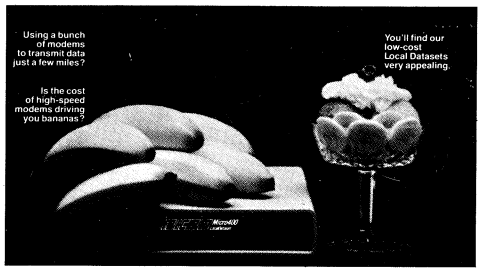
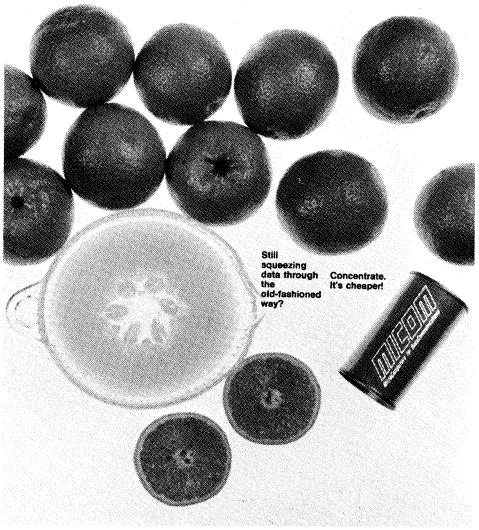
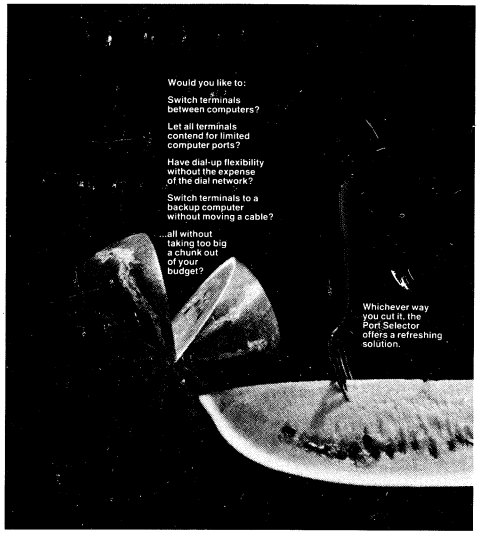


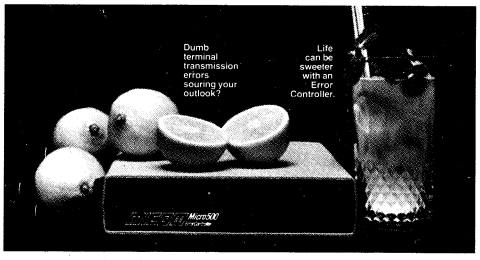
Micro800/X.25 Concentrator PAD

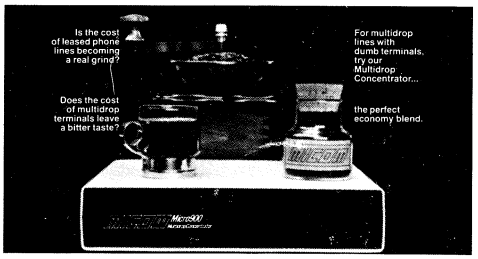
User's Manual

Stock Number 800-1229









MICOM®

Micro800/X.25
Concentrator PAD

User's Manual
Stock Number 800-1229

Model M854 Model M858 Model M8512 Model M8516	PROM 905-1161-0A, B, C

June 1984

THANK YOU FOR CHOOSING THE Micro800/X.25 CONCENTRATOR PAD

The Micro800/X.25, a member of MICOM's family of intelligent data communications products, is designed to help you get the most out of your communication lines.

This Micro800/X.25 User's Manual, in turn, is designed to help you get the most out of your new Micro800/X.25 by giving you all the information you need to use it effectively.

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 is a trademark of MICOM Systems, Inc.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with this manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If radio frequency interference is encountered after installation of the equipment, necessary corrective measures are required to reduce this interference. Information about recommendations for such measures can be obtained from the manufacturer. Contact MICOM Corporate Headquarters for assistance.

MICOM Systems, Inc.
20151 Nordhoff Street
Chatsworth, CA 91311

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, however, please call MICOM Customer Service. Telephone numbers for our Regional Offices are listed on the back cover of this manual.

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 performing the command facility logon procedures outlined in paragraph 5.5 of this manual.

Shipping charges must be prepaid.

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

FIGURES

TABLES

SECTION 1

INTRODUCTION

1.1 PRODUCT INTRODUCTION

The Micro800/X.25 Concentrator PAD is an X.25 Packet Assembler/Disassembler. It concentrates the asynchronous data from four to twenty-four terminals or computer ports onto a single X.25 access line. It is fully configurable on site to meet the operating requirements of CCITT compatible packet data networks (PDNs) and most existing terminals and computer systems. The Micro800/X.25 meets all of the requirements of CCITT Recommendations X.25, X.3, X.28, X.29 and X.121. It also includes additional special features that result in extra user convenience and flexibility.

1.2 Micro800/X.25 FEATURE SUMMARY

1.2.1 General Characteristics

The Micro800/X.25 includes the following standard features:

- Fully compatible with CCITT Recommendations X.3, X.28, X.29, X.121, and X.25
- From 4 to 24 asynchronous channels with a single X.25 composite channel
- Dedicated Command Port and a user-friendly Command Facility
- Configuration parameters stored in separate memory protected by a battery upon a power failure
- X.25 facilities supported:
  Fast select (optional)
  Closed user group
  Priority (DATAPAC)
  Reverse charging
  Throughput class negotiation
  Window and packet size negotiation
- Extensive call control capabilities:
  Full X.121 addressing
  Abbreviated addressing
  Autocall feature
  Subaddressing via X.121
  Subaddressing via call user data
- Class selection with port contention
- TACT diagnostic tests

- Default configurations upon power up
- Compact tabletop enclosure and rack-mount versions

1.2.2 Terminal Support Characteristics

The Micro800/X.25 includes the following standard features to provide support for almost all asynchronous terminals:

- All channels independently configurable through the Command Facility
- Speeds range from 50 to 9600 bps
- Full Autobaud and auto parity detection to 9600 bps.
- Call accounting statistics upon call completion
- Dedicated, dial-up, or dial-out channel connections
- Extended flow control capabilities: XON/XOFF, CTS/RTS
- 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

1.2.3 X.25 Trunk Characteristics

The Micro800/X.25 includes the following standard features on the X.25 trunk line to the PDN:

- Compatible with 1980 version of Recommendation X.25 LAPB/HDLC operation
- Speeds of 2400, 4800, 9600, or 19,200 bps (24 channel model) with external clock
- Speed of 9600 bps with internal clock.

- Configurable X.25 trunk parameters:
  k = Frame level window
  W = Packet level window
  T1 = Acknowledgement timer
  N2 = Number of retransmissions
  AT = Assurance timer

- Any combination of PVCs or 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

1.3 Micro800/X.25 APPLICATIONS

1.3.1 Terminal Concentrator PAD

The Micro800/X.25 Concentrator PAD can support direct, dedicated, and dial-up connections which makes it adaptable to many types of terminal applications. It can support terminals at speeds up to 9600 bps connected directly to individual channels or via point-to-point modems; in addition, its dial-up capabilities allow a population of more than 24 terminals to contend for its channels.

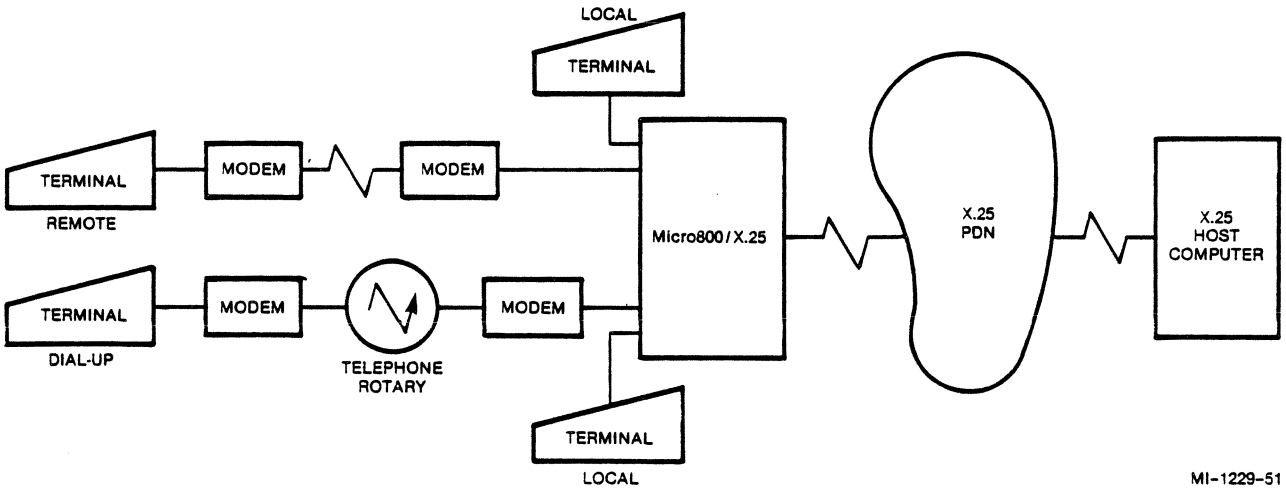


Figure 1-1. Terminal Concentrator PAD

1.3.2 Port Concentrator for X.25 Hosts

An increasing number of computer manufacturers provide X.25 protocol support for packet network access. The Micro800/X.25 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 Micro800/X.25 serves as a port concentrator, connecting a cluster of terminals to a single computer port.

With the dial-up channel capability of the Micro800/X.25, this port concentration capability can be used to provide contention for a large population of dial-up terminals. Only one X.25 port is required at the host computer for all these terminals.

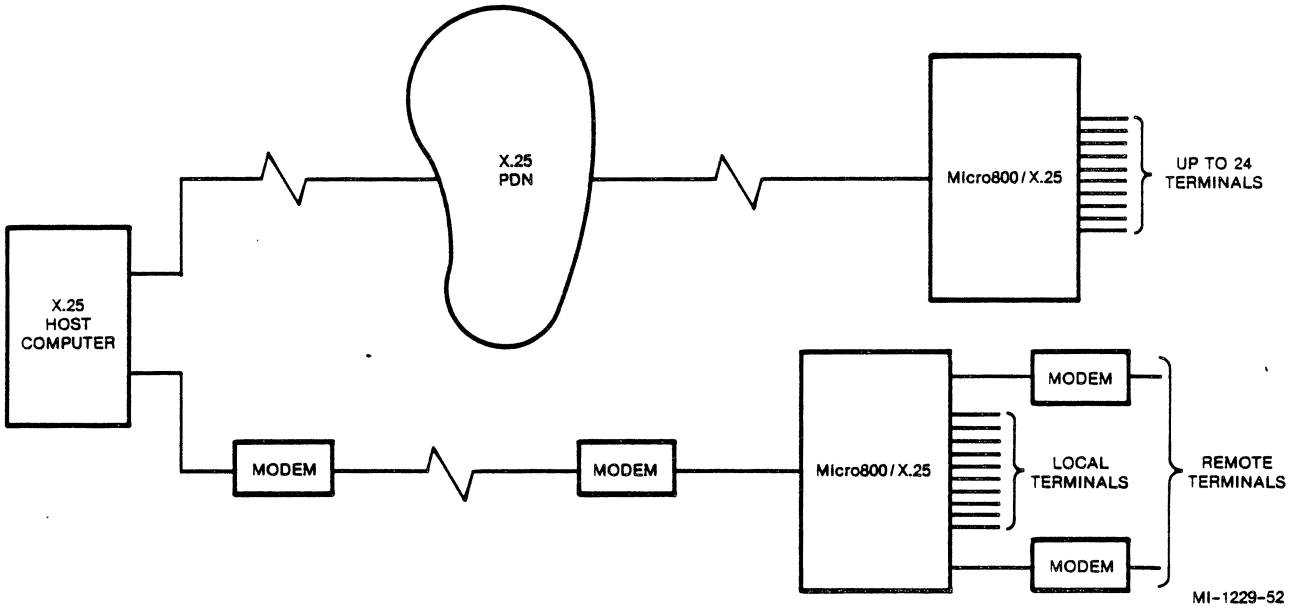


Figure 1-2. Port Concentrator for X.25 Hosts

1.3.3 X.25 Gateway

In conjunction with MICOM's Micro600 data PABX, the Micro800/X.25 can act as a "gateway" from the user's local network to an X.25 Packet Data Network.

On receiving a connection request from the Micro600, the Micro800/X.25 automatically generates a call to the PDN. Terminals or hosts can contend for the channels on the Micro800/X.25 which will, in turn, transparently establish connections through the PDN.

In the configuration shown below, any local terminal can be connected to either Host A or Host B, or Host A can be connected to Host B. Also, remote terminals dialing in to the data PABX can be connected to Host B through the PDN or to Host A through the Micro600. Considerable communications flexibility is provided by the Micro800/X.25 and Micro600 combination.

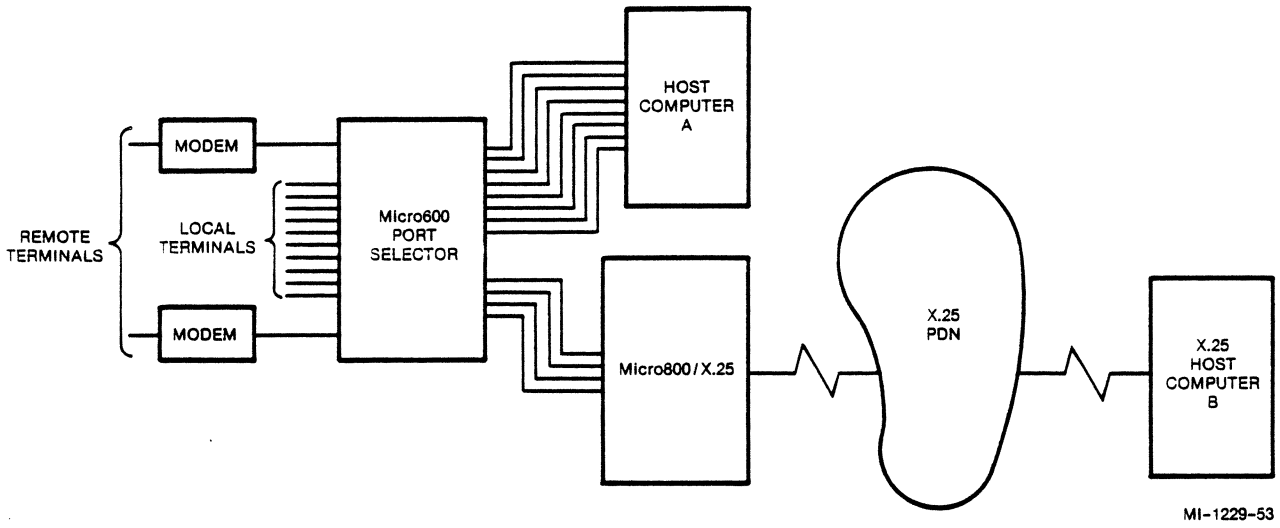


Figure 1-3. X.25 Gateway

1.3.4 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 Micro800/X.25 can be used for both host computer connection or terminal connection -- without making any changes to existing computer and terminal systems.

Special features of the Micro800/X.25 which make it unusually powerful as a minicomputer "front-end" include: automatic setup of the calling terminal PAD parameters; emulation of Bell 212 modem signalling at call setup time; and the optional ability to switch local terminals through to the host computer without placing a call through the PDN.

