1 = Device can flow control PAD with RTS 4 = PAD issues BEL character to device in CTS flow control
106	count fwd		0 = No forwarding on character count 1-255 = Number of characters that will trigger data forwarding
107	escdelay		0 = No special handling 1-255 = The forwarding delay time after ESC input, selected in .05 second increments
108	c.break		0 = Normal break signal 1-127 = Decimal value of an ASCII character to be interpreted by the PAD as a break key.
109	c.supp		0 = Disable mechanism 1-127 = Decimal value of the ASCII character used to trigger the echo suppression mechanism.
110	c.subs		0 = No character is echoed 1-127 = Decimal value of an ASCII character used for substitution character
111	echoctrl		0 = Device input priority 4 = Synchronize local field with incoming data formatting screens 1 = No priority 2 = Computer output priority X = Selective combination
112	special echo id.		0 = Disable 1-3 = Echo sequence ID associated with that device profile
113	pagelength		0 = No auto page feed 1-255 = Number of lines per page.
114	c.page		0 = Ignored 1-127 = Decimal value of the character to trigger the page function
115	ff pad		0 = No form feed padding 1-127 = Number of padding nulls that follow a Form Feed character.
116	inactivity		0 = No disconnection on inactivity 1-255 = Timer value in 1 minute increments.
117	X29acc		0 = X.29 access disallowed 1-127 = Decimal value of ASCII character to enable X.29 access
118	flow count		0 = Normal buffer allocation 1-100 = Each channel will be allowed the entered number of physical buffers if total buffer utilization is 50 percent or less. If total buffer utilization is over 50 percent, each channel will be allowed either the entered number of buffers, or seven buffers — whichever is less.
119	telex		0 = Disable telex support 8 = FIGS H equals the end-of-message, and is translated as an ASCII ETX. 1 = Enable telex support 16 = nnnn equals the end-of-message, and is translated as an ASCII ETX. 2 = If no data activity has occurred for 10 seconds, the PAD will send a letter shift to the terminal one second before transmitting data, to turn the motor on. XX = Any combination 4 = The string CR LF FIGS V equals the end-of-message, and is translated as an ASCII ETX.

SELECTION 3

SEQUENCE ID	COUNT	SPECIAL ECHO				
		ECHO SEQUENCE TRIGGER CHARACTER	1ST ECHOUT CHARACTER	2ND ECHOUT CHARACTER	3RD ECHOUT CHARACTER	4TH ECHOUT CHARACTER
1		ANY GRAPHIC CHARACTER (∧@ = CTRL @)				
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
2						
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
3						
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					

from Selection 2

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SELECTION 4

from Selection 1

SET REMOTE PARAMETERS

Header columns (angled): REMOTE PAR/ID, 1ST PARAMETER REF, PARAMETER VALUE, 2ND PARAMETER REF, PARAMETER VALUE, 3RD PARAMETER REF, PARAMETER VALUE, 4TH PARAMETER REF, PARAMETER VALUE, 5TH PARAMETER REF, PARAMETER VALUE, 6TH PARAMETER REF, PARAMETER VALUE, 7TH PARAMETER REF, PARAMETER VALUE, 8TH PARAMETER REF, PARAMETER VALUE, 9TH PARAMETER REF, PARAMETER VALUE, 10TH PARAMETER REF, PARAMETER VALUE

DEFINE UP TO 20 PARAMETERS

	1	2	3	4	5	6	7	8	9	10
1	:	:	:	:	:	:	:	:	:	:
2	:	:	:	:	:	:	:	:	:	:
3	:	:	:	:	:	:	:	:	:	:
4	:	:	:	:	:	:	:	:	:	:
5	:	:	:	:	:	:	:	:	:	:

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SELECTION 4 (continued)

SET REMOTE PARAMETERS

11TH PARAMETER REF / PARAMETER VALUE	12TH PARAMETER REF / PARAMETER VALUE	13TH PARAMETER REF / PARAMETER VALUE	14TH PARAMETER REF / PARAMETER VALUE	15TH PARAMETER REF / PARAMETER VALUE	16TH PARAMETER REF / PARAMETER VALUE	17TH PARAMETER REF / PARAMETER VALUE	18TH PARAMETER REF / PARAMETER VALUE	19TH PARAMETER REF / PARAMETER VALUE	20TH PARAMETER REF / PARAMETER VALUE	REMOTE PAR./ID
DEFINE UP TO 20 PARAMETERS										
11	12	13	14	15	16	17	18	19	20	
:	:	:	:	:	:	:	:	:	:	1
:	:	:	:	:	:	:	:	:	:	2
:	:	:	:	:	:	:	:	:	:	3
:	:	:	:	:	:	:	:	:	:	4
:	:	:	:	:	:	:	:	:	:	5

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SELECTION 5

TRUNK PARAMETERS

PAD ADDRESS	CLASS SELECT	PASSWORD	IN CALL	OUT CALL	K OUTSTANDING FRAMES	T1 LINE TIMEOUT	N2 RETRANSMISSIONS	T3 LINK ASSURANCE TIMER	W OUTSTANDING PACKETS	PACKET SIZE 1 = 128, 8 = 256	SEGMENT SIZE CODE 4 = 16 5 = 32, 6 = 64, 7 = 128, 8 = 256	NUI TYPE	NUI VALIDATION
1-15 NUMERIC CHARACTERS	TABLE 4	ASCII CHARACTERS	TABLE 5	TABLE 6	1-15 [1]	1-15	1-20	0-255	2-7	7,8	4-8	TABLE 7	TABLE 8
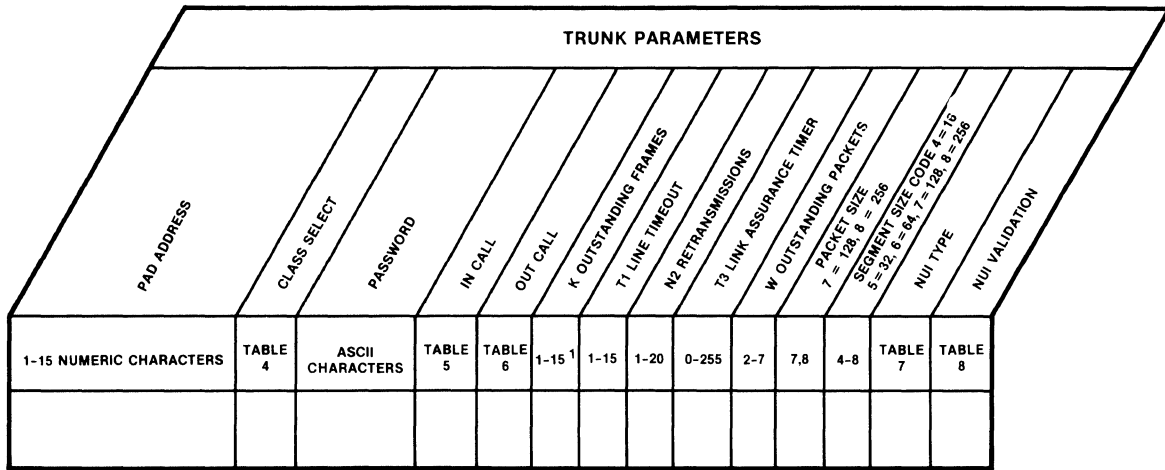
TABLE 4 — CLASS SELECT OPTIONS

0 = Use of call user data
1 = Use of X.121 subaddress field
2 = Disable class selection

TABLE 5 — INCOMING CALL CHARACTERISTICS

0 = No in call options enabled
1 = Accept reverse charge
2 = Trunk password required
4 = Accept fast select
8 = Allow use of LGN = 0 LCN = 0
16 = Restart if incoming call on undefined logical channel
xx = Any combination

TABLE 6 — OUTGOING CALL CHARACTERISTICS

0 = Call packet with calling address field
1 = No calling address
2 = Append channel number to calling address
4 = 1980 call accept packet with option fields
8 = All calls reverse charge
16 = Use packet negotiation
32 = Use window negotiation
xx = Any combination

TABLE 7 — NUI TYPE

0 = No NUI support
1 = DCS version of NUI-NUA
2 = Channel password protection
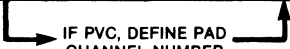
TABLE 8 — NUI VALIDATION

0 = Do not validate NUI
1 = Validate NUI
2 = Clear call if validation fails
4 = Strip NUI from facilities field if validation passes
x = Any combination

[1] VALUES 8 THROUGH 15 ARE VALID ONLY IF THE PAD IS ENABLED FOR EXTENDED FRAME SEQUENCING (SOFT SWITCH GROUP SYS 1, SELECTION 7).

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SELECTION 6

	TYPE OF VIRTUAL CHANNEL	LOGICAL CHANNEL NUMBERS		PAD CHANNEL NUMBER
		LOGICAL GROUP	LOGICAL CHANNEL	
	SVC OR PVC	00-15	00-255	1-16
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

IF PVC, DEFINE PAD CHANNEL NUMBER

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SELECTION 7

	MNEMONIC	ADDRESS ID DEFINITION					
		ADDRESS	CLASS (SUBADDRESS)	FACILITY	CUG ID	PROTOCOL ID	USERDATA
	TWO TO EIGHT ALPHA-NUMERIC CHARACTERS	DTE ADDRESS 1-15 NUMERIC	01-99	TABLE 9	00-99	EIGHT HEXADECIMALS	0-12 ASCII CHARACTERS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

TABLE 9 — FACILITY OPTIONS

0	=	No facility
1	=	Reverse charging
4	=	Closed user group
8	=	128 byte packet negotiation
16	=	Throughput class
32	=	Nonstandard protocol ID
64	=	Append class (subaddress) to called address
xxx	=	Any combination

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SELECTION 7 (continued)

MNEMONIC	ADDRESS ID DEFINITION					
	ADDRESS	CLASS (SUBADDRESS)	FACILITY	CUG ID	PROTOCOL ID	USERDATA
TWO TO EIGHT ALPHA-NUMERIC CHARACTERS	DTE ADDRESS 1–15 NUMERIC	01-99	TABLE 9	00-99	EIGHT HEXADECIMALS	0-12 ASCII CHARACTERS

21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

TABLE 9 — FACILITY OPTIONS

0	=	No facility
1	=	Reverse charging
4	=	Closed user group
8	=	128 byte packet negotiation
16	=	Throughput class
32	=	Nonstandard protocol ID
64	=	Append class (subaddress) to called address
xxx	=	Any combination