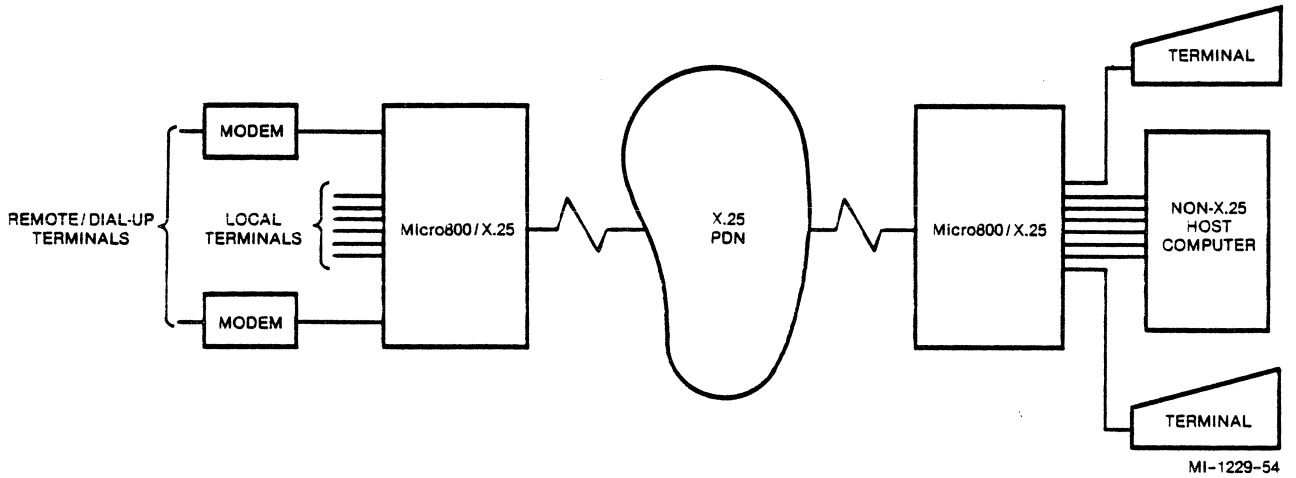


Figure 1-4. Interfacing Non-X.25 Computers

1.3.5 Computer Port Selection

Unlike standard PAD devices, the Micro800/X.25 can provide a port selection function which allows the user to select between different computers connected to a remote Micro800/X.25. This powerful feature represents another major functional enhancement over the basic requirements of X.3 and X.28. Ports at a computer site connected to a Micro800/X.25 can be grouped into classes, and classes can be selected by remote Micro800/X.25 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 feature 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 Micro800/X.25 users is easy. All the user needs to do is enter a 2-character class identifier when placing a call. The Micro800/X.25 ensures that a connection is made to the desired type of computer port.

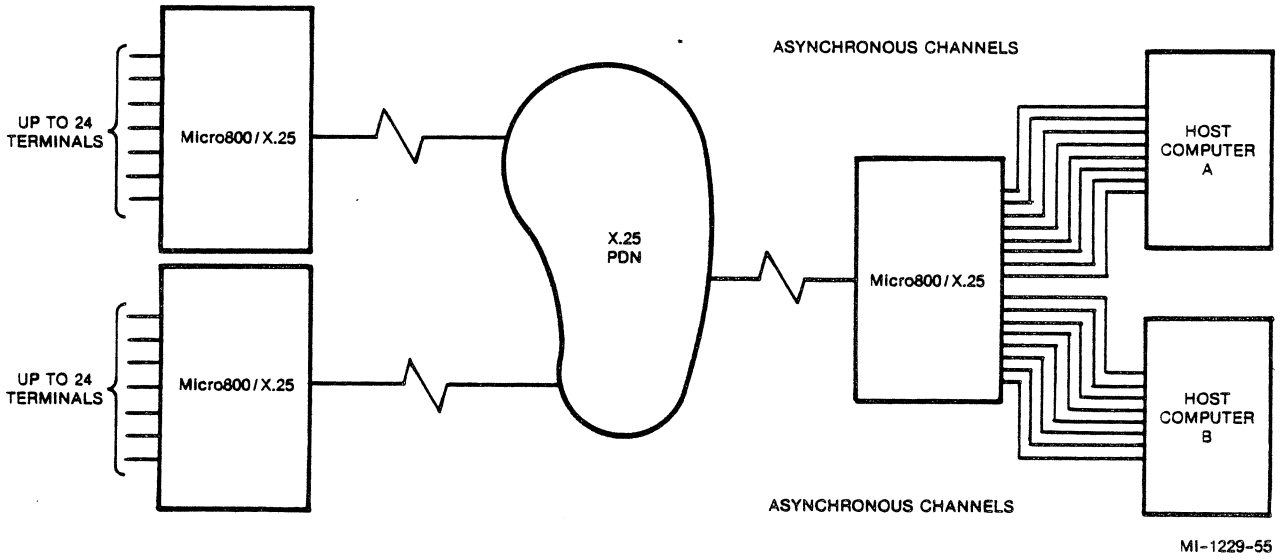


Figure 1-5. Computer Port Selection

1.3.6 Viewdata Applications

Viewdata applications require asymmetrical data rates. Viewdata normally operates at 1200 bps from the network to the user's display screen and at 75 bps from the user's terminal keyboard. The Micro800/X.25 Asymmetrical Channel Speed Option supports Viewdata and other similar terminals with or without speed conversion at the host site.

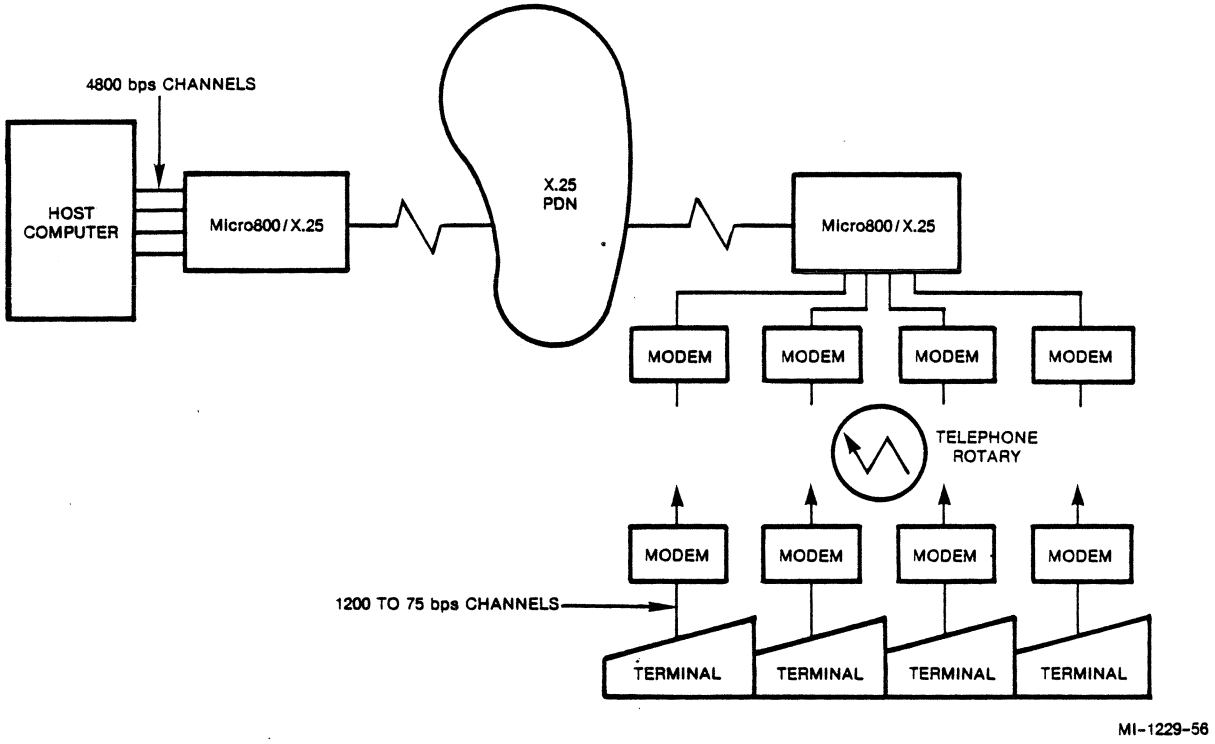


Figure 1-6. Viewdata Applications

1.4 DOCUMENT INTRODUCTION

This publication is designed to assist you in understanding the different features and capabilities of the MICOM PAD. It is intended for use by the Network administrator, the designer, and the user who wishes to access a packet data network via the PAD.

The structure of this document separates the simple, "most-used" features from the more-complex, detailed information. For example, section 2 describes simple system start-up procedures and section 4 describes terminal user connect/disconnect procedures. Sections 3 and 5 include detailed information relative to the overall operation of the PAD and PAD Administrative procedures. To help you access the required information more quickly, the following paragraphs describe the general content of each of the sections in this document:

Section 1 - Introduction

Briefly describes the Micro800/X.25 PAD, its applications, and the purpose and format of this document.

Section 2 - Getting Started

This section presents an overview of PAD Administrative functions and discusses system start-up. You can configure, control, and collect statistics from the PAD using a built-in command facility. This section also contains information that will help you get started on the network. All PADs are shipped with factory default configuration settings that are applicable in most operating environments. These default settings and the information in this section should help you get on the network with very little effort.

Section 3 - Theory of Operation

Before you install or reconfigure the PAD, you need to develop a firm understanding of the different features and operational techniques that have been implemented in the PAD. With this understanding, you should be able to determine how and when they can most effectively be used in your installation. The material in this section provides this kind of in-depth information. This section also includes extensive information relative to the PAD's support of X.25 Facilities, X.3, X.28, X.29 and X.121.

Section 4 - User Interface Information

Section 4 is for the terminal user who wishes to use the PAD. The information in this section describes how to establish a connection to the PAD, place a call over the network, examine/modify configuration parameters for that call, and how to interpret PAD service signals.

Section 5 - Administrative Procedures

The information in this section describes the various methods that can be used to access the Command Facility and the administrative functions that can be subsequently invoked. There are several ways to access the PAD's Command Facility:

- Locally, using the dedicated Command Port
- Locally, calling the Command Facility from another channel
- Remote users can call the Command Facility through the Network.

This section also includes a check list of items you should consider and be familiar with before you access the Command Facility. When you have logged on the Command Facility, you are presented with a command menu. The Command Facility is a user-friendly, menu-driven software module that can be used to examine and modify PAD configuration parameters, execute diagnostics, monitor PAD performance, and gather statistics. This section includes extensive information for using the Command Facility.

Section 6 - Diagnostics

You can quickly pinpoint problems using the PAD's LED indicators and operator-initiated tests. The information in this section will help you interpret the PAD's indicators and the result of operator-initiated tests.

Section 7 - Hardware Description and Installation

This section describes the PAD's physical and environmental characteristics. It discusses installation procedures and the use of different strappings in detail.

Appendix A - Configuration Sheets

The configuration sheets summarize all the parameters that can be configured via 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.

Appendix B - Factory Parameter Settings

The information in this section describes all of the PAD's configuration parameters as they are set by the factory. MICOM PADs are shipped with default configuration parameters that are applicable to many standard applications. You may want to operate the PAD as it is shipped. If you want to make only a few changes, the information in this section may help you get "up and running".

Appendix C - Configuration Switch Groups

You can override some of the factory default configurations using the PAD's configuration switches. The information in this appendix defines the function of each of these switches.

Appendix D - ASCII Chart

The ASCII chart is an essential reference to determine the various control characters necessary to define the PAD device profiles and other configuration parameters.

Appendix E - Cable Pin-outs

This section describes the various types of RS-232-C cables that you might need.

SECTION 2

GETTING STARTED

2.1 PURPOSE OF THE MICOM PAD

The MICOM PAD provides access to CCITT X.25-compatible packet networks or equipment for asynchronous devices. The operation of the PAD interface 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 parameters are provided in an effort to improve communications efficiency by reducing the number of packets generated over the Packet Data Network. Through the configuration of trunk-related parameters, PAD operation can be optimized when it is connected to different kinds of networks.

2.2 GETTING THE BEST OUT OF YOUR PAD

To assist you in the PAD's installation and operation, it is designed and implemented to address the following issues:

- Quick and easy installation
- How to tailor the PAD's operational characteristics to support your Network, devices, and applications requirements
- How to diagnose problems that may occur between the PAD and the Network, between the PAD and the attached device, and within the PAD itself.
- How to monitor and control the PAD and the device attached to it
- How to automate PAD management

Factory default configuration settings will reduce the time required to be fully operational with your new PAD hardware. The PAD is equipped with an integrated Command Facility that will help you tailor the PAD to your own specific operating environment, diagnose problems, and monitor and control the PAD and associated devices.

Addressing the last item in this list, MICOM also offers a complementary product, the M850-NCS Network Control System. This product allows you to control a number of PADs from a single workstation. Please refer to the User's Manual, stock number 800-1230 for details. Figure 2-1 illustrates a Network Control System implementation.

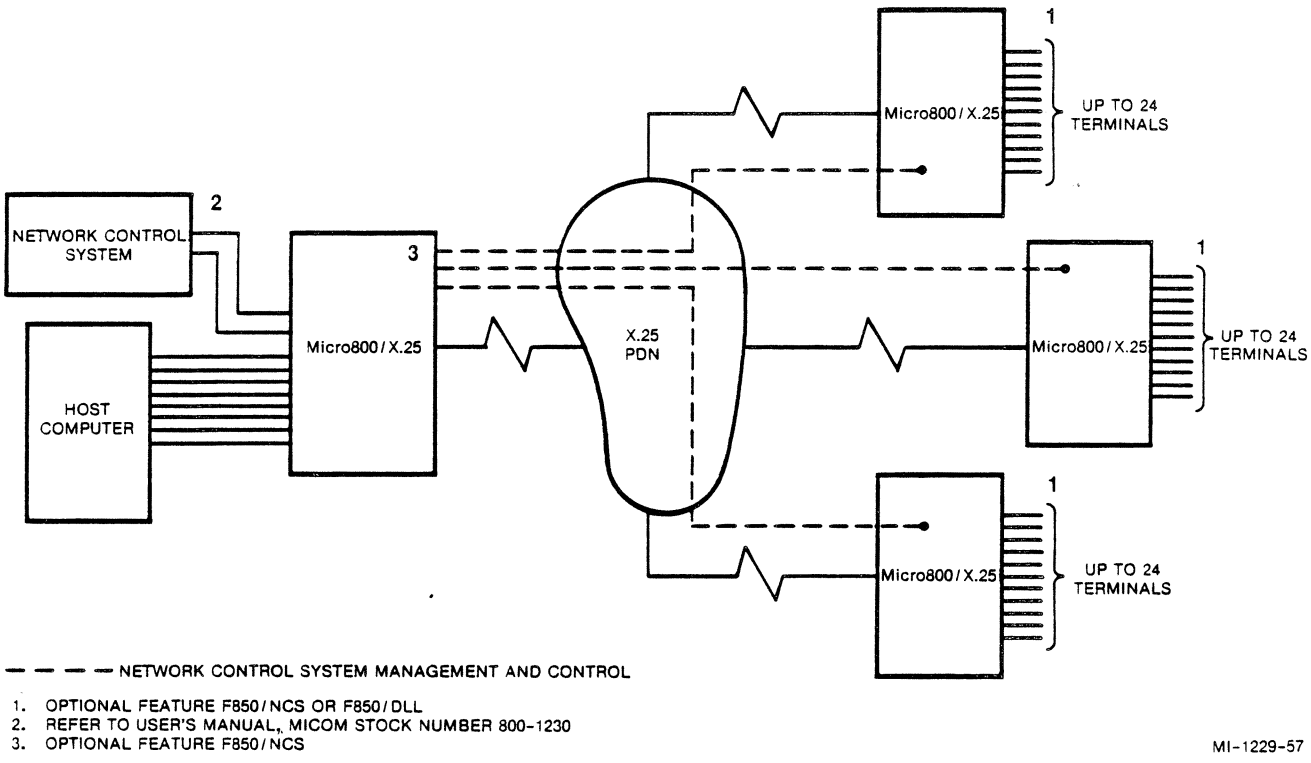


Figure 2-1. Typical Network Control System Implementation

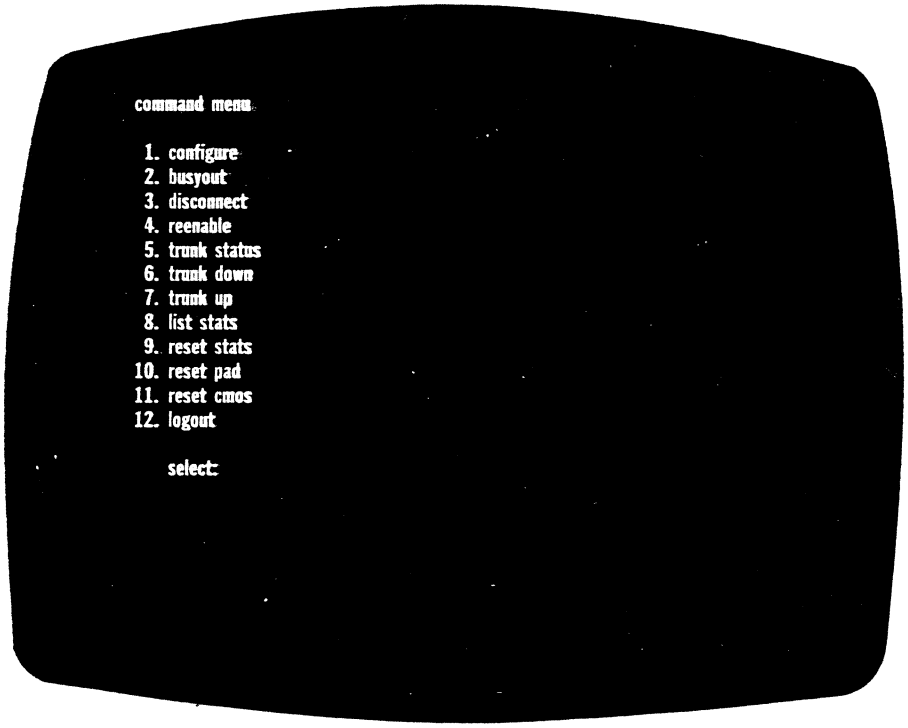
2.2.1 Command Facility

At the heart of the MICOM PAD, there is a software module that is referred to as the Command Facility. It provides you with the following administrative functions:

- PAD configuration
- Operational control
- Performance monitoring
- Diagnostics
- Statistics collection

The Command Facility can only be accessed by authorized personnel. It can be accessed locally at the PAD or from anywhere in the Network. When a connection is established, the PAD administrator is directed through the various administrative functions using a series of menus and data entry prompts. This approach greatly simplifies PAD configuration and management tasks. There are no special commands or complex syntax to memorize.

Following password access to the Command Facility, a menu of PAD administrative functions is displayed. The menu items consist of clear, English-text descriptions of each of the available administrative functions. They are not cryptic, abbreviated, or difficult to understand. When you select a menu item, additional descriptive prompts will direct you through the various administrative functions.



MI-1229-58

Figure 2-2. Command Facility Menu

Figure 2-2 illustrates the format of the Command Facility menu. You can use this feature immediately to examine PAD configuration and perform other administrative functions. We only recommend that you do not change the PAD's configuration parameters until you have a more in-depth understanding of their impact on system operation. With this restriction in mind, you can use the Command Facility immediately. The following paragraphs are a general description of each of the PAD administrative functions that are supported by the Command Facility:

Configuration — Selecting the right parameter values is essential to smooth and efficient operation of the PAD. All parameter values configured via the Command Facility are stored in nonvolatile memory.

Operational Control — Allows you to monitor and control access to the PAD channels and the X.25 trunk.

Performance Monitoring	Allows you to monitor the PAD, its channel activity, and its utilization.
Diagnostics	Allows you to 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 events and call accounting information.

2.2.2 PAD Set-Up

In an effort to anticipate your requirements, MICOM ships the PAD fully configured. This means we preset all its parameters to factory default values. These values are automatically copied into the configuration memory when a cold start procedure is initiated.* For example, all PAD channels will support dedicated connection and automatic speed and parity detection at cold start. When you receive the PAD, this allows you to attach any start/stop device and place a call over the Network.

The PAD also allows you to override some of these default values by setting the configuration switch groups.

For a detailed overview of these default values and the configuration switch settings, please refer to appendixes B and C.

* A cold start procedure is initiated each time the PAD is reset or powered on while the cold start, switch group S1 switch position 4 is ON. It also occurs automatically when a checksum error is detected in the nonvolatile configuration memory.

SECTION 3

FUNCTIONAL DESCRIPTION

3.0 INTRODUCTION

The following information has particular significance when you are planning the initial installation of the PAD and when you are examining the results of changing the type of applications and/or 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's involved in placing a call
- What occurs when an incoming call is received
- X.28 support with additional MICOM features
- X.29 support with additional MICOM features
- Permanent virtual circuits

Because of the strong relationship that exists in these operational areas, the text in this section includes extensive cross-referencing notes. We have also cross-referenced each subject or feature with its related configurable parameter(s) 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 through equipment (i.e., host computer, front ends, and communication processors) which comply with the recommendation X.25 as adopted by CCITT in 1980 and which have 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, it 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 in 1980.

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.

Factory shipped units are preset to exhibit an X.25 DTE logical appearance on their trunk. This makes the PAD suitable for immediate connection to the packet data networks. 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 configuration switch position (refer to appendix C).

In addition to the DTE or DCE logical appearance setting, the PAD allows you to tune the trunk paramters to meet the characteristics of the X.25 facilities being used (i.e., 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.

Link Assurance Timer: To ensure that the X.25 trunk is operational, the PAD can be configured to use the X.25 link-assurance procedure when it detects no activity on the trunk for the duration of the timer.

The factory setting is 15 seconds

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 128 bytes.

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 64 bytes.

If you need to change any of the factory settings listed above, please refer to paragraph 5.7.5.

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 communications sessions simultaneously 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 number of virtual circuits dictates the number of simultaneous sessions that can be supported over the X.25 trunk. This number can be less, equal, 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 (0). The number of SVCs is set to the number of physical channels, plus two (2).

3.1.3.1 A 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 would 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 thru 24).
- The Network identifies each PVC with a unique logical group number (LGN) and logical channel number (LCN). Permissible values are: 0 thru 15 for the LGN and 0 thru 255 for the LCN. You cannot define a PVC with both the LGN and LCN set to 0.
- 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 A 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 thru 15 for the LGN and 0 thru 255 for the LCN. Note, you cannot define SVCs to use any LGN/LCN number defined for PVC use. Typically, the PDN's 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 paragraph 5.7.5 "in call" selection). 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. 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 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 facilities 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 the X.25 facilities. Others may support non-X.25 facilities, referred to as National facilities.

3.1.4.1 Via 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 command, it performs the necessary encoding of the Call Request packet. The complete format of the X.28 connect 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/DATAPAC priority code
D	Throughput class negotiation

Other Facilities

Other facilities can be incorporated in the Call Request packet by using a free format syntax in the X.28 connect command.

The format is:

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

Where cc=facility code in hexadecimal

pp=facility parameter field in hexadecimal

Example: To request RPOA 1234, enter:

$X44=12:34

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 with the CCITT National marker when the Call Request packet is encoded.

3.1.4.2 Abbreviated Connect Command

You can also predefine the X.25 facilities using mnemonic addressing (refer to paragraph 5.7.7). 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.

3.1.4.3 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 5.7.5).

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 configuration switch group S2, position 7 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. Refer to paragraph C.1.2.3.
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 use this code to match the calling device with a channel of the same speed (refer to paragraph 3.1.5.1).
Fast Select	When the PAD detects a Fast Select request, it will prompt the user for an entry of up to 128 bytes. The entry will be inserted in the call user data field of the Call Request packet. The PAD supports "Restricted Fast Select." For Restricted Fast Select, the response is a clear indication packet with up to 128 bytes in the call user data 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 Class and Fast Select facility if you want to accept Fast Select calls.

3.1.5.1 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 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 requested is less than or equal to the trunk window size. 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 or device has 2 minutes to enter this data. The PAD will forward the response in the Clear Request packet.

FACILITY	PAD ACTION
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 confirming the speed of the assigned channel.
Non-X.25 Facilities	The call is accepted.
Other X.25 Facilities	The call is accepted.

3.1.6 Trunk Out-Of-Order

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 link Assurance Timer plus two times N2 by T1. Based on these factory default setting parameters, this value is equivalent to 115 seconds.

- Permanent Failure

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

  The PAD's LD indicator will go ON and all dial-in 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 DISC command and wait for a UA response to resume frame and packet level reestablishment procedures.

- Via a User 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 a "trunk up" command is issued via 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 co-located 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 occur:

- A Trunk-Up command is initiated via the Command Facility
- PAD Reset command
- PAD physically reset

When any one of these conditions exist, the PAD will reinitialize 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.

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.

3.1.7.1 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 Size

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, you must set a PAD configuration switch position (refer to appendix C) 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.

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 thru 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 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 129 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. Note that the character count has a maximum value of 255. Hence, this condition cannot effect the M-bit setting of 256-byte packets.

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

3.1.9 Trunk Password

You can protect your PAD against unauthorized access by defining a trunk password. Specifically, it 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.* Typically, the caller has no control over octets 1 thru 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.

3.2 ASYNCHRONOUS DEVICE SUPPORT

In a typical minicomputer/terminal system using point-to-point leased lines, the minicomputer directly controls such functions as:

- Character echo
- Control character sequence
- Editing
- XON/XOFF
- Break handling

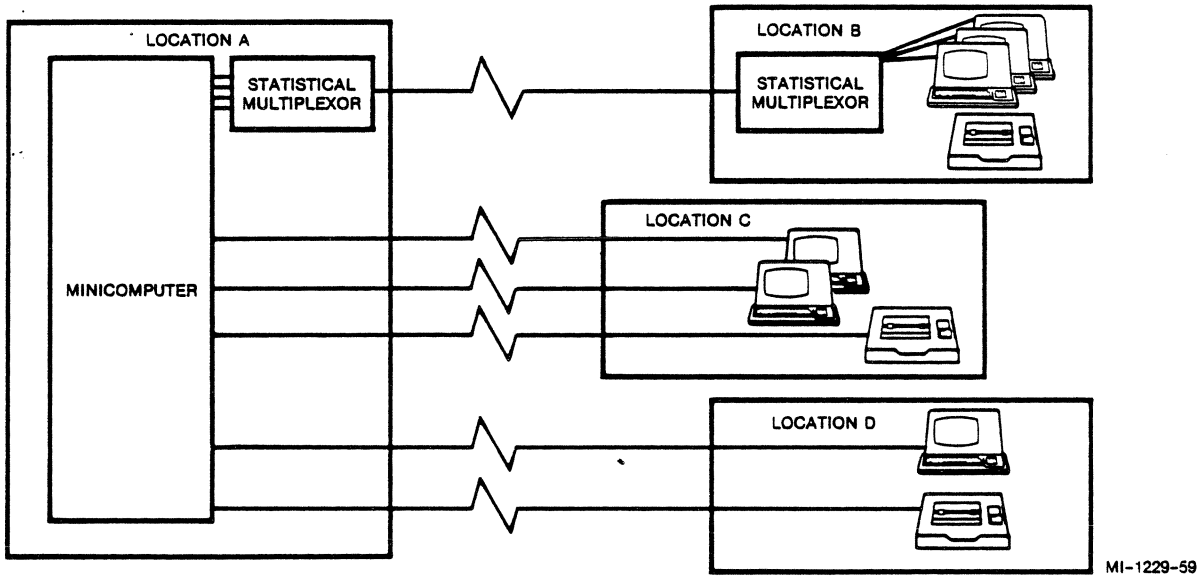


Figure 3-1. Typical Minicomputer/Terminal System

* If the call user data method of subaddressing is enabled, the trunk password must be in octets 7 thru 10. Refer to paragraph 3.5.4.1.

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, 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.

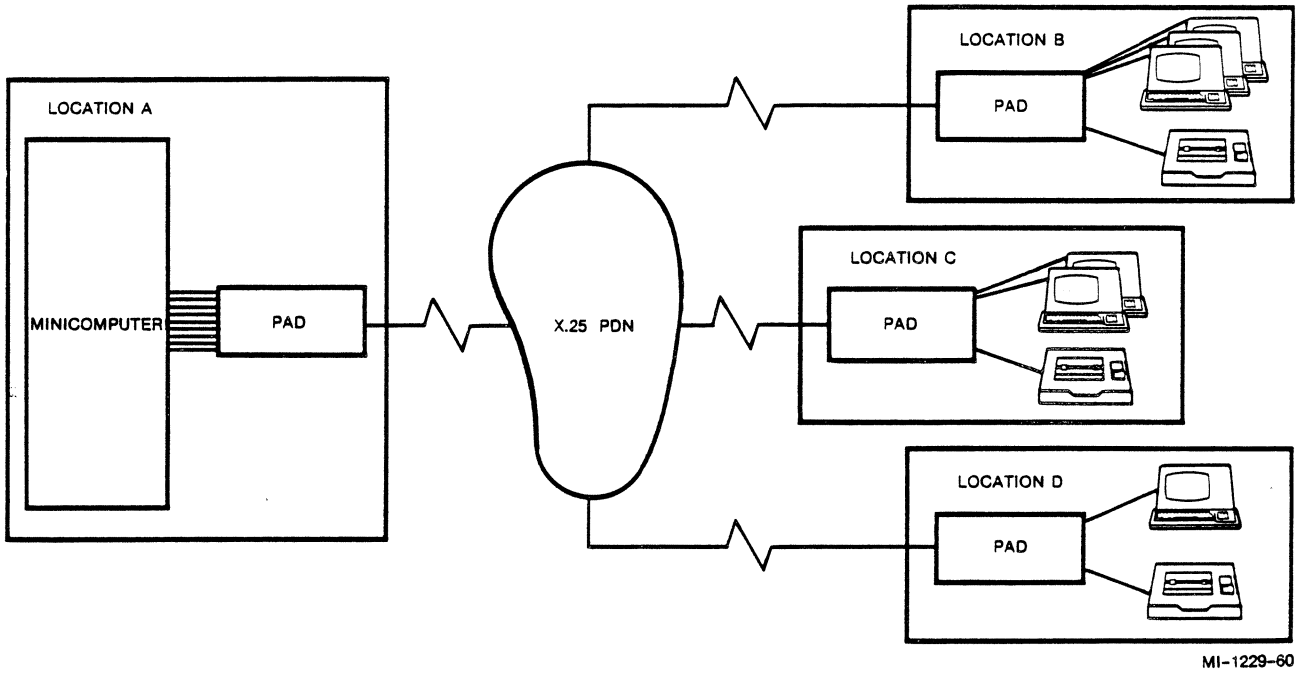


Figure 3-2. Minicomputer/Terminal System Using PDN Facilities

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 20 CCITT X.3 parameters (see table 3-1) and an additional set of 18 parameters. These parameters can be used to support a wide variety of start/stop 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 as host computer handling always involves greater transmission of data.

Collectively, the 38 parameters are grouped in what is called a "device profile." The PAD supports up to eight user-defined device profiles that can be assigned to the PAD's individual asynchronous channels.

By configuring each of the device profiles 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.

When a device profile is assigned to a channel via the Command Facility (refer to paragraph 5.7.2) the behavior of the channel is basically controlled by the values of the parameters in the profile. However, these parameters can be modified, via 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 via X.29 messages.

However, 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 will be 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, parity type, and number of stop bits.

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

The PAD supports Even, Odd, Mark, Space, or no parity. Characters which consist of 5 or 6 bits must be configured with no parity using Parameter 101. 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. The selection of autoparity automatically selects autobaud recognition (refer to paragraph 3.2.2.2).

3.2.1.4 Parity Checking

For 7-bit characters, the PAD will check the parity of device-generated characters. A parity check will cause the PAD to generate a question mark character ? to the attached device. If the bad character is not corrected via the editing functions, the data forwarded to the host will include a ? in lieu of the character.

Table 3-1. Device Profile Parameters

Parameter	Reference Number
PAD Recall	1
Echo	2
Data Forward	3
Idle Timer	4
Device XON/XOFF	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
Device Type	19
Echo Mask	20
*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

* All MICOM-enhanced parameters are assigned 100 numbers while CCITT parameters are numbered from 1 thru 20.

3.2.1.5 Network Parity

The PAD can be configured to pass data transparently or to perform parity conversion to and from 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. The process is reversed for incoming data.

Note that 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 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

3.2.2.1 Asynchronous Speed

The PAD supports the following asynchronous data rates: 50, 75, 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 these fixed speeds via 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 any of the above speeds 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.)

3.2.2.3 Asymmetrical Speed Support

This hardwired, factory-installed option*, allows the PAD to support asymmetrical channel data rates. When installed, the terminal receive speed on a given pair of channels will be as specified for the ODD-numbered channel in the device configuration profile. The terminal transmit speed on both channels will be as specified for the EVEN-numbered channel. The pairs are channels 1-2, 3-4, 5-6, 7-8, etc.