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SELECTION 8

	PROFILE	CLASS 1	CLASS 2	AUDIT LOG
		(SEE [1])	(SEE [1])	
REMARKS	1-24	00-99	00-99	TABLE 10

COMMAND PORT

Selection 2

COMMAND FACILITY ——————
0 = DISABLE REMOTE ACCESS

X.25 CONTROL CENTER ACCESS ——————

TABLE 10 — COMMAND PORT AUDIT LOG OPTIONS

0 = Disable call accounting
    and event reporting to
    both the X.25 Control Center
    and the Command
    Port

1 = Enable Command Port logging
    of all accounting records
    and selected events

2 = Send accounting data and all
    events to the X.25 Control
    Center

3 = Both 1 and 2

---

[1] MUST NOT BE ASSIGNED THE SAME VALUE

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SELECTION 9

HERALD

HERALD MESSAGE

0-32 ASCII CHARACTERS [1]

SELECTION 10

BULLETIN

BULLETIN MESSAGE

0-120 ASCII CHARACTERS [1]

SELECTION 11

PROMPT

PROMPT MESSAGE

0-16 ASCII CHARACTERS [1]

SELECTION 12

STAT PERIOD

PERIODIC REPORTING

TABLE 1·

SELECTION 13

HOST AUTOBAUD

OUTBOUND AUTOBAUD SEQUENCE

1-4 ASCII CHARACTERS [1]
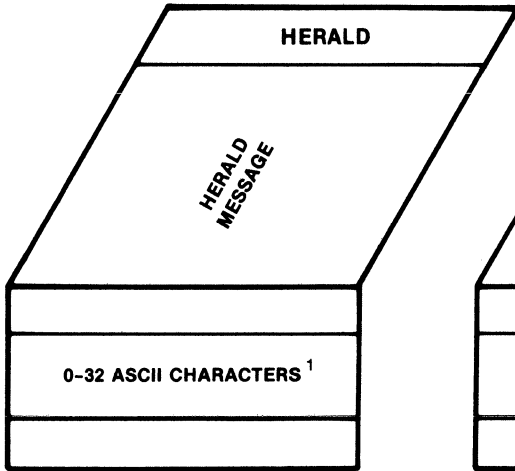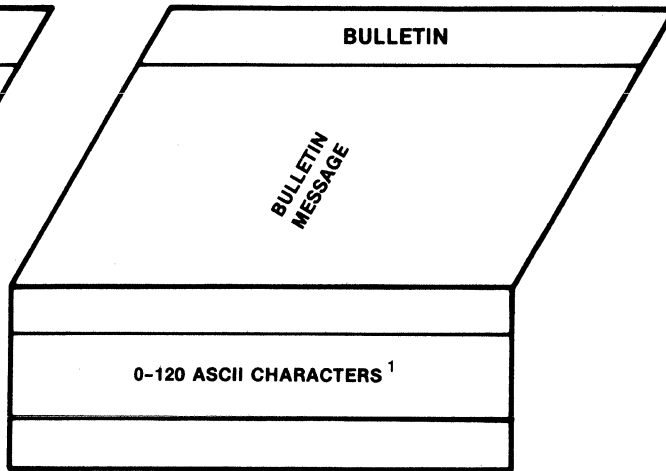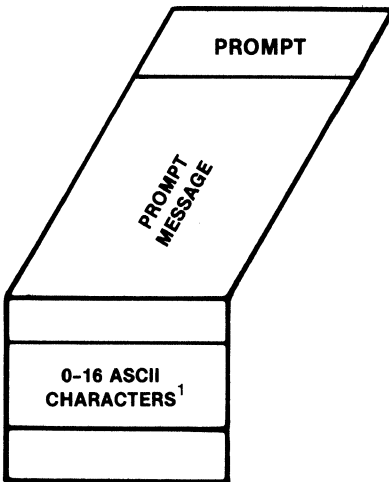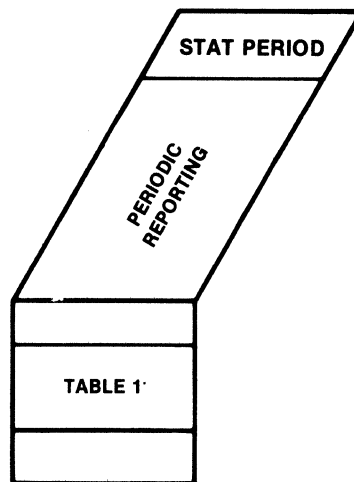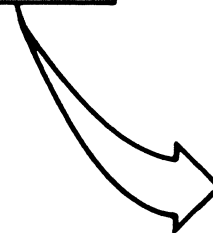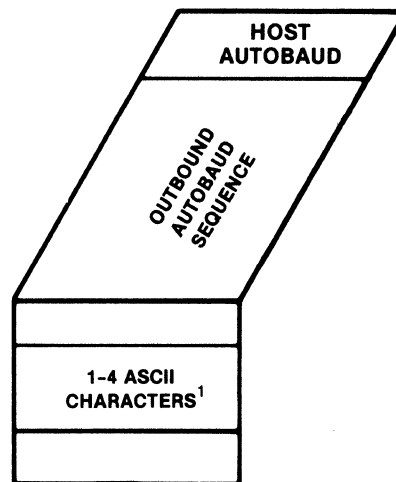
TABLE 11 — PERIODIC REPORTING OPTIONS
0 = Disable
1-6 = Number of 10 minute intervals

[1] TO DEFINE A CONTROL CHARACTER, ENTER ∧ FOLLOWED BY APPROPRIATE CHARACTER. EXAMPLE: CTRL-M (CR) = ∧ M

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SELECTION 14

XCC				
ADDRESS	FACILITY	CUG ID	PROTOCOL ID	USERDATA
1-15 NUMERIC	TABLE 12	00-99	8 HEX-ADEC-IMALS	0-12 ASCII CHAR-ACTERS
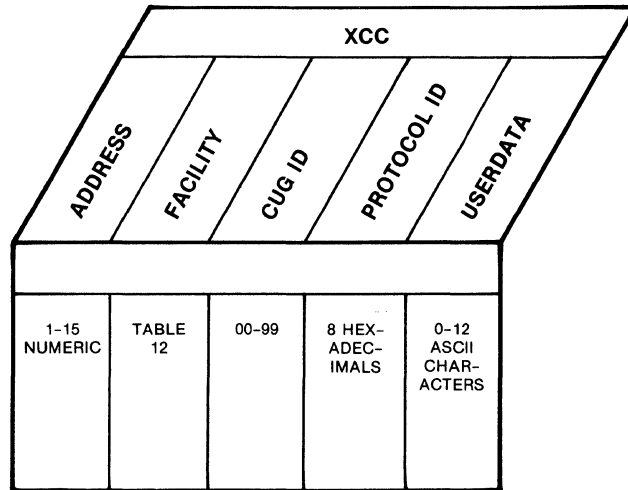
TABLE 12 — FACILITY OPTIONS

```
 0 = No facility
 1 = Reverse charging
 4 = Closed user group
 8 = 128 byte packet negotiation
32 = Non-standard protocol ID
xx = Combination
```

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SELECTION 15

```
                    ┌─────────────────────────────┐
                   ╱        SYSTEM PAR             ╱
                  ╱────────────┬─────────────────╱
                 ╱             │                 ╱
                ╱    VALUE1     │     VALUE2      ╱
               ╱               │                 ╱
              ┌───────────────┼─────────────────┐
              │               │                 │
              │    TABLE      │    RESERVED      │
              │     13        │  (ENTER A CR)    │
              │               │                 │
              ├───────────────┼─────────────────┤
              └───────────────┴─────────────────┘
```
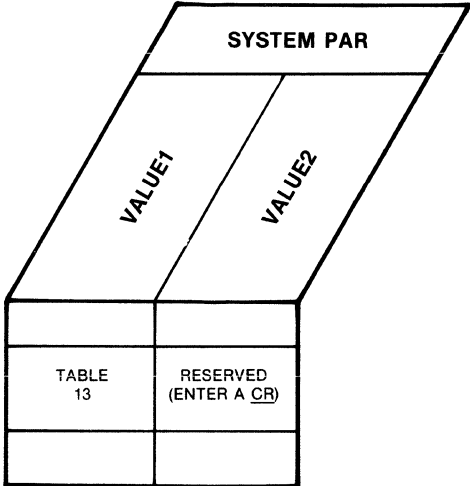
TABLE 13 — VALUE1 OPTIONS

0 =	Enable local switching between channels
1 =	Disable local switching between channels
2 =	Disable TACTR and TACTS on channels
4 =	Reserved
x =	Combination

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SELECTION 16

ENTRY NUMBER	NUA	NUI
	1-15 NUMERIC DIGITS	UP TO 10 ALPHANUMERIC CHARACTERS. THE FOLLOWING ARE NOT ALLOWED: SPACE DELETE —, + CR
001		
002		
003		
004		
005		
006		
007		
008		
009		
010		
011		
012		
013		
014		
015		
016		
017		
018		
019		
020		
021		
022		
023		
024		
025		

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SELECTION 16 (continued)

ENTRY NUMBER	NUA 1-15 NUMERIC DIGITS	NUI UP TO 10 ALPHANUMERIC CHARACTERS. THE FOLLOWING ARE NOT ALLOWED: SPACE DELETE —, + CR
026		
027		
028		
029		
030		
031		
032		
033		
034		
035		
036		
037		
038		
039		
040		
041		
042		
043		
044		
045		
046		
047		
048		
049		
050		

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SELECTION 16 (continued)

ENTRY NUMBER	NUA 1-15 NUMERIC DIGITS	NUI UP TO 10 ALPHANUMERIC CHARACTERS. THE FOLLOWING ARE NOT ALLOWED: SPACE DELETE —, + CR
051		
052		
053		
054		
055		
056		
057		
058		
059		
060		
061		
062		
063		
064		
065		
066		
067		
068		
069		
070		
071		
072		
073		
074		
075		

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SELECTION 16 (continued)

ENTRY NUMBER	NUA	NUI
	1-15 NUMERIC DIGITS	UP TO 10 ALPHANUMERIC CHARACTERS. THE FOLLOWING ARE NOT ALLOWED: SPACE DELETE —,+ CR
076		
077		
078		
079		
080		
081		
082		
083		
084		
085		
086		
087		
088		
089		
090		
091		
092		
093		
094		
095		
096		
097		
098		
099		
100		

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SELECTION 17

SOFT SWITCHES

SYS1   SYS2   SYS3

TABLE 14   TABLE 14   TABLE 14
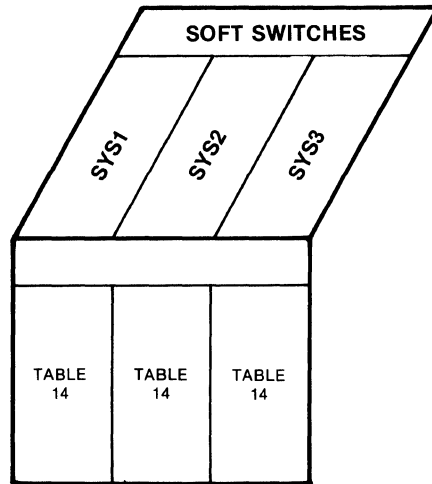
TABLE 14 — VALUES FOR SYS1, SYS2, SYS3

0	=	ALL POSITIONS ARE OFF
1	=	SWITCH POSITION 1
2	=	SWITCH POSITION 2
4	=	SWITCH POSITION 3
8	=	SWITCH POSITION 4
16	=	SWITCH POSITION 5
32	=	SWITCH POSITION 6
64	=	SWITCH POSITION 7
128	=	SWITCH POSITION 8
xxx	=	COMBINATION OF VALUES

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APPENDIX B

FACTORY PARAMETER SETTINGS

B.1 PARAMETER VALUES

   Besides the settings that can be altered by the configuration switch groups,
the PAD is conditioned on cold start with the following parameter values:

   1. All channels are:

       • Set to long form call only.