3.2.3 Echo Control

3.2.3.1 Echoing User Input

In a typical leased line or dial-in minicomputer/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 is normally configured to perform this echo function in the remote terminal sites instead of the host computer. 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 character echo functionality of the PAD is controlled by Parameter 2.

3.2.3.2 Selective Echoing

The PAD allows you to select which character to echo and which to pass without echo for host computer action. Typically, you would specify echo of all displayable characters and some control characters. The decision as to which control characters the PAD should handle locally depends entirely on the application terminal and computer capabilities.

Parameter 20 (Echomask) instructs the PAD to echo selected groups of characters.

* Prerequisite: The optional Feature F850/ASYM

3.2.3.3 Handling Escape Sequences

The use of Escape Sequences (ESC) 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 is controlled by Parameter 20 (Echomask).

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, it is only echoed if it is part of the characters to be echoed as specified 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 3 sets of echo sequences specified by Parameter 112. Each set contains up to 8 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

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, Enhanced 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 this feature is enabled by setting Parameter 111 to 0, the PAD will hold the output destined to the device until it detects one of the following conditions:

- A forwarding condition.
- No keying activity for a certain period of time. The inactivity period is equal to the value of Parameter 4, Forwarding Idle Timer.

3.2.4.3 No Priority

Parameter 111 (Enhanced Echo Control) enables you to define input, 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.

- 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 redisplay 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). Note that 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 not, the PAD discards it and does not echo any more input until a CR* character is entered. The PAD also displays a message "edit line too long", unless Parameter 6 is set to 0.

* CR underlined means user entered
  CR without underline means transmitted without user entry.

3.2.6.3 Editing Signals

When the PAD detects Parameter 16, 17 or 18, it acknowledges the user's request by generating the appropriate 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 tailor the editing service signals to suit your device type by Parameter 19 (dv. type).

For a character delete function, the PAD transmits the character sequence BS SP BS to a display-type device. This sequence erases the last keyed data character and repositions the cursor for the replacement character. The PAD will not generate service signals for a printer.

For a line delete function, the PAD transmits the same sequence to a display. The sequence is repeated as many times as the number of characters being deleted from the edit buffer. For a printer device, the character sequence X X X CR LF is transmitted.

NOTE

Neither of the these signals will be transmitted if you disable the PAD service signals via Parameter 6.

For a line display function, the PAD transmits the character sequence CR LF (Accumulated data) CR LF to either device type, CRT or printer.

3.2.7 Output Formatting

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 via Parameter 9 for LF, Parameter 14 for CR 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 per 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 behaviour via Parameter 13.

3.2.7.4 Automatic Pagination

The PAD's pagination feature allows you to 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:

- XON/XOFF Character (In-band) method
- CTS/RTS EIA (Out-of-band) method

3.2.8.1 EIA Method

For devices that support EIA flow control (typically host computers), the PAD can be configured via 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 via Parameter 5 to issue XOFF to halt transmission and XON to signal the device to resume transmission. Also, if the device can initiate flow control, the PAD can be configured via 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 flow control. This feature is enabled by setting Parameter 105 appropriately.

3.2.9 BREAK Handling

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

The PAD can take several actions when BREAK is detected from the device in data transfer mode:

- No action is required.
- 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 is enabled via Parameter 15.
- The packet (128 or 256 bytes) is full, unless the 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 feature 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 3.3.6).
- 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 feature 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 the Parameter 116 (Device Profile Inactivity Timer). Because the resolution of this timer is 1 minute, you should configure this timer equal to the desired value, plus one.

3.3 CHANNEL CONNECTIONS

3.3.1 Introduction

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 5.7.1). Also, each channel can be configured to support one of several EIA signalling methods to accommodate the requirements of the different attachments. The following paragraphs describe the EIA methods and how they effect the device connect and disconnect procedures.

3.3.2 Cabling

Because channels have an EIA-DCE, that is, modem appearance, you would normally use a standard RS-232-C cable (MICOM part 100-2219/1786) 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 (MICOM part 100-1436) between the modem and the channel.

Refer to appendix E.

3.3.3 Physical Connection Vs. Physical Path

Throughout this document, a physical connection refers to successful completion 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 indicator (Pulsing) - lead 22
  Busy-out indicator (Constant) - lead 22

The control signals monitored by the Channel are:

- Data terminal ready - lead 20
- Request-to-send - lead 4
- Ring-in indicator - 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 5.7.1) determines the status of these leads in both idle and operational mode. In addition, you can suspend the operation on any given channel by invoking either the "busyout" or "disconnect" command from the Command Facility. Either one will cause a dial-in channel to raise BO lead 25. Also, the PAD will not monitor any input control signals on channels that are in the "busyout" or "disconnect" state. Refer to paragraph 5.8 for further 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 co-located with the PAD with 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, that is, for leads 8, 6 and 5, respectively.

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, 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.
- If the call is cleared by the network or by the PAD, the channel will generate the appropriate X.28 service signals and momentarily drop all its leads before raising them again.
- The PAD will also momentarily drop its leads and reestablish the connection if the user inputs one or more characters in X.28 mode, and then fails to terminate them with a command delimiter, a CR, within 4 minutes.

3.3.6 Dial-in Connection (Auto Answer Support)

Auto answer support allows the channel to support Bell 212 or compatible modems. You would 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 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 not drop the EIA leads immediately. It will wait for two minutes or four retries for the user to initiate another call.

3.3.7 Dial-Out Connection

The dial-out capability allows a computer with dial-up or dedicated terminal support to use the Packet Data Network (PDN) with no changes to cabling, computer hardware, or software.

Two EIA signalling methods are provided to indicate an incoming call to the host: pulsed ringing and constant ringing.

3.3.7.1 EIA Leads in Idle State

In idle state, a channel configured for dial-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 modems.

3.3.7.2.1 Physical Connection

When an incoming call is routed to a dial-out pulsed ring channel, the channel will pulse EIA lead 22 (BO) up to 5 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 is detected during the allowable ring time of 30 seconds.

3.3.7.2.2 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.

3.3.7.3 Constant Ringing

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

3.3.7.3.1 Physical Connection

When an incoming call is routed to a dial-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). Subsequently, it will wait for lead 4 (RTS) to become High before it raises lead 5 (CTS).

3.3.7.3.2 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.

3.3.8 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 front-end, you can reduce the impact of batch type transmissions (printer-bound) over interactive 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 5.7.1).

3.3.9 PAD Action on Data Loss

A possible network data-loss condition on a given virtual circuit is signalled 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 (a PVC can only be reset) instead of resetting the SVC when a data loss condition occurs. (Refer to paragraph 5.7.1.)

3.3.10 User Connection Messages

When a connection is established the PAD service signals are not inhibited via X.3 Parameter 6, the MICOM PAD issues the following messages:

3.3.10.1 Herald Message XX

The Herald Message is configurable (refer to paragraph 5.7.9) 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 "micro800/x.25 channel."

3.3.10.2 Bulletin Message

This message follows the Herald Message and is also configurable (refer to paragraph 5.7.10). 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.

3.3.10.3 X.28 Service Prompt

This configurable prompt (refer to paragraph 5.7.11) 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 * .

3.4 ADDRESSING

3.4.1 Introducing X.121

CCITT standard X.121 defines a universal numbering scheme for addressing devices. This numbering scheme insures 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 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:

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

A 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 is a sample of some networks' DNIC:

TELENET = 3110
TYMNET = 3106

A NTN: This is up to a ten-digit terminal network number. The NTN portion of the address is not restricted and the definition of its format is dictated by the different network administrations.

3.4.2.1 Subaddressing

The NTN is typically divided in 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 (i.e., 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 2-digit subaddress is used. But, some networks can assign up to 4 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 describes PAD handling of the address fields, including the subaddress, in both outgoing and incoming call packets.

3.4.4 Incoming Calls

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 (i.e., computer port, a particular device, etc.) by specifying the channel or the group of channels where the resource is attached. This feature is most useful when the PAD is acting as a front-end 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 where 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 via 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 subaddressing and the PAD may have to communicate with devices that have subscribed 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 (i.e., 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 via 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 feature 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. Definitions of rotaries are normally based on operational criteria such as host type, application, speed, etc.

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 support rotaries and explicit channel selection simultaneously. 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 are factory set to 0. 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 subaddress 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 factory-set to 99. Refer to paragraph 5.7.8 to change 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

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 5.7.5 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 via the outcall parameter of the trunk. Refer to paragraph 5.7.5.

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

- Execute Terminal-Activated Channel Test (TACTS or TACTR)
- To receive local calls
- To allow channel selection by incoming calls

Refer to section 6 for a description of TACTS and TACTR. Refer to paragraph 3.4.4 for routing of incoming calls.

3.4.5.2 PAD Channels Address

The PAD can also append the originating channel number (1-24) to the PAD address. This can be used by your destination to identify the calling party on your PAD. Refer to paragraph 5.7.5.

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 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 / character. 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 method where AB=12345:

  C AB/22*Calluserdata

  In the case of an abbreviated command, the 22 will override the subaddress field configured for mnemonic AB. In both cases, the treatment of the 22 will be based on the method of subaddressing specified in the PAD's configuration (i.e., 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 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 specifiy a subaddress equal to 00 or 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. The PAD will ignore a 00 entry following a / character.

3.5 PLACING A CALL

3.5.1 Channels 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 5.7.1.

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 (i.e., configure, control, etc.) 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. On the other hand, a remote caller attempting to connect to the PAD's Command Facility will be cleared with diagnostic code 133 -- if you initiated a call from the Command Port.

3.5.3 Calling Methods

Each channel can be configured to support one or any combination of the following calling methods:

- Long form
- Abbreviated
- Autocall

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

3.5.3.1 Long Form Method

This method requires the user to enter a standard X.28 connect command to establish a virtual call.

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

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

The following paragraphs define valid entries in each field of the call connect command:

- [C]- C followed by a space is the X.28 call Connect Request command.

- (facility codes-) - Facility codes are optional entries in the call connect request. 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

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

* Prerequisite: The optional Feature F850/FSLECT

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 Connect 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 can be two digits specifying additional routing associated with the destination address.

- (*call user data) - The call user data field is available as an optional feature. If it is included, it must be preceded by an asterisk (*). 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 the Long Form Connect command:

Example 1:

Connect command with only the destination network address field:

C 12345678

Example 2:

Connect command with the optional subaddress field:

C 12345678/01

Example 3:

Connect command with a closed user group facility code, a subaddress field and call user data:

C G12-12345678/01* HELLO

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

If your PAD is configured for call user data subaddressing method, the subaddress digits which are preceded by the / character 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 Method

The abbreviated call 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 Connect command is as follows:

[C .] [AA] (/Subaddress) (*Call User Data)

HOW DOES IT WORK

In support of the abbreviated calling method, the PAD allows you to preconfigure up to 12 two-alphanumeric character mnemonics.

Each mnemonic will act as an index key to an internal configuration table in the PAD (refer to paragraph 5.7.7). The fields of the table are:

- 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 thru 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 5.7.7.
- The call user data uses octets 5 thru 16 of the call user data field.

A connect command using AB as a mnemonic, can be reduced to the simple format:

C .AB

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

Example:

C .AB/16 *UPTO12OOCTETS

This override capability dramatically increases the number of destinations which can be reached via the 12 mnemonics. For security reasons, the user cannot override the facilities or protocol ID associated with each mnemonic.

3.5.3.3 Autocall Method

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 5.7.1.

It can also initiate a call on detection of a CR from the device when the channel connection is established or after a call is cleared. This is referred to as AUTOCALL ON 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 Connect command.

HOW DOES IT WORK

For each channel configured for autocall support (refer to paragraph 5.7.1), 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 via a PAD channel.

- Local Call
- Remote Call
- Fast Select Call*
- Diagnostic Call

* Prerequisite: The optional Feature F850/FSLECT

3.5.4.1 Placing a 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 Connect command must specify the PAD address in the called address field of the X.28 Connect command. The user must also specify the class ID of the called channel in the subaddress field of the Connect command (i.e., after the separator character /. Refer to paragraph 3.4.5.3).

You can also initiate a local call via 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.

3.5.4.2 A Remote Call

The PAD will initiate a call request over its X.25 trunk when the called address in the X.28 Connect 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 could be up to 15 digits long. This satisfies the requirements 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 Connect command.

In this case, the PAD will prompt the user via an X.28 service prompt for up to 128 bytes of data. This data is placed in the call user data field of the outgoing Call Request packet.

The response to the Call Request packet must be a clear indication packet. The clear indication can contain up to 128 bytes of data in the call user data field.

This type of call would typically be used for application 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 A 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 and 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 address (refer to paragraph 3.4.5). Note that 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.

- 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 (i.e., host port, application, etc.).

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 password. This password must be present in octets 5 through 8 (four ASCII characters) of the incoming call's call user data field.* The caller's failure to do this causes the PAD to respond by rejecting the call with diagnostic code 133.

* If the PAD is configured to support subaddressing via the call user data field, the trunk password must be present in octets 7 thru 10.

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 anyone 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 channel(s) has been assigned a class ID equal to the subaddress. The channel(s) must have incoming or incoming and outgoing call capability.

If none 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 none 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 if:

- The device connected to that channel has its DTR/DSR signal High (refer to paragraph 3.3), and

- 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 if it has not received any input from the attached device in the last four minutes.

If the call is routed to a channel configured for dial-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* in the rotary that support the same speed, it 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.

  This feature 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.

* A free channel is a channel which is not engaged in a virtual call or EIA handshaking.

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 An Autobaud Channel

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 Facility. If the speed is not included in the incoming call, the default value is 9600 bps.

Refer to paragraph 5.7.13 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 forwarding of the call user data field when the service signals are disabled.

3.7 X.28 COMMANDS AND SERVICE SIGNALS

3.7.1 Introduction

X.28 specifies the dialogue between a user and the PAD. This dialogue has two components. The first is commands that the attached device can input. The second is 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 commmand, 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 (refer to paragraph 3.0) or to clear the call.

If you want to enable either of these functions, 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 the user escapes to X.28 mode, he is 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 an additional 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 5.7.1).

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 Indication 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 destination device is another MICOM PAD, diagnostic codes indicate the reason the clear or reset occurred.

Refer to section 4, tables 4-5 and 4-6.

3.7.4.2 Control of Service Signals

When the PAD is acting as a front-end for a non-X.25 host computer, all service signals and the X.28 prompt should be suppressed by setting Parameter 6. With this parameter set to suppress service signals, the PAD will also suppress the herald and the bulletin messages. The editing signals and responses to X.28 commands are also suppressed.

Call User Data

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 override mechanism on a per-channel basis. Refer to paragraph 5.7.1.

Editing Service Signals

By setting Parameter 19, you can instruct the PAD to issue the appropriate editing service signals according to the device type, either a visual display or a printer. Refer to paragraph 3.2.6.3.

3.8 X.29 SUPPORT

3.8.1 Introduction

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 following paragraphs describe processing of incoming X.29 messages:

- 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. The 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 issued 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

- On receipt of a READ, or 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, or 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 7 of the Device Profile) is detected, 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 an 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 setup 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. 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 via the public asynchronous access ports of your Packet Data Network. The device profiles are typically too general to be used as is. Using 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 network's public access ports.

Note that channels with the same class ID (i.e., belong to the same rotary), should typically be assigned the same "remote configuration parameters sequence." To enable this feature on a given channel, you must configure that channel as a host channel-type (refer to paragraph 5.7.1).

3.8.4.2 ASCII to X.29 Conversion

MICOM's PADs support a powerful feature to enable asynchronous host computers to alter the value of remote PAD parameters dynamically. This feature complements the "Remote Parameter Set-up" 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 commands 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, etc.

This conversion capability can be enabled or disabled by setting device profile Parameter 117. This parameter defines which parameter should be interpreted by the PAD as an X.29 access request (i.e., 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, i.e., the same mechanism required for forwarding X.28 escape character.

3.8.5 X.29 Service Signals

- 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 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.

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 5.7.6 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

The PAD will use the "com" service signal to indicate that a PVC is operational. Following a link restart, and when the PAD detects a "device not ready" condition on a channel configured for PVC operation, it will notify the remote destination device by a Reset DTE 01 (see table 4-5 for Reset Service Signals).

3.9.3 Command Facility

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.

SECTION 4

USER INTERFACE

4.1 INTRODUCTION

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. 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.

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

In order to connect to the PAD, you must first establish a physical access 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.
- Examine or modify device parameters assigned to the channel you are connected to.
- 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 via a dial modem or permanently connected via a dedicated arrangement using cables and/or private wire modems.

* A CR is required for an autobaud channel. A CR.CR sequence is required for a channel configured for autobaud and autoparity support.
** Prerequisite: The optional Feature F850/FSLECT

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 pitch 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 button on the data set.

4. For an autobaud-autoparity access channel, enter the ABR sequence CR.CR. For an autobaud-only access channel, enter CR. 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.

NOTES

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

2. 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 neccesary.

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 may require service.

- The PAD may require 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

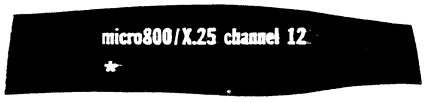
When you have successfully established a connection between your terminal and the PAD, the PAD will transmit the following messages:

- Herald Message - The PAD Herald message is the equivalent of a greeting or welcome message. The factory setting is: "micro 800/x.25 channel nn" (Where: nn is the channel number your terminal is physically connected to).

- 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 asterisk (*). The X.28 Service prompt indicates 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 messages indicate that you have completed a successful connection between your terminal and the PAD's 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 Format

Using the Long Form Calling method, you are required to enter the standard X.28 Connect command 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)

NOTE

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

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

- [C] - C followed by a space is the X.28 Call Connect Request command.
- (facility codes-) - Facility codes are optional entries in the Call Connect Request. 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

* Prerequisite: The optional Feature F850/FSLECT

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 Connect command and specifies the network address of the destination 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 can 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 asterisk (*). 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 Connect command:

Example 1:

Connect command with only the destination network address field:

```
C 12345678
```

Example 2:

Connect command with the optional subaddress field:

```
C 12345678/01
```

Example 3:

Connect 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 command (C) and a 2-character mnemonic. The general format of the abbreviated Call Connect command is as follows:

C .aa

Where: aa is a 2-character abbreviated call mnemonic that has previously been defined by your network administrator.

Example: C .AB

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 command in the format:

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

Valid entries in the subaddress and call user data fields are described in paragraph 3.5.1, Long Form Calling Method.

4.4.3 Autocall Calling Method

If you are using a channel that is configured for autocall, the PAD will automatically initiate a call to a predefined destination. The PAD can also be configured to initiate the call when it receives a carriage return character CR from your terminal. In either case, 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 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 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 via 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 127	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=1-8)	CR and LF Characters

NOTES

1. All commands must be terminated with a CR or a + character.

2. When X.28 extended mode is enabled, these commands also apply to MICOM-enhanced parameters 100-117.

3. The value 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. 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 communication status	STAT	(herald message) (Channel #)* (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 and LF characters (followed by the appropriate service message upon completion of the procedure with the PDN)
To transmit an interrupt packet to the remote device	INT	CR and LF characters
To exit X.28 command mode	(CR)	

* 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 and to exit X.28 mode.

Table 4-3. Terminal-Activated Channel Test Commands

Purpose	Command Format	PAD Response
To initiate a TERMINAL test	TACTT	in tact mode ¶6.3.2
To initiate a CHANNEL test	TACTL	in tact mode ¶6.3.1
To initiate a SYSTEM test	TACTS	tact call placed or clr xxx yyy ¶6.3.5
To initiate a TRUNK test	TACTR	tact call placed or clr xxx yyy
To terminate any above test	(BREAK KEY)	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, Diagnostics, 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 when any of the following conditions exist:

- 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 4-4. 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. You may enter up to 128 characters.
* 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 Connect 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.)
inactivity time out	Call has been cleared because of the inactivity timer.

1. The cause mnemonic consists of 3 alphabetic characters.
2. The diagnostic code consists of 3 numeric characters.
3. Hexadecimal value

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 4-5. Clear Service Signals Cause and Diagnostic Fields

Cause Mnemonic	Diagnostic Code	Explanation
dte	00*	Remote MICOM PAD cleared the call
	133*	Facilities requested are not allowed or trunk password is invalid at the remote MICOM PAD.
	134*	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	Mnemonic in Abbreviated Connect command or for an autocall channel is undefined.
	138	No free logical channel on your PAD.
	142	TACT call is not allowed from your channel.[1]
	146	NCS call already in progress.[1]
	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 from the remote X.25 equipment.

LEGEND:

xxx = Network-Dependent Diagnostic codes. Consult your Network directory for their significance.
nnn = Destination DTE Diagnostic code.
* The values may have different significance when generated by non-MICOM remote equipment.
[1] Prerequisite: The optional Feature F850/NCS

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 4-6. Reset Service Signals Cause and Diagnostic Fields

Cause Mnemonic	Diagnostic Code	Explanation
dte	00*	VC was reset.
	01*	Remote device is not ready (PVC).
	128*	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.

* The values may have different significance when generated by non-MICOM remote equipment.

SECTION 5

ADMINISTRATIVE PROCEDURES

5.1 INTRODUCTION

The PAD's Command Facility is a powerful, yet user friendly, software tool that is used to perform PAD administrative and management functions. These functions include:

- Configuration
- Channel control
- Trunk status monitoring and control
- Performance statistics
- Monitoring channel activity
- System initialization and diagnostics

The information in this section describes the various methods that you can use to access the Command Facility. It also includes a detailed, step-by-step description of each of the Command Facility administrative functions.

5.2 PROCESSING THE COMMAND FACILITY

In order to access the Command Facility, you need to review the procedures outlined in the following paragraphs:

- To set-up the PAD
- To access the Command Facility
- To logon to the Command Facility

5.3 SETTING-UP THE PAD

Before you try to establish any kind of communications with the PAD, we ask you to review this checklist:

1. The power is ON.

2. PAD visual indicators show normal status as described in appendix D. 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 configuration switch settings reflect your requirements. Refer to appendix A.

4. The cold/warm start switch is set to the warm start position.

5. 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 5.5). You may also have to configure the PAD's Network address (refer to paragraph 5.7.5).

5.4 TO ACCESS THE COMMAND FACILITY

You may access the PAD's Command Facility by using one of the following methods:

- Via a dedicated or dial-up connection to the PAD's dedicated Command Port
- By placing a local call from any of the PAD's channels
- By placing a virtual call to the PAD via the X.25 PDN

5.4.1 Via the Dedicated Command Port

- You can use direct RS-232-C connections, private wire modems, or dial-in modems configured for auto-answer support to access the Command Facility via the dedicated Command Port.
- Set your terminal to full-duplex.
- 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 a Herald message "m800/x.25 channel 00", unless it has been changed, and an X.28 Service prompt. If not, enter BREAK and retry. You may now place a call (refer to paragraph 3.5.2) or access the Command Facility by entering CR twice.
- The PAD will prompt you for your password. Refer to paragraph 5.5.
- To disconnect, power-off your device or select "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.

5.4.2 Via 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.
- If the PAD configuration memory contains the factory settings, your Call Connect 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 CR.
- The PAD will prompt for your password. Refer to paragraph 5.5.
- To disconnect, clear the call by entering clr.

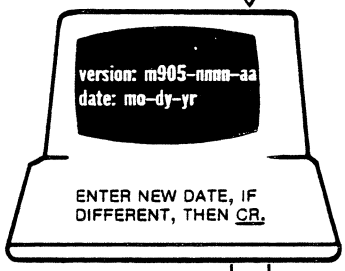
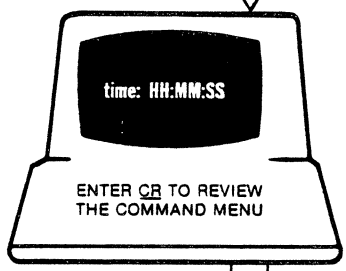
5.4.3 Via the Network

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 via 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.
- 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. Refer to paragraph 5.5.
- To disconnect, clear the call.

5.5 COMMAND FACILITY LOGON PROCEDURES

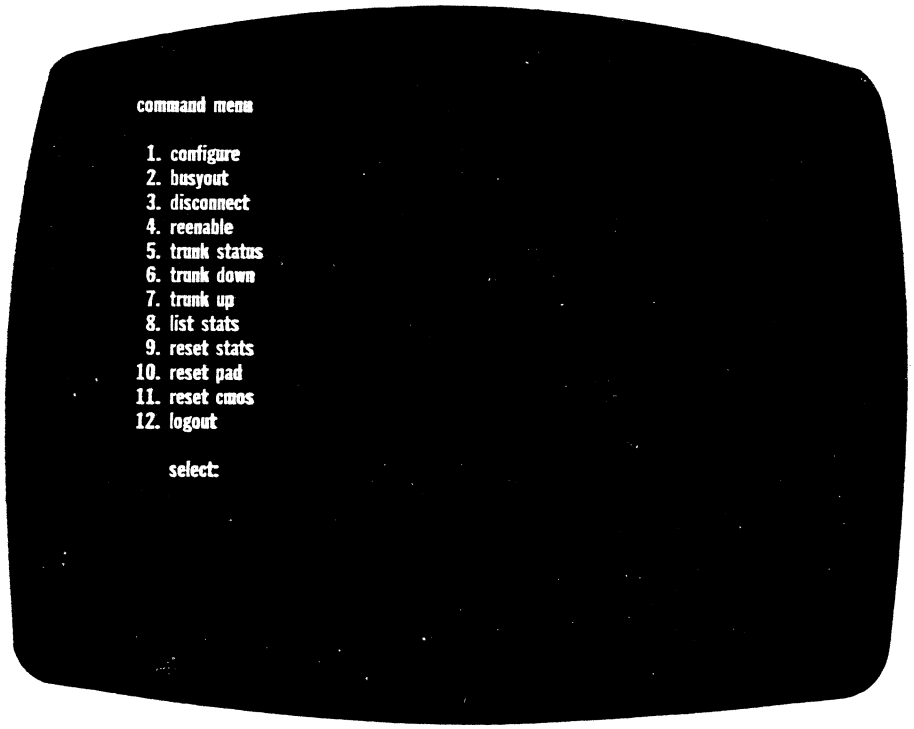
To logon to the Command Facility, you must have the key to the Command Facility -- the password. You may also use this procedure to change the factory-set password. Following the password, the Command Facility will display the software version, the time, and the date.

PROMPT	SPECIAL INSTRUCTIONS	DEFINITION
 FS = MX25	IF YOU WANT TO CHANGE PASSWORD, ANSWER PROMPT WITH OLD PASSWORD, SPACE, THEN NEW PASSWORD, THEN CR.	THE PASSWORD FIELD ALWAYS CONSISTS OF FOUR ALPHANUMERIC 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.
	IF YOU WISH TO CHANGE THE DATE, ENTER NEW DATE IN THIS ORDER: MONTH:DAY:YEAR BE SURE TO SEPARATE EACH ENTRY WITH HYPHEN (OR MINUS) SIGN.	THE VERSION IDENTIFIER M905-XXXX-X6 REFERS TO THE OPERATING SOFTWARE. AA REFERS TO THE REVISION LEVEL OF SOFTWARE NNNN.
	IF YOU WISH TO CHANGE TIME, ENTER NEW TIME IN THIS ORDER: HOURS:MINUTES:SECONDS.	THIS IS 24-HR. CLOCK.SO 2 PM IS 14:00:00.
FS = FACTORY SETTING		

MI-1229-66

5.6 ADMINISTRATIVE PROCEDURES

Once you have logged on to the Command Facility (refer to paragraph 5.4) you will be presented with a Command Menu. You can invoke any of the Command Facility management functions by making a selection.



MI-1229-58

Figure 5-1. Command Menu

To select a command, key-in the associated number and CR. If you should error in your selection before keying CR, simply backspace and reenter the correct number. You can exit the Command Menu via selection 12. You will again be prompted for your password.

Figure 5-2 is a cross-reference table of the different management functions and the command(s) that are associated with each of these functions.

Selection	Commands	Configuration Section 5.7	Channel Control Section 5.8	Trunk Monitoring and Control Section 5.9	Performance Statistics Section 5.10		Monitoring Channel Activity Section 5.11	System Initialization and Diagnostics Section 5.12	Call Accounting and Event Reporting Section 5.12
						Exit			
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	reset cmos						• [3]		
12	logout[1]				•				•

1. YOU MUST LOGOUT IN ORDER TO INITIATE THE PERIODIC OUTPUT OF THE STATISTICS REPORT. REFER TO PARAGRAPH 5.6.
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.

MI-1229-61

Figure 5-2. Command and Functions

5.6.1 Notation Conventions

There are several time-saving notation 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 procedure description. They are as follows:

- The symbol used for a carriage return is CR.
- Press CR after every entry or response to a prompt.
- Press CR if you accept the value currently displayed and simply want to continue to the next item.
- Enter CTRL-C and CR if you want to exit the Configuration Menu.
- Enter CTRL-C and CR when you want to exit a procedure and return to the menu you're working from.
- Prompts that require alphanumeric entries are enclosed in brackets: [XX]. They indicate parameter values now in effect.
- A prompt may include one or more asterisks:**. 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 indicates the number has not been entered. When it is entered, it can be two digits.
- Control characters are entered using the ^X format, where X is the character required (i.e., control G (BEL) is entered as ^G).

5.7 CONFIGURATION

The format of the configure menu is as follows:

Figure 5-3. Configure Menu

From the Configure Menu, you can perform the following PAD configuration functions:

- Configure: asynchronous channels
- Define:
  a. Device profiles
  b. X.25 trunk parameters
  c. Switched and Permanent Virtual Circuits
  d. Remote DTE IDs for auto and abbreviated calling
  e. Command Port profile and Command Facility subaddress
  f. Remote Parameter set up sequences.
- Compose messages for:
  a. Herald
  b. Bulletin
  c. Prompt
- Set frequency of: Statistical Reports
- Configure host autobaud sequence

The description of the configuration procedure is 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:

   - 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 Definitions. It contains a brief explanation of the purpose or function of each prompt, and a cross-reference to section 3.

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 "completion prompt": done. The Configuration Menu will be displayed.

Please make a note of the following: 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 CONTROL C, you will return to the configuration menu and cancel the change. You must enter the new value and respond to each prompt that follows in a given sequence until the "done" message is displayed.

Input Errors

There are two types of errors that will cause the "error" message to appear:

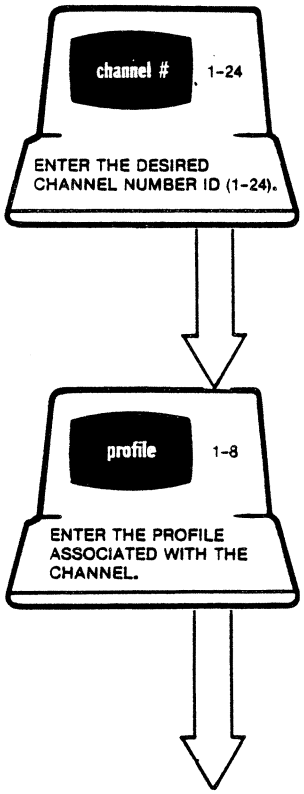
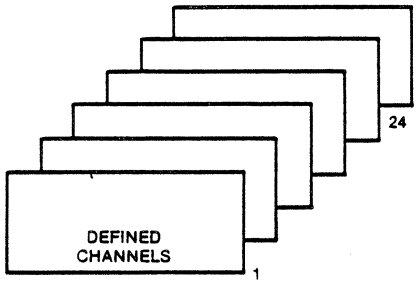
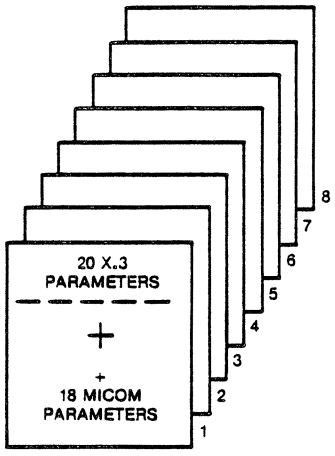
1. Out-of-Range Error -- You have entered a character outside the range of possible values.

2. 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.

5.7.1 Channel

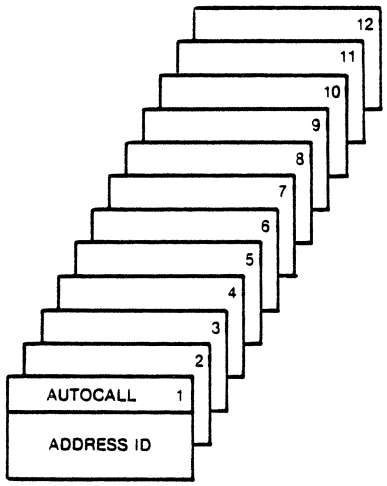
With this selection you can do several important things: one of these is to associate one of the eight possible device profiles with each channel. The relationship, however, is not one-to-one; you can assign any number of channels to the same device profile. In a later step, you can also associate a 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's 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 hierarchy scheme for addressing your channels by associating each channel with two class IDs.