       • Set to dedicated connection.

       • Associated with device Profile 1.

       • Used for subaddressing:

           - Class 1 = 0

           - Class 2 = Channel number (that is, Class 2 of Channel number
               3 = 3).

   2. The trunk parameters are set to the following:

       K   = 7
       T1   = 5
       N2   = 10
       W   = 2
       T3   = 15
       Packet size   = 7
       Segment size   = 6
       NUI type   = 0 (NUI support disabled)
       NUI validation = 0 (NUI validation disabled)

   3. The Command Port parameters:

       • Are set to class 1 = 99.
       • Have the ability to make long-form or abbreviated calls.
       • Have the Command Port associated with device Profile 1.

   4. The Herald Message is: mb3-x.25 async pad channel nn.

   5. The Bulletin Message is not defined.

   6. The X.28 Service Prompt is an *.

   7. The Command Facility password is MX25.

   8. Time and date are set to 0.

9. The PAD's own address is set to 00.

10. The PAD uses the X.121 subaddressing method.

B.2 DEVICE PROFILES

1. There are two different types of default device profiles. All 24
   profiles are initialized as follows:

Profile	Type	Default Profile Number
1	Terminal	1
2	Host Computer	2
3-24	Terminal	1

The terminal type device profile is suitable for start/stop devices.
The host type device profile is suitable for connecting host computers
to the PAD channels. It is to be used where the PAD is front-ending the
asynchronous host computer (see table B-1 at the end of this appendix).

B.2.1 Terminal Profile

With the Terminal Profile, the following operations are available:

* The PAD will perform autobaud, up to 9600 bps (Parameter 11), and auto-
  parity (Parameter 101).

* The user can access X.28 mode by the Ctrl-P character (Parameter 1).

* The PAD will echo the terminal input (Parameter 2). The terminal should
  be set to full-duplex.

* Data will be forwarded to the Network when the PAD detects a CR
  character input at the terminal (Parameter 3).

* The PAD and the device can exercise flow control, using XON/XOFF
  characters Ctrl-Q/Ctrl-S (Parameters 5 and 12).

* The terminal will receive all service signals and PAD messages
  (Parameter 6).

* When the BREAK key is pressed, the terminal will cause the PAD to
  transmit both a Break Indication Packet and an Interrupt Packet. It
  will also purge all data destined for the terminal (Parameter 7).

* The PAD will transmit four null characters following each CR character
  transmitted to the terminal (Parameter 9).

- The PAD will output data lines having a maximum length of 80 characters. They will automatically insert LF and CR after 80 characters output (Parameter 10).

- The PAD will transmit an LF character to the terminal when it detects a CR character from the terminal (Parameter 13).

- The PAD will transmit four null characters following each LF character transmitted to the terminal (Parameter 14).

- The following local editing functions are enabled during data entry mode (Parameter 15).

    - The Ctrl-H character is used to delete a character (Parameter 16).

    - The Ctrl-X character is used to delete the user buffer (Parameter 17).

    - The Ctrl-R character is used to re-display the user's input (Parameter 18).

- The PAD will assume that the device type is a video display for service signals in the editing mode; therefore, the sequence BS SPACE BS will be transmitted to the device once in response to a character deletion, and n times in response to a line deletion (where n equals the number of characters in the line) (Parameter 19).

- The PAD will echo all terminal-transmitted characters except the following (Parameter 20):

    ESC, BEL, ENQ, ACK, DEL, CAN, DC2, ETX, EOT, HT, LF, VT, FF, SO, SI, DLE, DC1, DC3, DC4, NAK, SYN, ETB, EM, SUB, FS, GS, RS, US.

- The user can set the PAD so that it will not echo his input, by preceding it with a Ctrl-Z. The PAD will then echo the character * for each character entered. To disable that mode, the user must again key the Ctrl-Z character (Parameters 109 and 110).

B.2.2 Host Computer Profile

The Host Computer profile supports the following operations:

- The PAD will support a fixed speed of 2400 bps for asynchronous channel connection to the host (Parameter 11).

- The PAD will not perform echoing or parity checking (Parameter 2).

- The PAD will not generate PAD messages or service signals to the host (Parameter 6).

- The PAD and the host can exercise flow control over each other using the RTS/CTS EIA method (Parameter 105).

- Data will be forwarded to the Network when the 1-second idle timer expires (Parameter 4). This follows the last byte from the host computer.

Table B-1. Default Device Profiles

Parameters	Parameter Numbers	Parameter Values	
		Profile Number 1 Terminal Type	Profile Number 2 Host Computer Type
PAD Recall	1	1	0
Echo	2	1	0
Data Forward	3	2	0
Idle Timer	4	0	20
Device XON/XOFF	5	1	0
Service Signal	6	5	0
BREAK Handling	7	21	0
Discard Output	8	0	0
CR Padding	9	4	0
Line Folding	10	80	0
Speed	11	32	12
PAD XON/XOFF	12	1	0
Auto LF Insertion	13	4	0
LF Padding	14	4	0
Edit	15	1	0
Char Delete	16	8	0
Line Delete	17	24	0
Line Display	18	18	0
Editing Service Signals	19	2	1
Echo Mask	20	190	255
Parity Treatment	21	3	0
Page Wait	22	0	0
Bits per Character	100	2	2
Device Parity	101	5	0
Network Parity	102	0	0
XON Char	103	17	0
XOFF Char	104	19	0
Enhanced Flow Control	105	0	3
Data Fwd Count	106	0	0
ESC Timer	107	0	0
Sp Break Char	108	0	0
Temp Echo Supp Char	109	26	0
Echo Subst Char	110	42	0
Echo Control	111	0	0
Special Echo Seq. ID	112	0	0
Page Length	113	0	0
Form Feed Character	114	0	0
Form Feed Padding	115	0	0
Inactivity Timer	116	0	0
X.29 Access Char	117	0	0
Flow Count	118	0	0
Telex	119	0	0

NOTE:
   The MICOM enhanced parameters are numbered 100 through 119. The CCITT
   parameters are numbered 1 through 22.

ASCII CHART

CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
NUL 0	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112
SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113
STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
ETX 3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
EOT 4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116
ENQ 5	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117
ACK 6	SYN 22	& 38	6 54	F 70	V 86	f 102	v 118
BEL 7	ETB 23	' 39	7 55	G 71	W 87	g 103	w 119
BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
HT 9	EM 25	) 41	9 57	I 73	Y 89	i 105	y 121
LF 10	SUB 26	* 42	: 58	J 74	Z 90	j 106	z 122
VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123
FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	¦ 124
CR 13	GS 29	− 45	= 61	M 77	] 93	m 109	} 125
SO 14	RS 30	. 46	> 62	N 78	∧ 94	n 110	∿ 126
SI 15	US 31	/ 47	? 63	O 79	— 95	o 111	RUBOUT (DEL) 127

KEY

NAK 21	ASCII character decimal

MT-000-01

APPENDIX D

CONFIGURATION OF A LOCAL X.25 CONTROL CENTER (XCC) PAD

As described in paragraph 1.6, MICOM offers an optional product, the XCC (X.25 Control Center), that provides the user with centralized PAD management. The XCC is physically attached to a MICOM PAD (known as the local PAD). Through the local PAD, the XCC interfaces with the remote PADs that it manages (see figure 1-9).

As described in this appendix, the local PAD must be appropriately configured to communicate with the XCC. This configuration is performed through the PAD's Command Port. The minimum configuration requirements for the local XCC PAD include the following:

- Asynchronous channel definitions for the two XCC interface channels

- A device profile (device profile number 24 is recommended, and is shown on the configuration sheets in this appendix)

- Trunk parameters

- At least two SVCs

Refer to section 5 for the general operating procedures for the PAD Command Port and for information on configuring remote XCC PADs. Use the configuration sheets at the end of this appendix to configure the two XCC interface channels and their associated profile for the local XCC PAD.

You must complete the PAD Address and Class Select fields in the trunk configuration (refer to paragraph 5.5.6). The remaining default values for the trunk configuration are compatible with XCC operation. When your network requires it, the PAD address should be set to the address that will allow remote PADs to call in for downline loads of operating parameters, or to report call accounting and events. The Class Select field must be set to one of the following values:

    0 = Use of call user data
    1 = Use of X.121 subaddress field

The preceding value must be compatible with the subaddressing scheme supported by your network, and must be the same as all remote PADs that the XCC will manage. It is not possible for the XCC to communicate with a PAD that has a different Class Select value.

In the SVC/PVC configuration (refer to paragraph 5.5.7), you must specify at least two SVCs and assign a logical channel and group number to each. The two SVCs are necessary to support simultaneous operation of the two XCC channels. The following comments are important to the proper assignment of SVCs:

- Do not configure unassigned numbers nor more circuits than you have subscribed to. The PAD can be set to ignore calls or to restart the trunk, when it detects an incoming call over an undefined circuit. This condition results in performance degradation.

- When a user places a call, the PAD will use the highest numbered, free logical channel that is defined for SVC operation. On the other hand, the network's incoming call uses the lowest numbered, free logical channel. If you configure more logical channels than subscribed to, the network will clear the PAD's call requests and indicate a local procedural error.