SELECTION 1: CHANNEL

PROMPTS	CMOS	DEFINITION
		THIS ENTRY DESIGNATES THE CHANNEL THAT YOU ARE NOW GOING TO CONFIGURE. THE POSHSIBLE VALUES ARE 1 THRU 24.
		EACH OF THESE EIGHT POSSIBLE DEVICE PROFILES INCLUDES 20 X.3 PARAMETERS, PLUS 18 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.

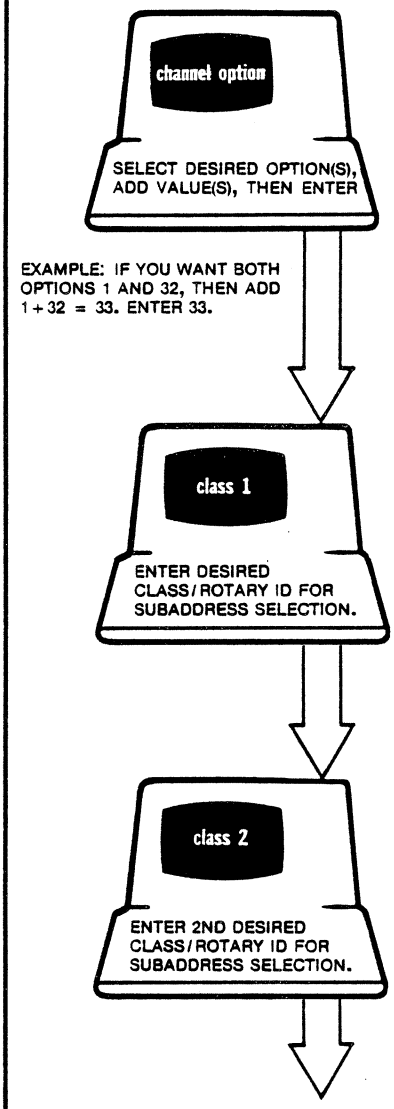
MI-1229-06

SELECTION 1: CHANNEL (continued)

PROMPTS	CMOS		DEFINITION
	CALL #	OPTION	
		ENABLE INCOMING CALLS	ENABLES INCOMING CALLS; ¶ 3.5.1
call option SELECT DESIRED OPTION(S), ADD VALUES, THEN ENTER EXAMPLE: IF YOU DESIRE TO ENABLE BOTH LONG FORM AND ABBREVIATED CALLS, ADD 1 + 2 = 3. ENTER 3.	1	LONG FORM CALLS	RESTRICTS THIS CHANNEL TO LONG FORM CALLS. ¶ 4.4.1
	2	ABBREVIATED CALLS	PERMITS OUTGOING CALLS USING ABBREVIATED ADDRESSING. ¶ 4.4.2
	4	AUTOCALL ON DEVICE READY	INITIATES CALL AUTOMATICALLY WHEN EIA AND AUTOBAUD COMPLETED. SEE NEXT PROMPT. ¶ 4.4.3
	8	AUTOCALL ON CR	INITIATES A CALL UPON DATA ACTIVITY SIGNALLED BY A CR. ¶ 4.4.3
	16	ALWAYS PASS CALL USER DATA	USED WHEN SERVICE SIGNALS ARE DISALLOWED. ¶ 3.7.4.2
	32	INCOMING CALLS BARRED	ALLOW OUTGOING CALLS ONLY. ¶ 3.5.1
	128	CLEAR ON DATA LOSS	CLEAR SVC UPON DATA LOSS. ¶ 3.3.9
	XXX	ANY COMBINATION	
address id ENTER ASSOCIATED MNEMONIC FOR AUTOCALL. USE ANY 2 ALPHANUMERICS. EXAMPLE: ENTER ADDRESS ID AA. THE ADDRESS ASSOCIATED WITH THIS MNEMONIC WILL BE DEFINED IN SELECTION 7.	 SKIP ENTRY IF CHANNEL IS NOT AN AUTOCALL		THE MNEMONIC ENTERED HERE IS USED TO RETRIEVE THE INFORMATION NEEDED TO MAKE AN AUTOMATIC CALL ON BEHALF OF THE DEVICE. ¶ 3.5.3.3

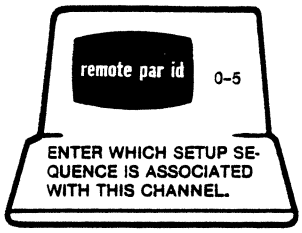
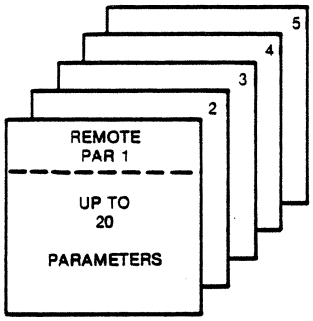
MI-1229-07

SELECTION 1: CHANNEL (continued)

PROMPTS	CMOS		DEFINITION
	OPTION #	CHANNEL MODE	
	0	DEDICATED	¶ 3.3.5
	1	SUPPORT AUTO ANSWER MODEMS	¶ 3.3.6
	2	RING OUT UPON INCOMING CALL	¶ 3.3.7.2
	6	RAISE DCD UPON INCOMING CALL	¶ 3.3.7.3
	8	HOST PORT	SEE PROMPT 8
	16	PRIORITY CHANNEL	¶ 3.3.8
	32	ENABLE CALL ACCOUNTING	¶ 5.12
	64	DISABLE X.28 EXTENDED MODE	¶ 3.7.3
	128	Micro600 LINE INTERFACE OPTION	APPLICABLE WHEN ATTACHED TO A MICOM Micro600 PORT SELECTOR
	XXX	ANY COMBINATION	
	00-99 POSSIBLE ASSIGNMENTS		WHILE NETWORK ADDRESSES SPECIFIY A GIVEN PAD, THE CLASS NUMBER ALLOWS YOU TO SPECIFY ONE OR MORE OF ITS CHANNELS. ¶ 3.4.4.2
	00-99 POSSIBLE ASSIGNMENTS		THE ADDITION OF CLASS 2 GIVES YOU A SECONDARY MECHANISM TO ADDRESS THE CHANNEL. ¶ 3.4.4.2

MI-1229-08

SELECTION 1: CHANNEL (continued)

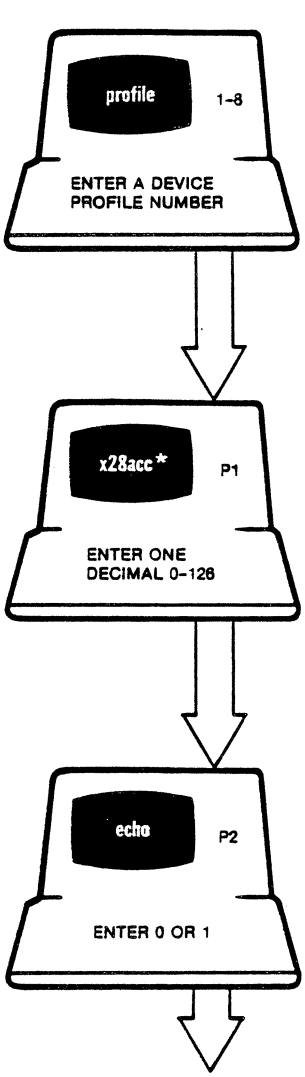
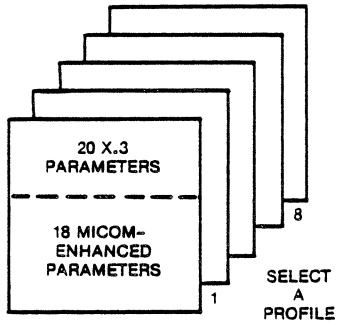
PROMPTS	CMOS	DEFINITION
 ENTER 0 IF NONE IS REQUIRED.	 THIS CHANNEL MUST BE CONFIGURED AS A HOST PORT TO ENABLE THIS FEATURE. SEE CHANNEL OPTION PROMPT 5.	YOU CAN ASSOCIATE 1 OF 5 REMOTE PARAMETER SETUP SEQUENCES WITH THE CHANNEL YOU ARE NOW DEFINING. ¶ 3.8.4.1
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-09

5.7.2 Profile

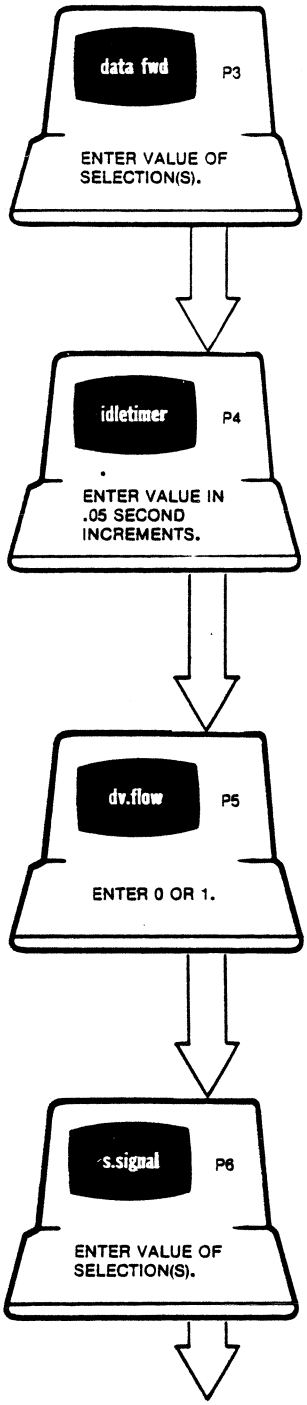
With this procedure, you can define eight unique device profiles. Each profile contains all the 20 parameters defined in the CCITT X.3 specification and an additional 18 MICOM-enhanced parameters. By assigning a device profile to a channel, you adapt the channel to the different equipment you may want to connect.

SELECTION 2: PROFILE 1

PROMPTS	CMOS	DEFINITION
	 0 = NOT POSSIBLE 1 = POSSIBLE BY CHARACTER DLE (CONTROL P) OR . . . 2-126 = DECIMAL VALUE OF ASCII CHARACTER USED TO ACCESS THE X.28 MODE. 0 = DISABLE ECHO 1 = ENABLE ECHO	YOUR PROFILE SELECTION HERE TELLS THE SYSTEM WHICH OF EIGHT PROFILES YOU ARE NOW ABOUT TO CONFIGURE. TO HELP YOU DEFINE THE DIFFERENT PARAMETERS, WE HAVE PROVIDED YOU WITH AN ASCII TABLE IN APPENDIX D. **PAD RECALL CHARACTER.** PARAMETER 1, YOU CAN EITHER ALLOW OR DENY X.28 MODE ACCESS VIA AN ASCII CHARACTER. ¶ 3.7.2 **ECHO ENABLE.** PARAMETER 2 CONTROLS WHETHER OR NOT THE PAD SHOULD ECHO THE RECEIVED CHARACTERS. ¶ 3.2.3.1

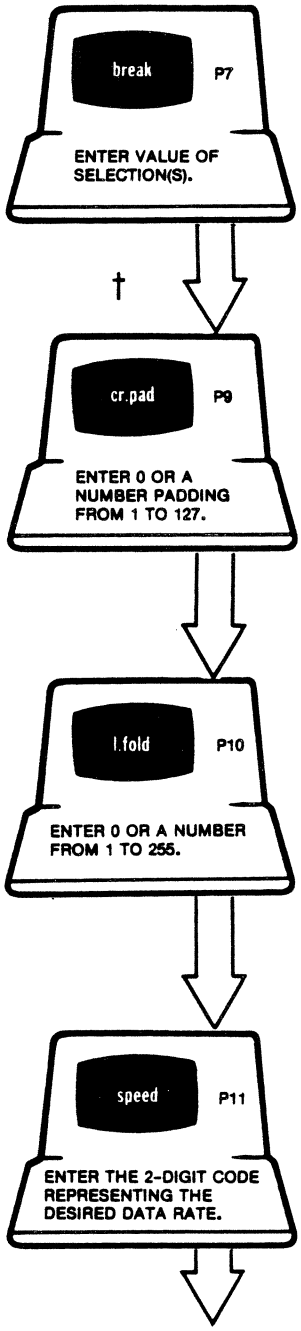
NOTE:
THE * IS USED THROUGHOUT THIS SELECTION TO INDICATE THE PARAMETERS WHICH MUST NOT BE ASSIGNED THE SAME VALUE.

MI-1229-10

PROMPTS	CMOS	DEFINITION
	0 = NO DATA FORWARDING 1 = ALPHANUMERIC CHARACTERS 2 = CR 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. ¶ 3.2.10
	0 = NO IDLETIMER 1-255 = MULTIPLE OF .05 SECONDS, i.e., MAXIMUM 12.75 SECONDS.	**IDLE TIMER** PARAMETER 4 CAUSES FORWARDING UPON EXPIRY OF AN IDLE TIMER, UNLESS PARAMETER 15 IS ENABLED. ¶ 3.2.10, 3.2.6,1, AND 3.2.4.2
	0 = NO FLOW CONTROL 1 = XON/XOFF FLOW CONTROL	**DEVICE FLOW CONTROL** PARAMETER 5 DETERMINES WHETHER OR NOT THE PAD USES XON/XOFF TO EXERCISE FLOW CONTROL OVER THE ATTACHED DEVICE. ¶ 3.2.8.2
	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. ¶ 3.2.6.3, 3.3.10 AND, 3.7.4.2

MI-1229-11

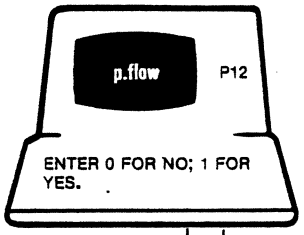
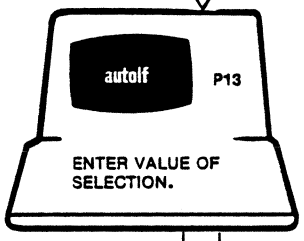
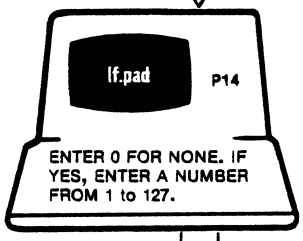
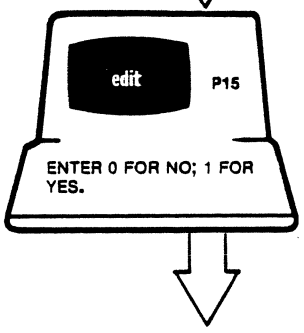
SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	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 HANDLING** PARAMETER 7 DETERMINES THE ACTION OF THE PAD UPON DETECTION OF A BREAK SIGNAL FROM THE DEVICE. ¶ 3.2.9
	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. ¶ 3.2.7.1
	0 = NO LINEFOLDING 1-125 = 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. ¶ 3.2.7.2
	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 10 = 50 bps 11 = . . .[1] 12 = 2400 bps 13 = 4800 bps 14 = 9600 bps 32 = AUTOBAUD (110-9600 bps)	**DATA RATE** PARAMETER 11 ALLOWS YOU TO SELECT THE CHANNEL DATA RATE. REFER TO PARAGRAPHS 3.2.2.3 FOR ASSYMETRICAL SPEED SUPPORT. ¶ 3.2.2.3

† PARAMETER 8 IS NONCONFIGURABLE.
1 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.