SELECTION 1

ASYNCHRONOUS CHANNELS

	CHANNEL	PROFILE	CALL OPTION 1	CALL OPTION 2	ADDRESS ID MNEMONIC	CHANNEL OPTION	CLASS 1	CLASS 2	REMOTE PAR./ID
RS-232-C CABLES		1-24	TABLE 1	TABLE 2		TABLE 3	00-99	00-99	
100-2645-xx	1	24	1	0	0	0	97	97	0
100-2645-xx	2	24	1	0	0	0	97	97	0
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								

SELECTION 2

SELECTION 4

SELECTION 7

TABLE 1 — CALL OPTION 1

0 =	Enable incoming calls
1 =	Long form calls
2 =	Abbreviated calls
4 =	Auto call on "device ready"
8 =	Auto call on CR
16 =	Always pass call user data
32 =	Incoming calls barred
64 =	Extended EIA controls
128 =	Clear on data loss, if SVC. Reset if PVC
xxx =	Any combination

TABLE 2 — CALL OPTION 2

0 =	None
1 =	Reserved
2 =	Reserved
4 =	Automatically append reverse charge facility
8 =	Leased line emulation for PVCs
16 =	HPX support
xx =	Any combination

TABLE 3 — CHANNEL OPTION

0 =	Dedicated or Dedicated with extended EIA controls enabled [1]
1 =	Support auto answer modems
2 =	Ring-out or Ring-out with extended EIA controls enabled [1]
3 =	Auto answer
4 =	Ring-out (with security) [2] or Raise DCD (with security) [1, 2]
6 =	Raise DCD
8 =	Host port
16 =	Priority channel
32 =	Enable call accounting
64 =	Disable X.28 extended mode
128 =	Micro600 line interface option
xxx =	Combination of values [3]

[1] WHEN THIS CONNECTION TYPE IS SELECTED, EXTENDED EIA CONTROLS MUST BE ENABLED. TO ENABLE EXTENDED EIA CONTROLS, ENTER CALL NUMBER 64 (EXTENDED EIA CONTROLS) IN RESPONSE TO THE CALL OPTION 1 PROMPT.

[2] SEE TABLE 3-2 FOR AN EXPLANATION OF "SECURITY."

[3] OPTION NUMBERS 0 THROUGH 6 CANNOT BE COMBINED WITH EACH OTHER. OPTION NUMBERS 8 THROUGH 128 CAN BE COMBINED WITH EACH OTHER, OR WITH ONE OF THE 0 THROUGH 6 OPTIONS.

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SELECTION 2

PROFILE	x28acc	echo	data fwd	idletimer	dv flow	s.signal	break	discard output	cr pad	l.fold	speed	p.flow	autolf	lf pad	edit	c.del	l.del	l.disp	ed.ser.sig	echomask	parity treatment	page wait
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	(SEE [1])							N/A								(SEE [1])	(SEE [1])	(SEE [1])				
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						
21																						
22																						
23																						
24	1	0	2	0	1	5	0		0	0	14	1	0	0	1	0	0	0	2	0	0	0
	1	1	2	0	1	5	21		4	80	32	1	4	4	1	8	24	18	2	190	3	0
	0	0	0	20	0	0	0		0	0	12	0	0	0	0	0	0	0	1	255	0	0

Required XCC Profile Values

Default Profile 1, 3 through 24 (Terminal Profile)

Default Profile 2 (Host Computer Profile)

NOTE:
   SEE FACING PAGE FOR POSSIBLE PARAMETER VALUES.

[1] THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE.

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SELECTION 2 (continued)

PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
1	X28acc		0 = Not possible 1 = Possible by character DLE (Ctrl-P) or . . . . 2-126 = Decimal value of ASCII character used to access the X.28 mode.
2	echo		0 = Disable echo 1 = Enable echo
3	data fwd		0 = No data forwarding 4 = ESC, BEL, ENQ, or ACK 32 = HT, LF, VT, or FF 1 = Alphanumeric characters 8 = DEL, CAN, or DC2 64 = All other characters in columns 0 2 = CR 16 = EOT or ETX and 1 of the ASCII chart. XXX = Any combination of above values.
4	idletimer		0 = No idle timer 1-255 = Inactivity period multiplied by 50 ms (If parameter 119, telex, is disabled). Maximum period is 12.75 seconds. = Inactivity period multiplied by 200 ms (If parameter 119, telex, is enabled). Maximum period is 51 seconds.
5	dv flow		0 = PAD does not use XON/XOFF flow control. 1 = PAD uses XON/XOFF flow control in data transfer mode only. 2 = PAD uses XON/XOFF flow control in both data transfer mode and command mode.
6	s.signal		0 = No PAD messages or service prompt 4 = PAD outputs service prompt only 1 = PAD outputs messages only 5 = PAD outputs prompt and messages.
7	break		0 = No action 2 = Reset packet sent 8 = Escape to X.28 mode 1 = Interrupt packet sent 4 = Indication of break PAD message 16 = Discard output to device XX = Any combination of above values
9	cr pad		0 = None 1-127 = Number of padding characters after CR.
10	l.fold		0 = No linefolding 1-255 = Number of characters that trigger linefolding
11	speed		0 = 110 bps 3 = 1200 bps 6 = 150 bps 9 = 100 bps 12 = 2400 bps 32 = Autobaud (110-9600 1 = 134.5 bps 4 = 800 bps 7 = 1800 bps 10 = 50 bps 13 = 4800 bps bps, except 134.5 2 = 300 bps 5 = 75 bps 8 = 200 bps 14 = 9600 bps bps)
12	p.flow		0 = Device cannot exercise flow control over PAD 1 = Device can exercise flow control using XON/XOFF characters.
13	autolf		0 = No line feed insertion 4 = LF after CR when echoing 6 = PAD transmits LF when echoing 1 = LF after CR from remote DTE 5 = LF after CR to device when echo or transmitting CR 2 = LF after CR sent to remote DTE remote DTE sends CR 7 = PAD transmits LF after all CR 3 = LF after CR from or to remote DTE
14	lf pad		0 = No line feed padding 1-127 = number of nulls padding after line feed.
15	edit		0 = No editing 1 = Editing enabled
16	c.del		0-127 = Decimal value of character used for character delete
17	l.del		0-127 = Decimal value of character used for line delete
18	l.disp		0-127 = Decimal value of character used for line display.
19	ed.ser.sig		0 = No editing service signals will be sent 1 = The character \ will be sent for a character deletion. The characters xxx CR LF will be sent for a line deletion. 2 = The characters BS space BS will be sent for a character deletion. For a line deletion, BS space BS will be sent n times, where n equals the number of characters in the line. 3-126 = The defined ASCII character will be sent for a character deletion. The characters xxx CR LF will be sent for a line deletion.
20	echomask		0 = No echomask (all characters are echoed) 16 = No echo of ESC or ENQ 128 = No echo of characters with a 1 = No echo of CR 32 = No echo of ACK, NAK, decimal value of 31 or below 2 = No echo of LF STX, SOH, EOT, ETB, or ETX except CR, LF, VT, HT, FF, BEL, 4 = No echo of VT, HT, or FF 64 = No echo of the editing BS, ESC, ENQ, ACK, NAK, STX, 8 = No echo of BEL or BS characters defined by SOH, EOT, ETB, ETX, and DEL. parameters 16, 17, and 18 XXX = Any combination
21	parity treatment		0 = Disable parity checking; Disable parity generation 2 = Enable parity generation 1 = Enable parity checking 3 = Enable parity checking; Enable parity generation
22	page wait		0 = Disable page waits 1-255 = The number of linefeeds the PAD will transmit before initiating a page wait condition.

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SELECTION 2 (continued)

MICOM ENHANCED PARAMETERS

100 bits/char	101 dv.parity	102 net.parity	103 c.xon (SEE 1)	104 c.xoff (SEE 1)	105 special flow	106 count fwd	107 escdelay	108 c.break (SEE 1)	109 c.supp (SEE 1)	110 c.subs (SEE 1)	111 echoctrl	112 special echo id	113 pagelength	114 c.page (SEE 1)	115 ff pad	116 inactivity	117 X29acc (SEE 1)	118 flow count	119 telex	PROFILE
																				1
																				2
																				3
																				4
																				5
																				6
																				7
																				8
																				9
																				10
																				11
																				12
																				13
																				14
																				15
																				16
																				17
																				18
																				19
																				20
																				21
																				22
																				23
2	0	0	17	19	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	24
2	5	0	17	19	0	0	0	0	26	42	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Required XCC Profile Values

Default Profile 1, 3 through 24 (Terminal Profile)

Default Profile 2 (Host Computer Profile)

See Selection 3

NOTE:
SEE FACING PAGE FOR POSSIBLE PARAMETER VALUES.

[1] THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE.

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SELECTION 2 (continued)

PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
100	bits/char		0 = 5 bits 1 = 6 bits 2 = 7 bits 3 = 8 bits
101	dv.parity		0 = Transparent parity 1 = Space 2 = Mark 3 = Even 4 = Odd 5 = Auto parity as determined by auto-baud sequence
102	net.parity		0 = Pass data as received 1 = Space 2 = Mark 3 = Even 4 = Odd
103	c.xon		0 = ignored 1-127 = Decimal value of ASCII character for XON
104	c.xoff		0 = ignored 1-127 = Decimal value of ASCII character for XOFF
105	special flow		0 = None 1 = Device can flow control PAD with RTS 2 = PAD can flow control device with CTS x = Any combination 4 = PAD issues BEL character to device in CTS flow control
106	count fwd		0 = No forwarding on character count 1-255 = Number of characters that will trigger data forwarding
107	escdelay		0 = No special handling 1-255 = The forwarding delay time after ESC input, selected in .05 second increments
108	c.break		0 = Normal break signal 1-127 = Decimal value of an ASCII character to be interpreted by the PAD as a break key.
109	c.supp		0 = Disable mechanism 1-127 = Decimal value of the ASCII character used to trigger the echo suppression mechanism.
110	c.subs		0 = No character is echoed 1-127 = Decimal value of an ASCII character used for substitution character
111	echoctrl		0 = Device input priority 1 = No priority 2 = Computer output priority 4 = Synchronize local field with incoming data formatting screens X = Selective combination
112	special echo id		0 = Disable 1-3 = Echo sequence ID associated with that device profile
113	pagelength		0 = No auto page feed 1-255 = Number of lines per page.
114	c.page		0 = Ignored 1-127 = Decimal value of the character to trigger the page function
115	ff pad		0 = No form feed padding 1-127 = Number of padding nulls that follow a Form Feed character.
116	inactivity		0 = No disconnection on inactivity 1-255 = Timer value in 1 minute increments.
117	X29acc		0 = X.29 access disallowed 1-127 = Decimal value of ASCII character to enable X.29 access
118	flow count		0 = Normal buffer allocation 1-100 = Each channel will be allowed the entered number of physical buffers if total buffer utilization is 50 percent or less. If total buffer utilization is over 50 percent, each channel will be allowed either the entered number of buffers, or seven buffers — whichever is less.
119	telex		0 = Disable telex support 1 = Enable telex support 2 = If no data activity has occurred for 10 seconds, the PAD will send a letter shift to the terminal one second before transmitting data, to turn the motor on. 4 = The string CR LF FIGS V equals the end-of-message, and is translated as an ASCII ETX. 8 = FIGS H equals the end-of-message, and is translated as an ASCII ETX. 16 = nnnn equals the end-of-message, and is translated as an ASCII ETX. XX = Any combination

APPENDIX E

TELEX SUPPORT

The PAD provides the following functions to support telex applications:

* Baudot-to-ASCII and ASCII-to-Baudot conversion

* Transmission of a motor-on signal prior to data transmission (if a period of data inactivity has occurred)

* Extended resolution of the data forwarding idle timer

* Configurable end-of-message

Each of these functions is described in the paragraphs that follow.

E.1 TRANSLATION TABLES

Tables E-1 through E-3 illustrate the PAD's Baudot-to-ASCII translations. The translations are standard with two exceptions:

* The Baudot WRU is translated into an ASCII EOT, not into an ENQ as is standard

* The following Baudot strings are translated into an ASCII ETX:

    - CR LF FIGS V
    - FIGS H
    - NNNN

Baudot-to-ASCII conversion is enabled by device profile Parameter 119, Telex. Refer to paragraph 5.5.3 for information on configuring this parameter.

Table E-4 shows the ASCII-to-Baudot translations.

Table E-1. Baudot-to-ASCII Translation Table

HEX	BAUDOT	HEX	ASCII
00	NUL NUL	00 00	NUL * NUL
01	E 3	45 33	E * 3
02	LF LF	0A 0A	LF * LF
03	A –	41 2D	A * –
04	SP SP	20 20	SP * SP
05	S '	53 27	S * '
06	I 8	49 38	I * 8
07	U 7	55 37	U * 7
08	CR CR	0D 0D	CR * CR
09	D WRU	44 04	D * EOT
0A	R 4	52 34	R * 4
0B	J BEL	4A 07	J * BEL
0C	N ,	4E 2C	N * ,
0D	F <	46 3C	F * <
0E	C :	43 3A	C * :
0F	K (	4B 28	K * (
10	T 5	54 35	T * 5
11	Z +	5A 2B	Z * +
12	L)	4C 29	L *)
13	W 2	57 32	W * 2
14	H >	48 3E	H * >
15	Y 6	59 36	Y * 6

NOTE:
EACH BAUDOT CHARACTER HAS TWO POSSIBLE ASCII TRANSLATIONS, BASED UPON THE CURRENT TRANSLATION MODE (FIGURE OR LETTER). IF IN THE LETTER MODE, THE PAD TRANSLATES FROM BAUDOT TO THE UPPER ASCII VALUE, SHOWN ABOVE WITH AN ASTERISK (*) FOLLOWING. IF IN THE FIGURE MODE, THE PAD TRANSLATES TO THE LOWER ASCII VALUE, SHOWN ABOVE WITHOUT AN ASTERISK (*).

Table E-1. Baudot-to-ASCII Translation Table (continued)

HEX	BAUDOT	HEX	ASCII
16	P 0	50 30	P★ 0
17	Q 1	51 31	Q★ 1
18	O 9	4F 39	O★ 9
19	B ?	42 3F	B★ ?
1A	G —	47 5F	G★ —
1B	FIGS	(NO TRANSLATION — CHANGE TO FIGURE MODE)	
1C	M .	4D 2E	M★ .
1D	X /	58 2F	X★ /
1E	V =	56 3D	V★ =
1F	LTRS	(NO TRANSLATION — CHANGE TO LETTER MODE)	

NOTE:
EACH BAUDOT CHARACTER HAS TWO POSSIBLE ASCII TRANSLATIONS, BASED UPON THE CURRENT TRANSLATION MODE (FIGURE OR LETTER). IF IN THE LETTER MODE, THE PAD TRANSLATES FROM BAUDOT TO THE UPPER ASCII VALUE, SHOWN ABOVE WITH AN ASTERISK (★) FOLLOWING. IF IN THE FIGURE MODE, THE PAD TRANSLATES TO THE LOWER ASCII VALUE, SHOWN ABOVE WITHOUT AN ASTERISK (★).

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Table E-2. Special Baudot-to-ASCII Translations

HEX	BAUDOT	HEX	ASCII
1B 0B 03	FIGS JA	08	BS
1B 0B 0D	FIGS JF	24	$
1B 0B 1A	FIGS JG	26	&
1B 0B 14	FIGS JH	24	$
1B 0B 0B	FIGS JJ	1B	ESC
1B 0B 1C	FIGS JM	21	!
1B 0B 0C	FIGS JN	3B	;
1B 0B 05	FIGS JS	22	"
1B 0B 1E	FIGS JV	40	@
1B 0B 1D	FIGS JX	5C	\
1B 0B 11	FIGS JZ	2A	*

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Table E-3. Special Baudot-to-ASCII Translations Enabled With Profile Parameter 119 of the Command Facility

HEX	BAUDOT	HEX	ASCII
0C 0C 0C 0C	NNNN	03	ETX
08 02 1B 1E	CR LF FIGS V	03	ETX
1B 14	FIGS H	03	ETX

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Table E-4. ASCII-to-Baudot Translation Table

HEX	ASCII	HEX	BAUDOT
00	NUL	00	NUL
01	SOH	00	NUL
02	STX	00	NUL
03	ETX	00	NUL
04	EOT	09 ∗	WRU
05	ENQ	00	NUL
06	ACK	00	NUL
07	BEL	0B∗	BEL
08	BS	00	NUL
09	HT	00	NUL
0A	LF	02	LF
0B	VT	00	NUL
0C	FF	00	NUL
0D	CR	08	CR
0E	SO	00	NUL
0F	SI	00	NUL
10	DLE	00	NUL
11	DC1	00	NUL
12	DC2	00	NUL
13	DC3	00	NUL
14	DC4	00	NUL
15	NAK	00	NUL
16	SYN	00	NUL
17	ETB	00	NUL
18	CAN	00	NUL
19	EM	00	NUL
1A	SUB	00	NUL
1B	ESC	0B∗	BEL
1C	FS	00	NUL
1D	GS	00	NUL
1E	RS	00	NUL
1F	US	00	NUL
20	SP	04	SP
21	!	1D∗, 1C∗	/.
22	"	05∗, 05∗	"
23	#	04, 0C∗∗, 19∗∗, 0A∗∗, 04	NBR
24	$	04, 09∗∗, 12∗∗, 0A∗∗, 05∗∗, 04	DLRS
25	%	04, 16∗, 1D∗, 16∗, 04	0/0
26	&	04, 03∗∗, 0C∗∗, 09∗∗, 04	AND
27	'	05∗	'
28	(	0F∗	(
29	)	12∗	)
2A	∗	04, 1C∗, 11∗, 1C∗, 04	.+.
2B	+	11∗	+
2C	,	0C∗	,
2D	−	03∗	−
2E	.	1C∗	.
2F	/	1D∗	/
30	0	16∗	0
31	1	17∗	1
32	2	13∗	2
33	3	01∗	3
34	4	0A∗	4
35	5	10∗	5
36	6	15∗	6
37	7	07∗	7
38	8	06∗	8
39	9	18∗	9
3A	:	0E∗	:
3B	;	0C∗	,
3C	<	04, 1C∗, 12∗∗, 10∗∗, 1C∗, 04	.LT.
3D	=	1E∗	=
3E	>	04, 1C∗, 1A∗∗, 10∗∗, 1C∗, 04	.GT.
3F	?	19∗	?

NOTE:
CHARACTERS SHOWN ABOVE WITH ONE ASTERISK (∗) ARE FIGURE MODE CHARACTERS. THOSE SHOWN WITH TWO ASTERISKS (∗∗) ARE LETTER MODE CHARACTERS. CHARACTERS SHOWN WITH NO ASTERISKS HAVE THE SAME MEANING IN BOTH FIGURE AND LETTER MODE.

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HEX	ASCII	HEX	BAUDOT
40	@	04, 03 ★ ★, 10 ★ ★, 04	AT
41	A	03 ★ ★	A
42	B	19 ★ ★	B
43	C	0E★ ★	C
44	D	09 ★ ★	D
45	E	01 ★ ★	E
46	F	0D★ ★	F
47	G	1A★ ★	G
48	H	14 ★ ★	H
49	I	06 ★ ★	I
4A	J	0B★ ★	J
4B	K	0F★ ★	K
4C	L	12 ★ ★	L
4D	M	1C★ ★	M
4E	N	0C★ ★	N
4F	O	18 ★ ★	O
50	P	16 ★ ★	P
51	Q	17 ★ ★	Q
52	R	0A★ ★	R
53	S	05 ★ ★	S
54	T	10 ★ ★	T
55	U	07 ★ ★	U
56	V	1E★ ★	V
57	W	13 ★ ★	W
58	X	1D★ ★	X
59	Y	15 ★ ★	Y
5A	Z	11 ★ ★	Z
5B	[	0F★	(
5C	\	04, 19 ★ ★, 1D ★, 04	B/
5D	]	12 ★	)
5E	∧	00	NUL
5F	—	19 ★	?
60	`	19 ★	?
61	a	03 ★ ★	A
62	b	19 ★ ★	B
63	c	0E★ ★	C
64	d	09 ★ ★	D
65	e	01 ★ ★	E
66	f	0D★ ★	F
67	g	1A★ ★	G
68	h	14 ★ ★	H
69	i	06 ★ ★	I
6A	j	0B★ ★	J
6B	k	0F★ ★	K
6C	l	12 ★ ★	L
6D	m	1C★ ★	M
6E	n	0C★ ★	N
6F	o	18 ★ ★	O
70	p	16 ★ ★	P
71	q	17 ★ ★	Q
72	r	0A★ ★	R
73	s	05 ★ ★	S
74	t	10 ★ ★	T
75	u	07 ★ ★	U
76	v	1E★ ★	V
77	w	13 ★ ★	W
78	x	1D★ ★	X
79	y	15 ★ ★	Y
7A	z	11 ★ ★	Z
7B	{	0F★	(
7C	I	19 ★	?
7D	}	12 ★	)
7E	⌒	19 ★	?
7F	DEL	00	NUL

NOTE:
CHARACTERS SHOWN ABOVE WITH ONE ASTERISK (★) ARE FIGURE MODE CHARACTERS. THOSE SHOWN WITH TWO ASTERISKS (★★) ARE LETTER MODE CHARACTERS. CHARACTERS SHOWN WITH NO ASTERISKS HAVE THE SAME MEANING IN BOTH FIGURE AND LETTER MODE.