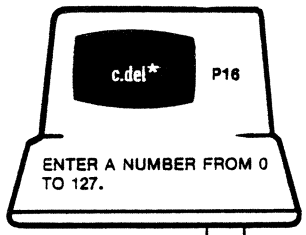
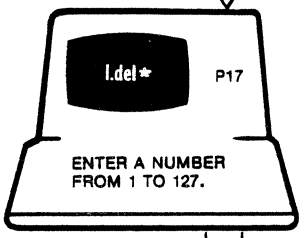
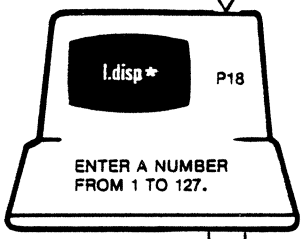
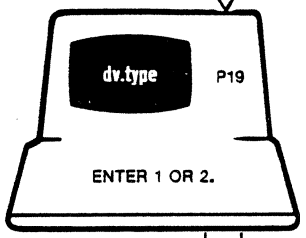
MI-1229-12

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	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. ¶ 3.2.8.1, 3.3.5.2 AND, 3.3.6.3
	0 = NO LINE FEED INSERTION 1 = LF AFTER CR FROM REMOTE DTE 2 = LF AFTER CR SENT 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 ECHOING OR TRANSMITTING CR 7 = PAD TRANSMITS LF AFTER ALL CR'S	**LINE FEED INSERTION** PARAMETER 13 CAUSES THE PAD TO INSERT AN LF CHARACTER INTO THE DATA STREAM ON DETECTION OF CR. ¶ 3.2.7.3
	0 = NO LINE FEED PADDING 1-127 = NUMBER OF PADDING NULLS AFTER LINE FEED.	**LINE FEED PADDING** PARAMETER 14 CAUSES THE PAD TO OUTPUT A SPECIFIED NUMBER OF NULL CHARACTERS FOLLOWING THE TRANSMISSION OF AN LF TO THE DEVICE. ¶ 3.2.7.1
	0 = NO EDITING 1 = EDITING ENABLED	**EDIT** PARAMETER 15 DENIES OR PERMITS THE USE OF EDITING CHARACTERS DEFINED BY PARAMETERS 16, 17, AND 18. ¶ 3.2.6

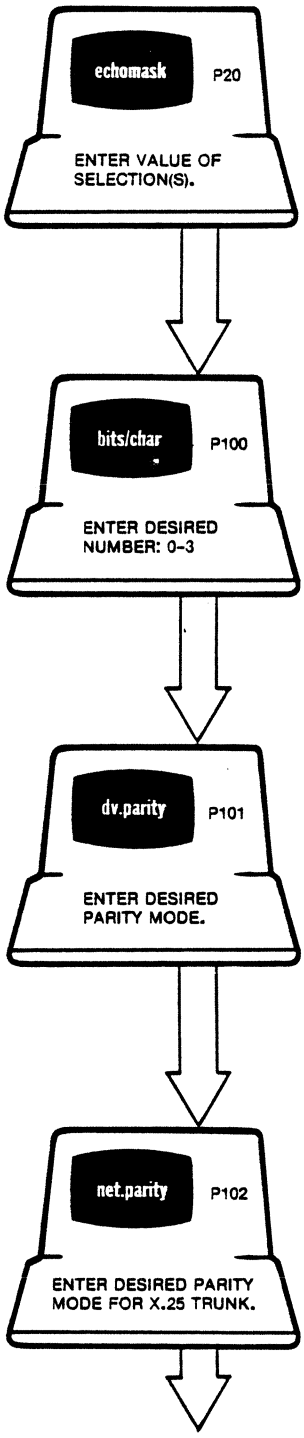
MI-1229-13

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	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.
	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.
	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.
	1 = HARD COPY DEVICE 2 = VIDEO DISPLAY DEVICE	**EDITING SERVICE SIGNALS** PARAMETER 19 SPECIFIES THE DEVICE TYPE SO THAT THE PAD KNOWS HOW TO HANDLE THE EDITING CONTROL SIGNALS. ¶ 3.2.6.3

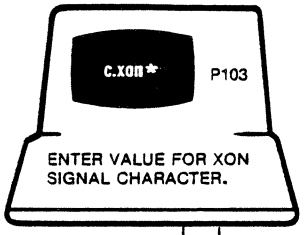
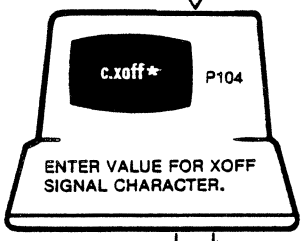
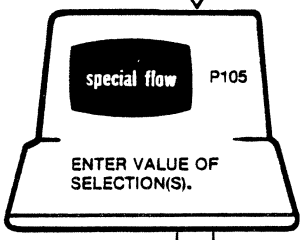
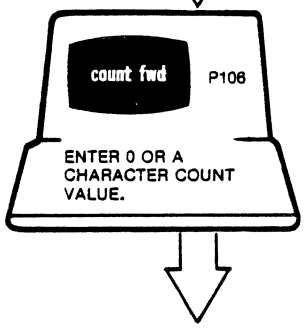
MI-1229-14

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	1 = ALPHANUMERIC CHARACTERS 2 = CR 4 = ESC, BEL, BNQ, ACK 8 = DEL, CAN, DC2 16 = ETX, EOT 32 = HT, LF, VT, FF 64 = ALL OTHER CONTROL CHARACTERS IN COLUMNS 1 AND 2 OF ASCII CHART 128 = ALL REMAINING CHARACTERS XXX = ANY COMBINATION OF ABOVE VALUES	**ECHOMASK** PARAMETER 20 ALLOWS ECHOING OF SELECTED CHARACTERS WHEN PARAMETER 2 IS ENABLED. ¶ 3.2.3.2
	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. ¶ 3.2.1
	0 = TRANSPARENT PARITY 1 = SPACE 2 = MARK 3 = EVEN 4 = ODD 5 = AUTO PARITY AS DETERMINED BY AUTOBAUD SEQUENCE	PARAMETER 101 SPECIFIES THE PARITY THAT THE PAD USES IN COMMUNICATING WITH THE DEVICE. ¶ 3.2.1
	0 = PASS DATA AS RECEIVED 1 = SPACE 2 = MARK 3 = EVEN 4 = ODD	PARAMETER 102 SPECIFIES THE PARITY THAT THE PAD USES OVER THE X.25 TRUNK. ¶ 3.2.1.5

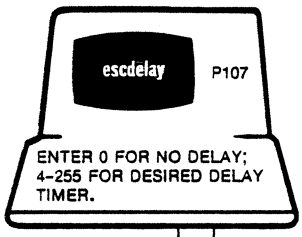
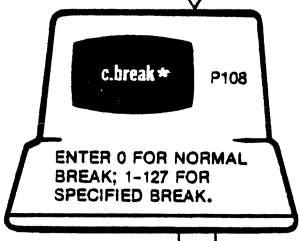
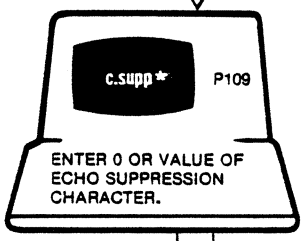
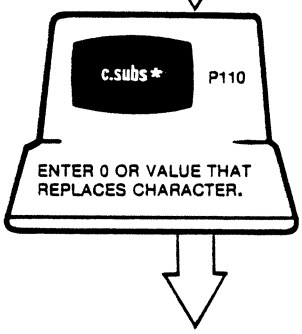
MI-1229-15

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	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.
	0 = IGNORED 1-127 = DECIMAL VALUE OF ASCII CHARACTER FOR XOFF	PARAMETER 104 SPECIFIES THE CHARACTER VALUE USED FOR THE XOFF SIGNALING CHARACTER. REFER TO PARAMETERS 5 AND 12.
	0 = NONE 1 = DEVICE CAN FLOW CONTROL PAID WITH RTS 2 = PAID CAN FLOW CONTROL DEVICE WITH CTS 4 = PAID ISSUES BEL CHARACTER TO DEVICE IN FLOW CONTROL. XX = 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 ¶ 3.2.8.1
	0 = NO FORWARDING ON CHARACTER COUNT 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 IS ENABLED. ¶ 3.1.8.3

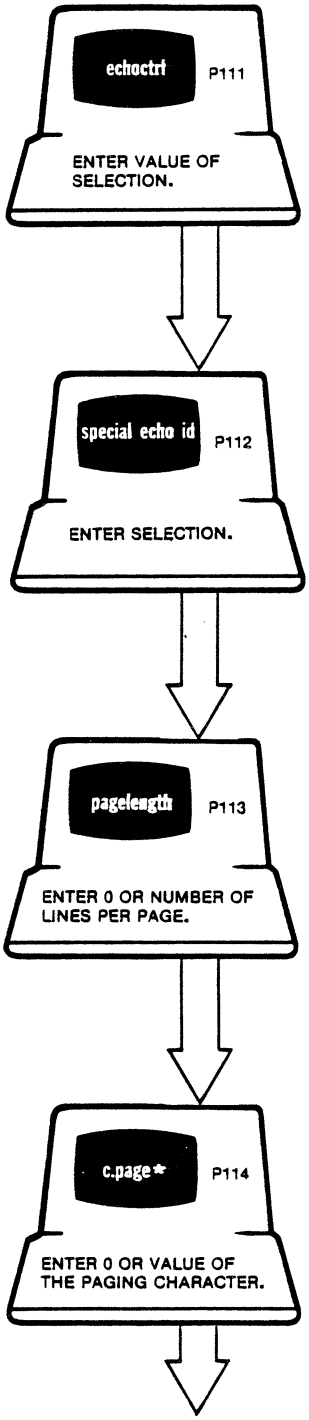
MI-1229-16

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	0 = NO SPECIAL HANDLING 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 ON AN ESC CHARACTER. ¶ 3.2.10.2 AND 3.2.3.3
	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. ¶ 3.2.9.1
	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. ¶ 3.2.3.4
	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 ONLY IF ENABLED BY PARAMETER 20, ECHOMASK.

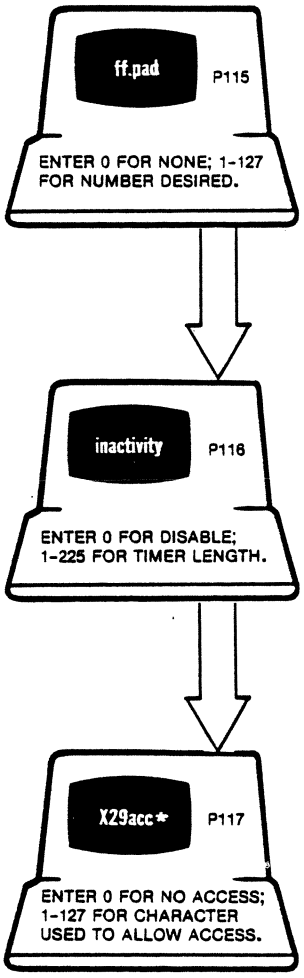
MI-1229-17

SELECTION 2: PROFILE (continued)

PROMPTS	CMOS	DEFINITION
	0 = DEVICE INPUT PRIORITY 1 = NO PRIORITY 2 = COMPUTER OUTPUT PRIORITY 4 = SYNCHRONIZE LOCAL FIELD WITH INCOMING DATA FORMATTING SCREENS X = SELECTIVE COMBINATION	¶ 3.2.4.2 ¶ 3.2.4.3 ¶ 3.2.4.1 ¶ 3.2.5
	0 = DISABLE 1-3 = ECHO SEQUENCE ID ASSOCIATED WITH THAT DEVICE PROFILE. REFER TO SELECTION 3.	PARAMETER 112 ALLOWS, OR DISALLOWS, THE USE OF SPECIAL ECHO CHARACTERS. ¶ 3.2.3.5
	0 = NO AUTOPAGE FEED 1-255 = NUMBER OF LINES PER PAGE.	PARAMETER 113 DETERMINES NUMBER OF LINES PER PAGE FOR THE AUTO-PAGING FUNCTION. REFER ALSO TO PARAMETER 114. ¶ 3.2.7.4
	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.

MI-1229-18

SELECTION 2: PROFILE (continued)

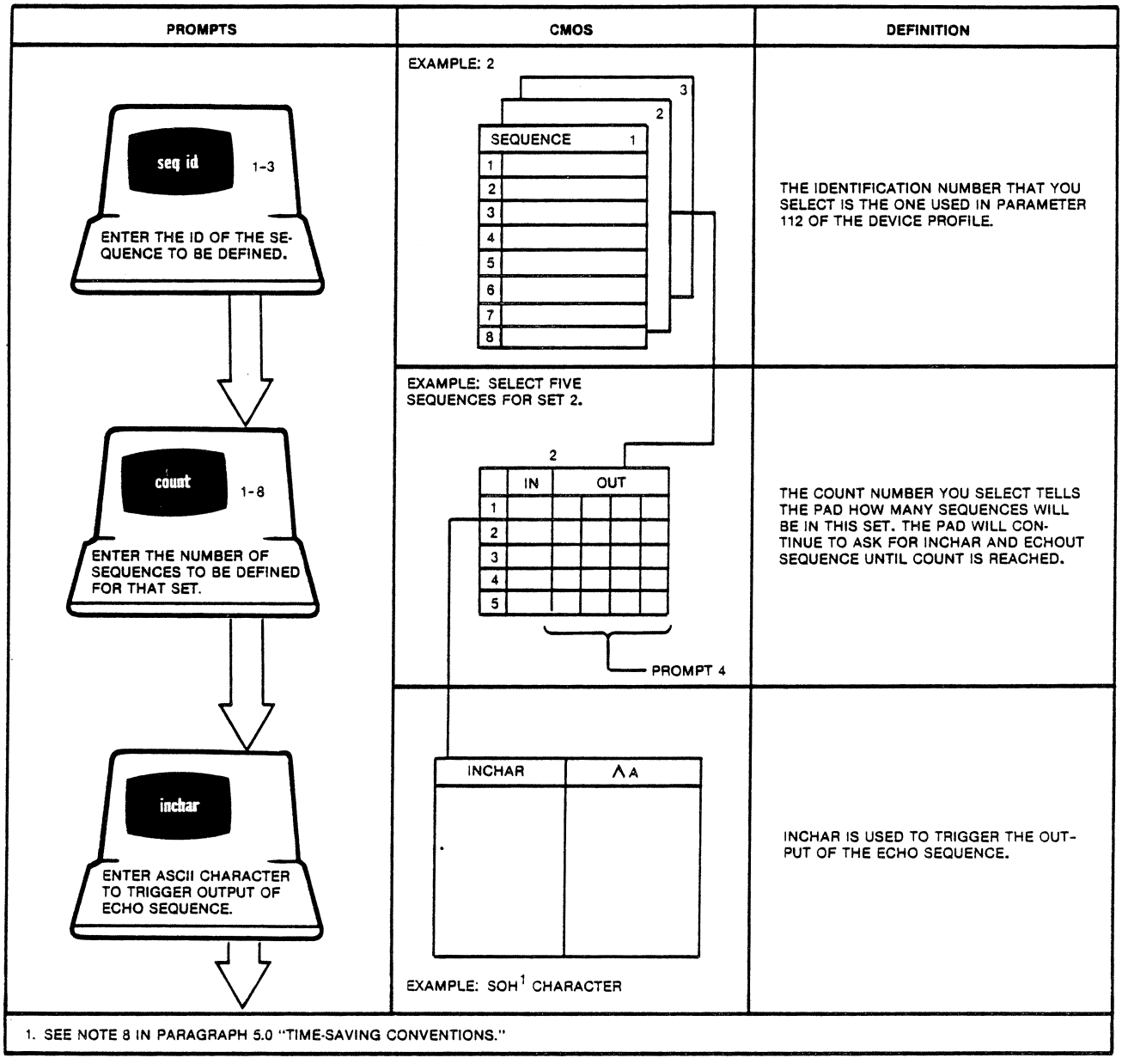
PROMPTS	CMOS	DEFINITION
	0 = NO FORM FEED PADDING 1-127 = NUMBER OF PADDING NULLS THAT FOLLOW A FORM FEED CHARACTER.	FF PADDING CAUSES THE PAD TO OUTPUT A SPECIFIED NUMBER OF NULL CHARACTERS FOLLOWING THE TRANSMISSIONS OF AN FF CHARACTER TO THE DEVICE. ¶ 3.2.7.1
	0 = NO DISCONNECTION ON INACTIVITY 1-255 = TIMER VALUE IN 1 MINUTE INCREMENTS.	PARAMETER 116 CAUSES THE PAD TO CLEAR A CALL BASED ON AN INACTIVITY PERIOD. ¶ 3.2.13
	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. ¶ 3.8.4.2 AND 4.5.1
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-19

5.7.3 Special Echo Sequences

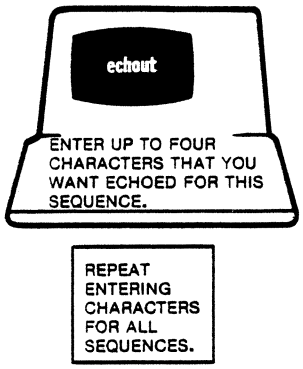
With this procedure, you can define up to three sets of special echo sequences. Each set can contain eight sequences of one-to-four special echo characters. One associates these multi-echo sets with one or more device profiles. Refer to paragraph 3.2.3.5 (Parameter 112).