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E.2 MOTOR-ON SIGNALING

When data activity has not occurred for 10 seconds (neither transmit nor receive), the PAD will send a Letter Shift to the terminal 1 second before beginning data transmission to turn the motor on.

Motor-on signaling is enabled by Parameter 119, Telex. Refer to paragraph 5.5.3 for information on configuring this parameter.

E.3 DATA FORWARDING IDLE TIMER RESOLUTION

Parameter 4, Idle Timer, causes automatic forwarding of data when no transmit or receive activity has occurred for the defined time period. When telex support is disabled (Parameter 119 = 0), this time period is determined by multiplying the value entered for Parameter 4 by 50 milliseconds, as defined in CCITT's X.3 specification.

When telex support is enabled (Parameter 119 is non-zero), the idle timer inactivity period is determined by multiplying the value entered for Parameter 4 by 200 milliseconds, thus extending the resolution of the timer. The maximum configurable inactivity period is 51 seconds.

Refer to paragraph 5.5.3 for information on configuring Parameter 4.

E.4 END-OF-MESSAGE

Any one of the following strings (or all three) can be defined as the end-of-message. The PAD translates the end-of-message string into an ASCII ETX:

    CR LF FIGS V   FIGS H   NNNN

End-of-message strings are defined by Parameter 119, Telex. Refer to paragraph 5.5.3 for information on configuring this parameter.

APPENDIX F

HIGH-SPEED OPTIONS

The MICOM BOX Type 3 X.25 Asynchronous PAD is available with either an X.21 or a V.35 high-speed X.25 link. When either of these options is installed, the X.25 link (composite) is capable of speeds up to 72,000 bps.

CCITT Recommendations V.35 and X.21 describe the electrical characteristics of the respective link. V.35 supports a variety of V.35 interface types, which are frequently used for telephone company applications. X.21 supports the X.21 interface. In addition, X.21 electrical characteristics are identical to those required for the RS-442 and V.36 interface types.

The PAD's high-speed X.25 link option consists of:

- Either a V.35 or an X.21 interface daughterboard, and related cable, for the composite port.

- The high-speed FEATUREPAK cartridge MB3-XAP-HS. This FEATUREPAK cartridge supports the X.21 or V.35 link and activates the Direct Memory Access (DMA) daughterboard. (The DMA daughterboard is present on all units, but is passive unless the high-speed FEATUREPAK cartridge is installed.)

The PAD can be ordered initially with a high-speed link (see figure 1-2 for model numbers), or the standard unit can be easily upgraded in the field. To upgrade a standard PAD to high-speed, you order the high-speed FEATUREPAK cartridge (MB3-XAP-HS) and a kit which contains a high-speed daughterboard and related cable (see table F-1).

As shown in table F-1, you order a daughterboard that is already configured as DTE or DCE. MICOM then provides you with the appropriate cable. This simplifies ordering and upgrading procedures.

Table F-1. High-Speed Daughterboard Upgrade Kits

Kit Number	Contents of Kit
MBK-V35-to-DTE	One V.35 daughterboard configured as DCE One 15-foot V.35 DCE cable, for connection to a DTE device (MICOM part number 100-2785)
MBK-V35-to-DCE	One V.35 daughterboard configured as DTE One 15-foot V.35 DTE cable, for connection to a DCE device (MICOM part number 100-2784)
MBK-X21-to-DTE	One X.21 daughterboard configured as DCE One 15-foot X.21 DCE cable, for connection to a DTE device (MICOM part number 100-2795)
MBK-X21-to-DCE	One X.21 daughterboard configured as DTE One 15-foot X.21 DTE cable, for connection to a DCE device (MICOM part number 100-2794)

In addition to one of the preceding upgrade kits, the high-speed FEATUREPAK cartridge (MB3-XAP-HS) is required for the upgrade.

NOTE: The installation and upgrade procedures that follow are intended for the experienced communications technician.

F.1 INSTALLING A PAD WITH A HIGH-SPEED X.25 LINK

PADs that are initially ordered with a high-speed link are shipped with an X.21 or V.35 high-speed daughterboard already factory-installed on the base module. An X.21 or V.35 daughterboard can also be installed in the field (refer to paragraph F.2).

Installation of a high-speed PAD is identical to that of a standard unit (refer to section 2), with two exceptions:

- The cable used for the link varies. Refer to paragraph F.4 for information on cabling an X.21 or V.35 high-speed X.25 link.

- The X.21 and V.35 daughterboards come pre-configured as DCE or DTE (see table F-1). If you need to change the configuration, you can do so by means of a header and a four-position strap block. (The standard RS-232-C daughterboard is hard-wired as a DTE.) For information on changing the configuration of an X.21 or V.35 daughterboard, see figure F-2 (later in this appendix). If you change this configuration, make sure you also change the cable (refer to paragraph F.4).

F.2   UPGRADING A STANDARD RS-232-C X.25 LINK TO HIGH-SPEED

A standard RS-232-C X.25 link can be easily upgraded to high-speed in the field. The procedure basically consists of removing the standard RS-232-C daughterboard (and related cable) for the composite port and installing either an X.21 or V.35 daughterboard (and related cable) in its place. The standard FEATUREPAK cartridge must also be exchanged for a high-speed FEATUREPAK cartridge. Instructions are provided in the following procedures.

Removing the Standard RS-232-C Daughterboard:

   1. Remove all power to the unit.

   2. Open the unit and remove the expansion modules (if any), referring to the instructions in paragraph 2.2.

   3. Locate the standard RS-232-C daughterboard for the composite port on the base module (see figure F-1). The daughterboards are attached to the base module by means of threaded standoffs and nuts. Use a nut driver to remove the nuts.

   4. Two female connectors on the daughterboard mate with two male connectors on the base module. Being very careful not to bend or break any pins, lift the daughterboard from one side and then the other with your hand, gradually lifting the daughterboard off the base module connector pins. Store the daughterboard in a static-sensitive bag (or equivalent).
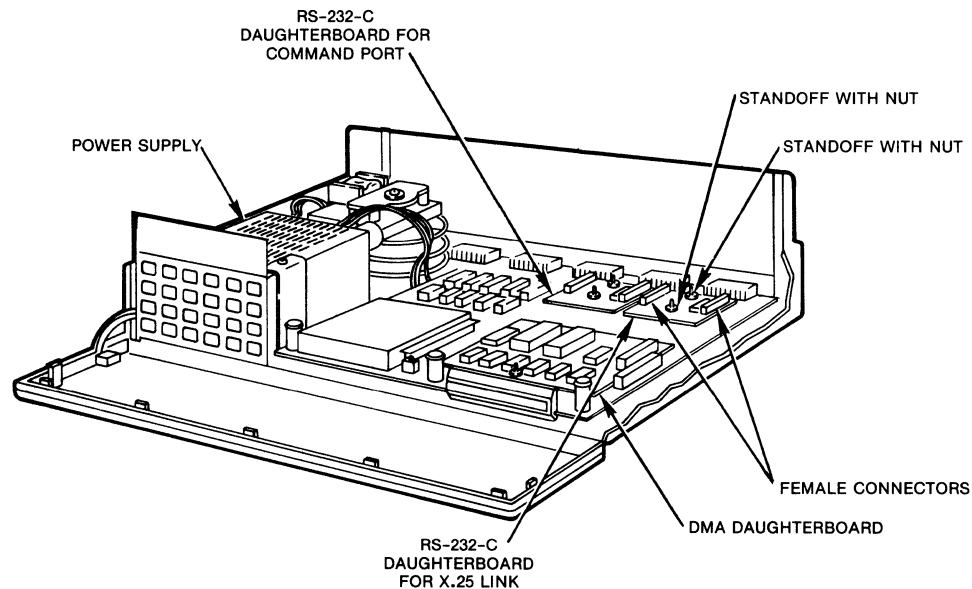
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Figure F-1.   The Base Module With Standard Daughterboards

Configuring a High-Speed Daughterboard as DCE or DTE:

5. The high-speed X.21 and V.35 daughterboards are configured as DTE or DCE by means of a header and a four-position strap block. Daughterboards are shipped with strap blocks in the DTE or DCE position, depending on how you order them (see table F-1). If you need to change a configuration, remove the strap block and reinstall it in the other position (see figure F-2).

NOTE: If you change the configuration of a daughterboard, make sure you install the correct cable. For example, if you install the strap block in the DCE position on a V.35 daughterboard, make sure you also install a V.35 cable that is meant to connect to a DTE device.

X.21 DAUGHTERBOARD **V.35 DAUGHTERBOARD**
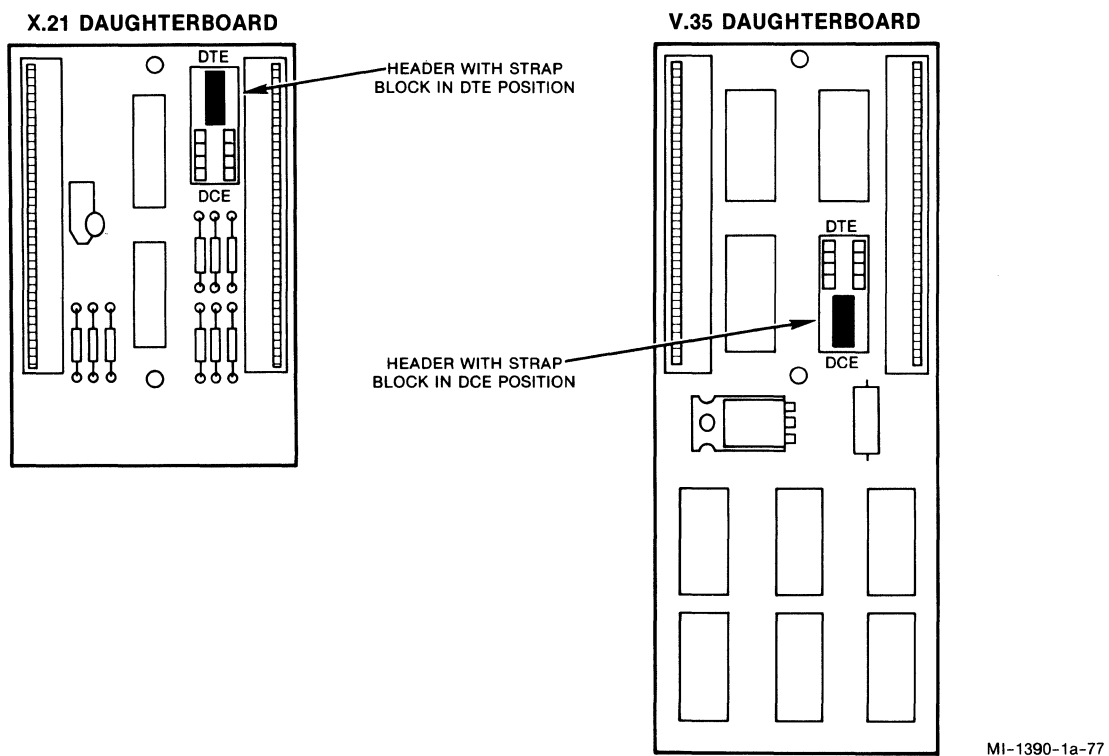
Figure F-2. Configuring a High-Speed Daughterboard as DTE or DCE

Installing a High-Speed X.21 or V.35 Daughterboard:

6. Position the high-speed X.21 or V.35 daughterboard on the base module, aligning the holes in the daughterboard with the base module standoffs (see figure F-3). The male connector pins on the base module will then align with the female connector on the daughterboard. Being careful that the alignment is correct and that pins are not being bent or broken, press the daughterboard down with your hand until it is fully seated on the base module.

7. Reinstall the nuts on the standoffs. Tighten the nuts with either your fingers or a nutdriver.

8. Reinstall the expansion modules (if any) and close up the unit.

9. Remove the standard FEATUREPAK cartridge and install the high-speed FEATUREPAK cartridge (refer to paragraph 2.2.2 for instructions on FEATUREPAK cartridge installation).
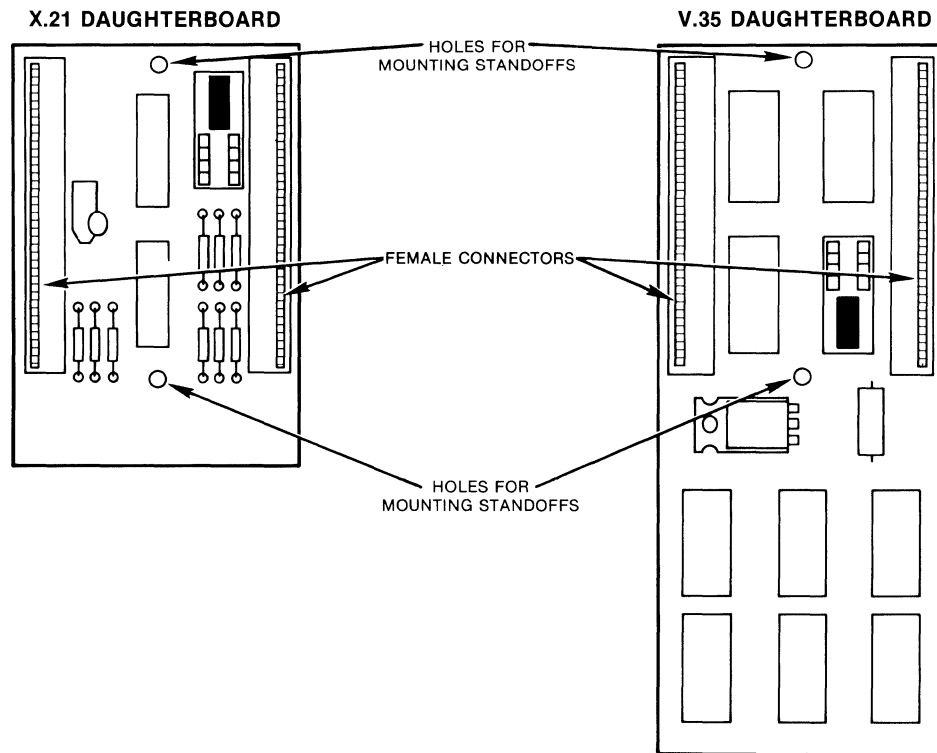
Figure F-3. High-Speed Daughterboard Holes and Connectors

F.3 PIN ASSIGNMENTS FOR HIGH-SPEED LINKS

Pin assignments for the composite port vary when a high-speed daughterboard is configured as DTE or DCE and the appropriate cable is connected. Tables F-2 and F-3 list pin assignments for DTE and DCE X.21 links, and tables F-4 and F-5 list pin assignments for DTE and DCE V.35 links. These pin assignments are provided for the benefit of customers who wish to create their own cables.

MICOM offers DTE X.21 and V.35 cables and DCE X.21 and V.35 cables in high-speed daughterboard kits, as shown in table F-1. Refer to paragraph F.4 for information on the individual MICOM cables.

Table F-2.   Composite Pin Assignments -- X.21 to a DTE Device

Connector Pin Number	Assigned Signal
9	Transmitted Data B
24	Transmitted Data A
15	Signal Timing A
8	Indication B
7	Signal Ground
6	Control A
2	Received Data A
4	Signal Timing B
20	Control B
18	Indication A
3	Received Data B

Table F-3.   Composite Pin Assignments -- X.21 to a DCE Device

Connector Pin Number	Assigned Signal
9	Received Data B
24	Received Data A
15	Signal Timing A
8	Control B
7	Signal Ground
6	Indication A
2	Transmitted Data A
4	Signal Timing B
20	Indication B
18	Control A
3	Transmitted Data B

Table F-4. Composite Pin Assignments -- V.35 to a DTE Device

Connector Pin Number	Assigned Signal
9	Send Data B
24	Send Data A
22	Serial Clock Transmit External A
15	Serial Clock Transmit A
20	Data Set Ready
7	Signal Ground
18	Clear-To-Send
2	Received Data A
10	Received Line Signal Detect
13	Ring Indicator
12	Local Test
17	Serial Clock Transmit External B
23	Serial Clock Receive A
8	Request-To-Send
6	Data Terminal Ready
5	Serial Clock Receive B
4	Serial Clock Transmit B
3	Received Data B

Table F-5. Composite Pin Assignments -- V.35 to a DCE Device

Connector Pin Number	Assigned Signal
9	Received Data B
24	Received Data A
23	Serial Clock Transmit A
22	Serial Clock Receive A
20	Data Terminal Ready
7	Signal Ground
10	Request-To-Send
2	Send Data A
8	Received Line Signal Detect
13	Local Test
12	Ring Indicator
5	Serial Clock Transmit B
15	Serial Clock Transmit External A
16	Clear-To-Send
6	Data Set Ready
4	Serial Clock Transmit External B
17	Serial Clock Receive B
3	Send Data B

F.4 CABLING

MICOM offers two V.35 cables and two X.21 cables. Each cable is 15 feet in length, shielded, and has a 25-pin female connector at one end for connection to the PAD's male composite port. The connector at the other end varies with the interface. Figures F-4 through F-7 provide diagrams for each cable.

MICOM Part Number	Cable Description
100-2785	V.35 DCE, for connection to a DTE device
100-2784	V.35 DTE, for connection to a DCE device
100-2795	X.21 DCE, for connection to a DTE device
100-2794	X.21 DTE, for connection to a DCE device

NOTE: The composite connector pin assignments for X.21 and V.35 links are listed in tables F-2 through F-5 for the benefit of customers who wish to create their own cables.
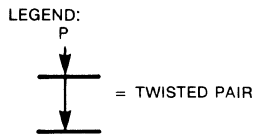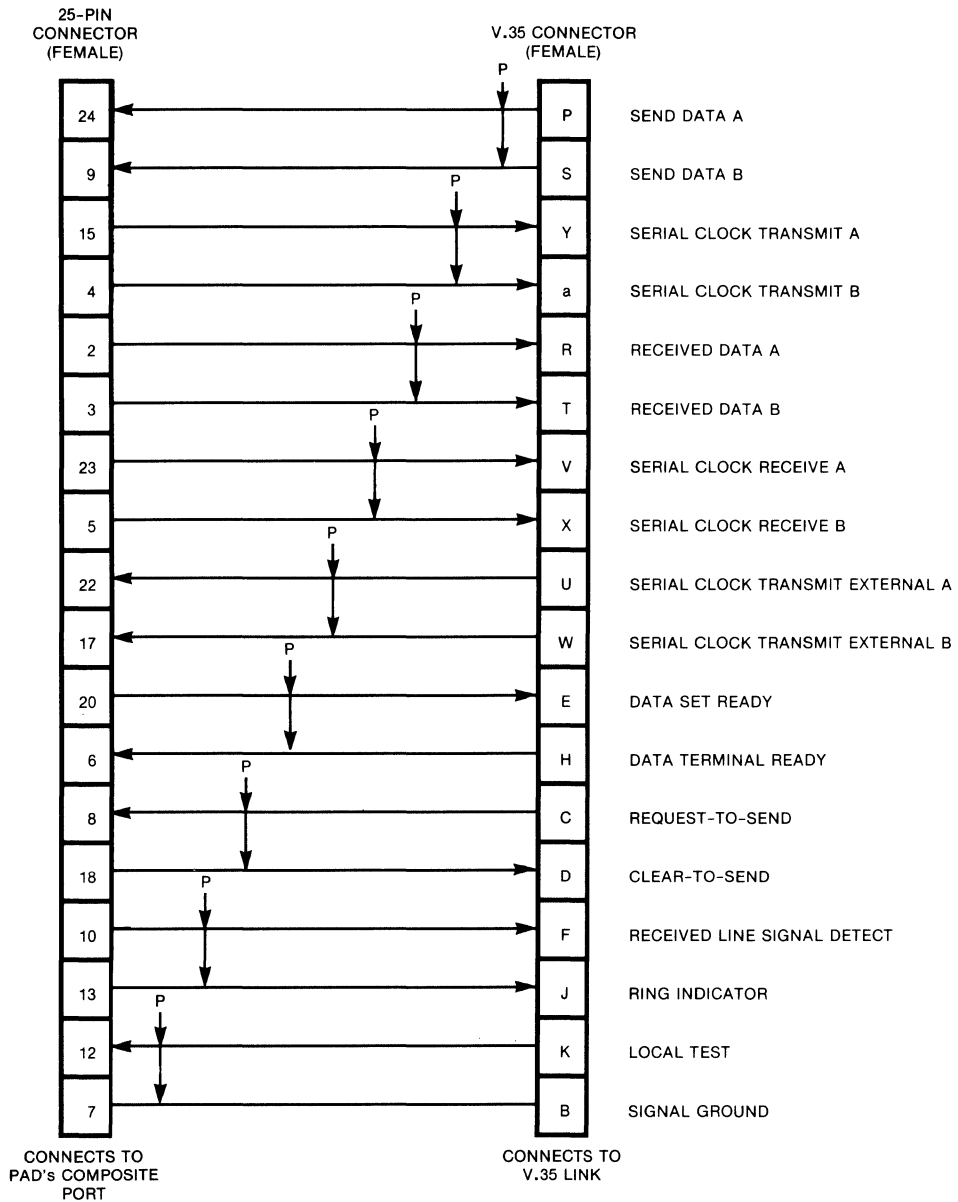
Figure F-4. V.35 DCE Shielded Cable (MICOM part number 100-2785)
for Connection to a DTE Device

```
      25-PIN
    CONNECTOR                                    V.35 CONNECTOR
     (FEMALE)                                        (MALE)
                                                 P
                                                 ↓
    ┌─────┐                                   ┌─────┐
    │  2  │──────────────────────────────────▶│  P  │   SEND DATA A
    ├─────┤                                 │ ├─────┤
    │  3  │─────────────────────────────────┘▶│  S  │   SEND DATA B
    ├─────┤                      P             ├─────┤
    │ 23  │◀─────────────────────↓─────────────│  Y  │   SERIAL CLOCK TRANSMIT A
    ├─────┤                      ↓             ├─────┤
    │  5  │◀─────────────────────┘─────────────│  a  │   SERIAL CLOCK TRANSMIT B
    ├─────┤                   P                ├─────┤
    │ 24  │◀──────────────────↓────────────────│  R  │   RECEIVED DATA A
    ├─────┤                   ↓                ├─────┤
    │  9  │◀──────────────────┘────────────────│  T  │   RECEIVED DATA B
    ├─────┤                P                   ├─────┤
    │ 22  │◀───────────────↓───────────────────│  V  │   SERIAL CLOCK RECEIVE A
    ├─────┤                ↓                   ├─────┤
    │ 17  │◀───────────────┘───────────────────│  X  │   SERIAL CLOCK RECEIVE B
    ├─────┤             P                      ├─────┤
    │ 15  │────────────↓──────────────────────▶│  U  │   SERIAL CLOCK TRANSMIT EXTERNAL A
    ├─────┤            ↓                       ├─────┤
    │  4  │────────────┘──────────────────────▶│  W  │   SERIAL CLOCK TRANSMIT EXTERNAL B
    ├─────┤          P                         ├─────┤
    │  6  │◀─────────↓─────────────────────────│  E  │   DATA SET READY
    ├─────┤          ↓                         ├─────┤
    │ 20  │──────────┘────────────────────────▶│  H  │   DATA TERMINAL READY
    ├─────┤        P                           ├─────┤
    │ 10  │────────↓──────────────────────────▶│  C  │   REQUEST-TO-SEND
    ├─────┤        ↓                           ├─────┤
    │ 16  │◀───────┘───────────────────────────│  D  │   CLEAR-TO-SEND
    ├─────┤      P                             ├─────┤
    │  8  │◀─────↓─────────────────────────────│  F  │   RECEIVED LINE SIGNAL DETECT
    ├─────┤      ↓                             ├─────┤
    │ 12  │◀─────┘─────────────────────────────│  J  │   RING INDICATOR
    ├─────┤    P                               ├─────┤
    │ 13  │────↓──────────────────────────────▶│  K  │   LOCAL TEST
    ├─────┤    ↓                               ├─────┤
    │  7  │────┘──────────────────────────────▶│  B  │   SIGNAL GROUND
    └─────┘                                   └─────┘
  CONNECTS TO                              CONNECTS TO
 PAD's COMPOSITE                             V.35 LINK
     PORT
```

LEGEND:
```
   P
   ↓
───┼───   = TWISTED PAIR
   ↓
```

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Figure F-5.   V.35 DTE Shielded Cable (MICOM part number 100-2784)
              for Connection to a DCE Device

```
       25-PIN                              15 PIN D-SUB
    CONNECTOR                               CONNECTOR
     (FEMALE)                          P     (FEMALE)

        2 ─────────────────────────→     4        RECEIVED DATA A
                                   P
        3 ─────────────────────────→    11        RECEIVED DATA B
                               P
       24 ←─────────────────────────     2        TRANSMITTED DATA A

        9 ←─────────────────────────     9        TRANSMITTED DATA B
                           P
       18 ─────────────────────────→     5        INDICATION A

        8 ─────────────────────────→    12        INDICATION B
                       P
       15 ─────────────────────────→     6        SIGNAL ELEMENT TIMING A

        4 ─────────────────────────→    13        SIGNAL ELEMENT TIMING B
                   P
        6 ←─────────────────────────     3        CONTROL A

       20 ←─────────────────────────    10        CONTROL B

        7 ─────────────────────────     8        SIGNAL GROUND

    CONNECTS TO                          CONNECTS TO
   PAD's COMPOSITE                         X.21 LINK
       PORT
```

LEGEND:
```
   P
   ↓
   ┿        = TWISTED PAIR
   ┴
```
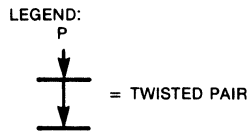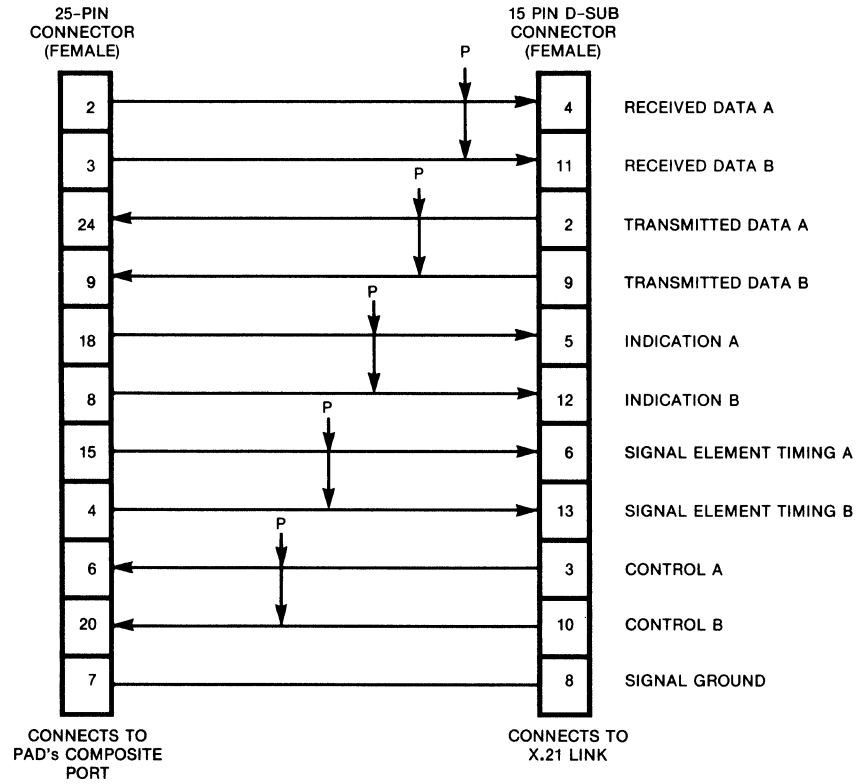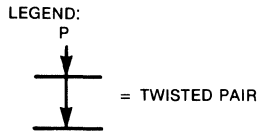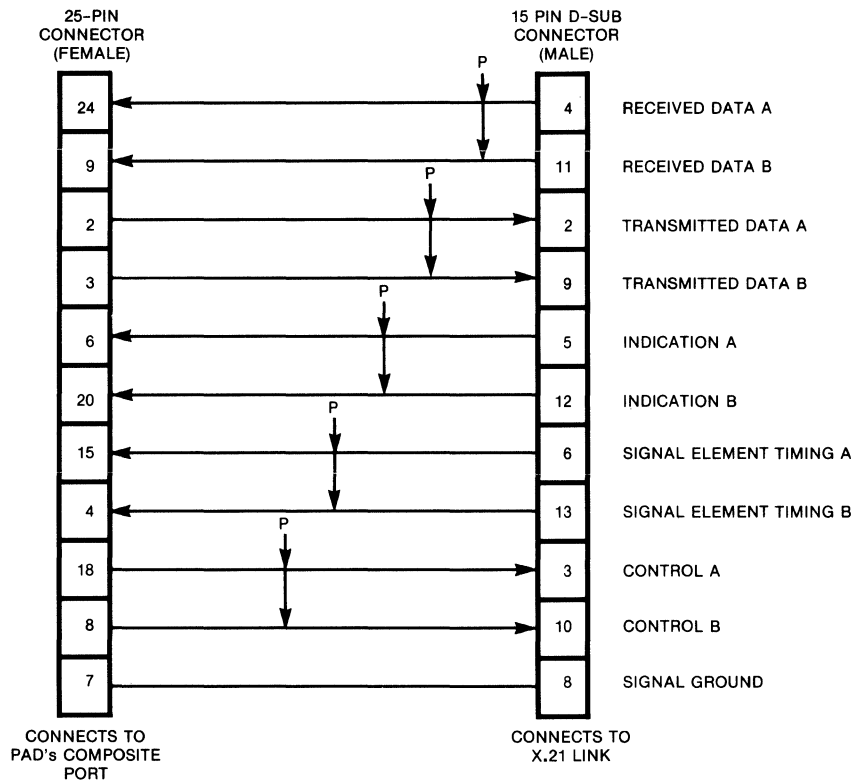
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Figure F-6.   X.21 DCE Shielded Cable (MICOM part number 100-2795)
             for Connection to a DTE Device

Figure F-7. X.21 DTE Shielded Cable (MICOM part number 100-2794)
for Connection to a DCE Device

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