SELECTION 3: SPECIAL ECHO



MI-1229-20

SELECTION 3: SPECIAL ECHO (continued)

PROMPTS	CMOS	DEFINITION
	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.		

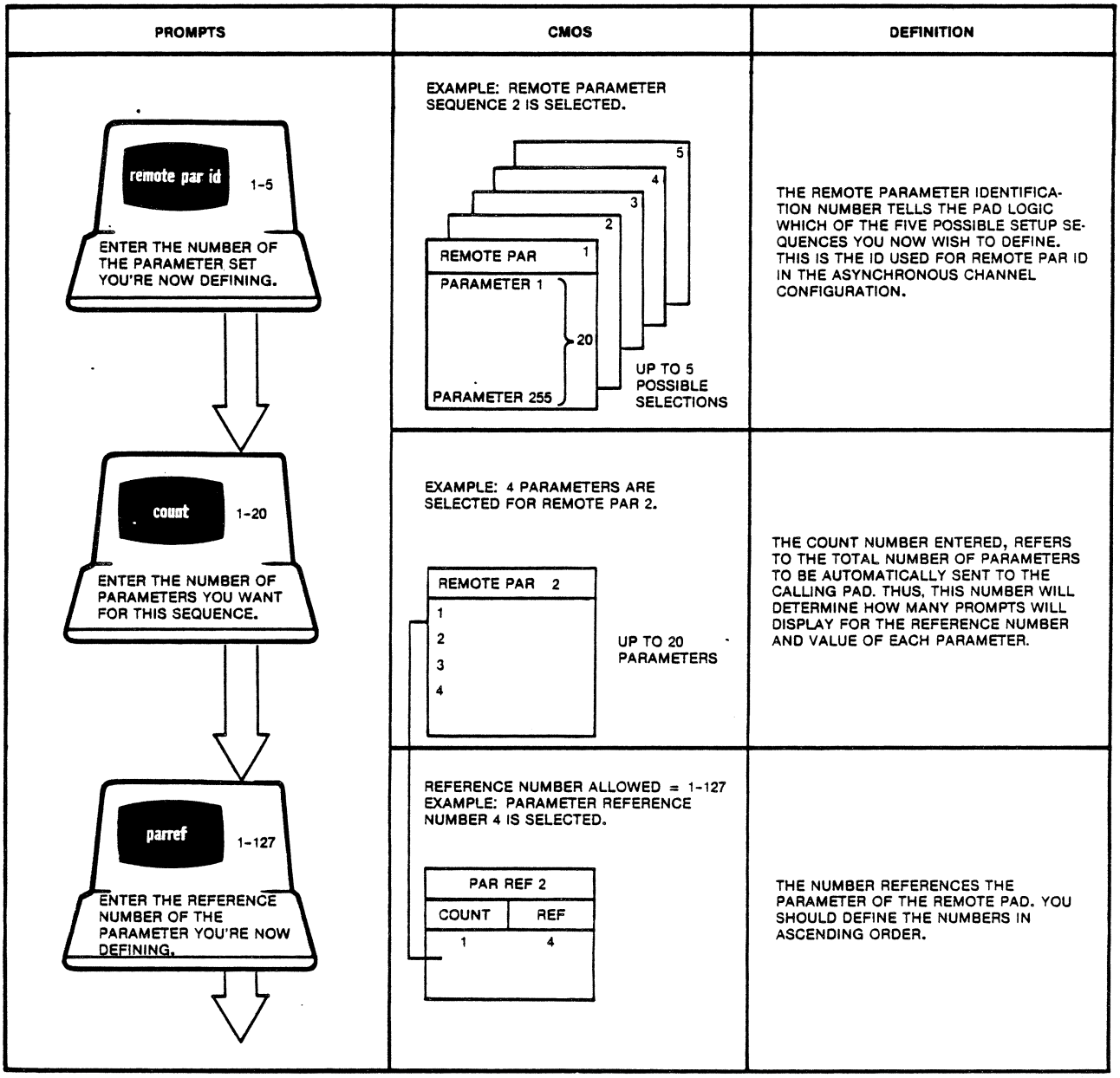
MI-1229-21

5.7.4 Remote Parameters

With this selection, you can define up to five remote parameter setup sequences. Each can have up to 20 parameters. The PAD, on accepting an incoming call, 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 3.7.4.1.

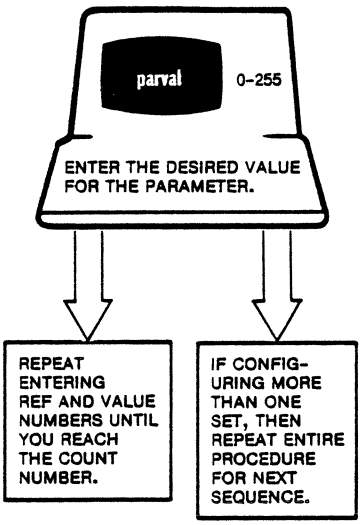
Each of these setup sequences may be associated with a PAD channel -- channel configuration, "remote par ID." Refer to paragraph 5.7.1.

SELECTION 4: REMOTE PAR



MI-1229-01

SELECTION 4: REMOTE PAR (continued)

PROMPTS	CMOS	DEFINITION
	EXAMPLE: THIS IS HOW A TABLE OF COUNT, PARREF, AND PARVAL MIGHT LOOK FOR ONE DEFINED SEQUENCE. COUNT / HOW MANY?: 4 PARREF / WHICH NUMBER?: 4, 7, 114, 116 PARVAL / WHAT VALUE?: 5, 4, 2, 1 VALUES ALLOWED = 0-255	THE PARAMETER VALUE (PARVAL) IS THE ACTUAL VALUE FOR EACH PARAMETER YOU HAVE SELECTED.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-02

5.7.5 Trunk

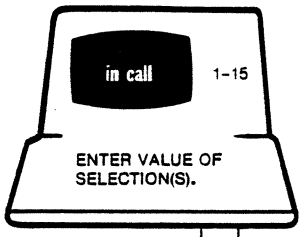
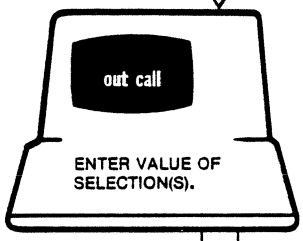
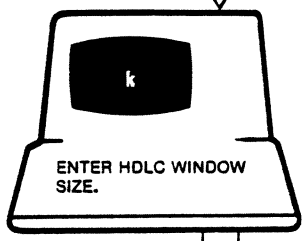
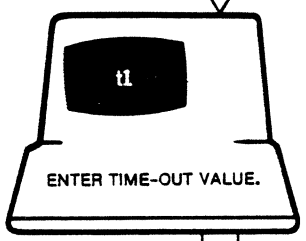
With this procedure, you can define the trunk parameters. This includes parameters at the link, frame, and packet levels. Besides these, you will select among various options affecting call establishment.

SELECTION 5: TRUNK

PROMPTS	CMOS	DEFINITION
pad address 1-15 ENTER 1-15 DIGITS FOR THE PAD NETWORK ADDRESS. FS = 00		THIS IS THE PAD NETWORK ADDRESS. NUMBER USED FOR: — A CALLING ADDRESS: ¶ 3.4.5.1 — DETERMINING THE CLASS IN AN INCOMING CALL: ¶ 3.4.4.1 — DETERMINING A LOCAL VS REMOTE CALL: ¶ 3.5.4.1 — TACT DIAGNOSTICS CALLS: ¶ 3.5.4.4
class select 0-2 ENTER VALUE OF THE SELECTION REQUIRED. FS = 0	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. ¶ 3.4.4
password ENTER FOUR ASCII CHARACTERS. FS = (NONE)	STORE FOUR ASCII CHARACTERS IN CMOS FOR PASSWORD.	THE TRUNK PASSWORD ALLOWS ONLY SELECTED USERS TO ADDRESS PAD. ¶ 3.1.9
NOTE: FS = FACTORY SETTING		

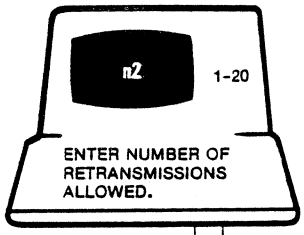
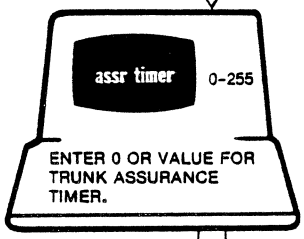
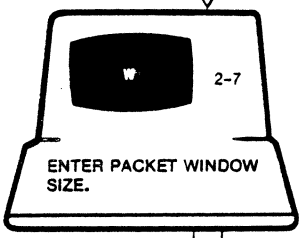
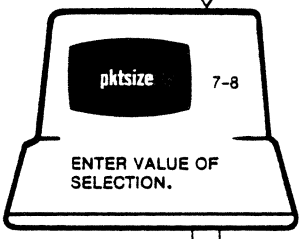
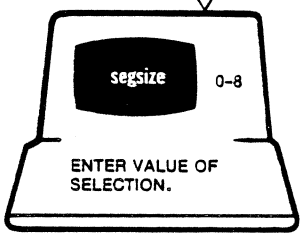
MI-1229-22

SELECTION 5: TRUNK (continued)

PROMPTS	CMOS	DEFINITION
 FS = 0	0 = NO TRUNK PASSWORD, NO FACILITIES ALLOWED 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	THIS SELECTION DETERMINES HOW THE PAD HANDLES AN INCOMING CALL. ¶ 3.6.2 ¶ 3.6.1 ¶ 3.6.2 ¶ 3.1.3.2 ¶ 3.1.3.2
 FS = 0	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 XXX = ANY COMBINATION	THIS SELECTION DETERMINES THE CHARACTERISTICS OF THE CALL REQUEST AND CALL ACCEPT PACKET. ¶ 3.4.5.1 ¶ 3.4.5.2 USED FOR NETWORKS WHICH REQUIRE THE EXTENDED CALL ACCEPT PACKET. ¶ 3.1.4.3 ¶ 3.1.8 ¶ 3.1.8.2
 FS = 7	K = 1 TO 7	¶ 3.1.2
 FS = 5	T1 = 1 TO 15 SECONDS	¶ 3.1.2
NOTE: FS = FACTORY SETTING		

MI-1229-23

SELECTION 5: TRUNK (continued)

PROMPTS	CMOS	DEFINITION
 FS = 10	N2 = 1 TO 20 RETRIES	¶ 3.1.2
 FS = 15	0 = NO TRUNK ASSURANCE PROCEDURES 1-255 = INACTIVITY PERIOD IN SECONDS	MUST BE SET TO A VALUE GREATER THAT PARAMETER T1 ¶ 3.1.2
 FS = 2	W = 2 TO 7	¶ 3.1.2
 FS = 7	7 = 128-BYTE PACKETS 8 = 256-BYTE PACKETS	¶ 3.1.2 AND 3.1.5.1
 FS = 6	4 = 16-BYTE SEGMENTS 5 = 32-BYTE SEGMENTS 6 = 64-BYTE SEGMENTS 7 = 128-BYTE SEGMENTS 8 = 256-BYTE SEGMENTS	¶ 3.1.2
NOTE: FS = FACTORY SETTING		

MI-1229-24

5.7.6 SVC/PVC

With this procedure, you can override the factory settings for the Logical Group Numbers (LGNs) and the Logical Channel Numbers (LCNs), refer to appendix C. You can do this for each "switched virtual circuit" and each "permanent virtual circuit" 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.

The reason why you would define more SVCs than channels is:

- If you want to guarantee access to the Command facility from the network while all channels are active
- If your PAD is managed by a Network Control System.

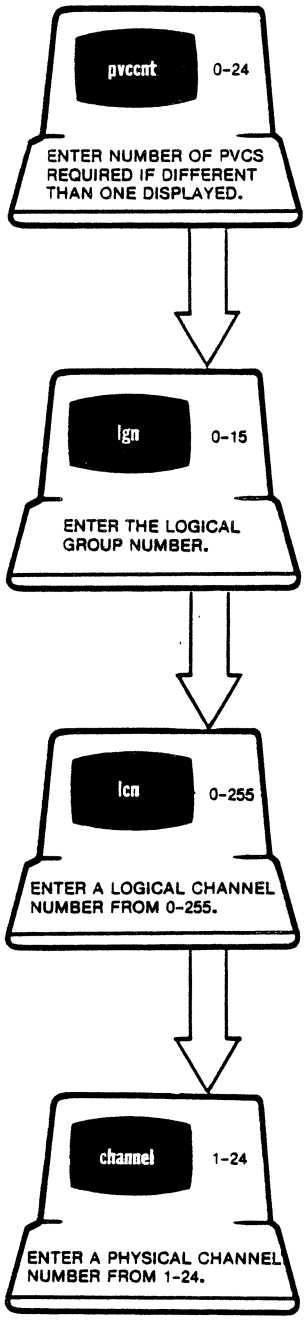
SELECTION 6: SVC/PVC

PROMPTS	CMOS	DEFINITION
svccnt 0-26 ENTER NUMBER OF SVCS REQUIRED, IF DIFFERENT THAN ONE DISPLAYED.	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. ¶ 3.1.3.2
lgn 0-15 ENTER THE LOGICAL GROUP NUMBER. FS = AS PER CONFIGURATION SWITCHES 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. FS = 0 THRU N+1. SEE APPENDIX A	VALUE = 0-255	THE LCN IS ALSO A PART OF THE SVC ID.

NOTE: FS = FACTORY SETTING

MI-1229-25

SELECTION 6: SVC/PVC (continued)

PROMPTS	CMOS	DEFINITION
	VALUES = 0-N WHERE N = NUMBER OF CHANNELS	THIS SELECTION DETERMINES THE NUMBER OF TIMES BOTH THE LGN AND LCN PROMPTS WILL BE DISPLAYED. ¶ 3.1.3.1
	VALUE = 0-15	THIS IS A PART OF THE PERMANENT VIRTUAL CIRCUIT IDENTIFICATION. ITS VALUE MUST BE COMPATIBLE WITH YOUR NETWORK.
	VALUE = 0-255	THE LCN IS ALSO A PART OF THE PVC ID. NOTE: THE LGN AND LCN OF A PVC MUST BE DIFFERENT THAT THOSE OF AN SVC.
	VALUE = 1-N WHERE N = NUMBER OF PAD CHANNELS	THE CHANNEL TO BE ASSOCIATED WITH THE SELECTED PVC.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-26

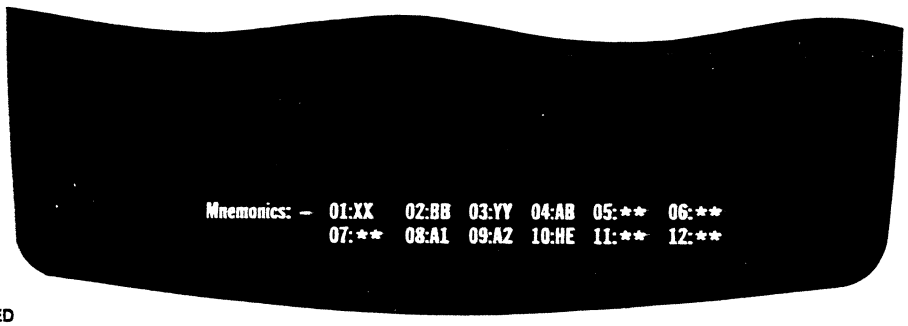
5.7.7 Address ID

With this procedure you can define up to 12 mnemonics associated with autocalling channels and/or for use by those using abbreviated addressing. One uses auto-calling/abbreviated addressing when they routinely make calls to the same DTE, or to restrict a user to calling one or more of a selected number of destinations.

These procedures allow you to define the X.25 facilities, the address, the sub-address, 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.)

Before prompting you for entries, and to allow you to keep tab on mnemonics already defined, the Command Facility will display all 12 mnemonics each time you make this selection.

Example,



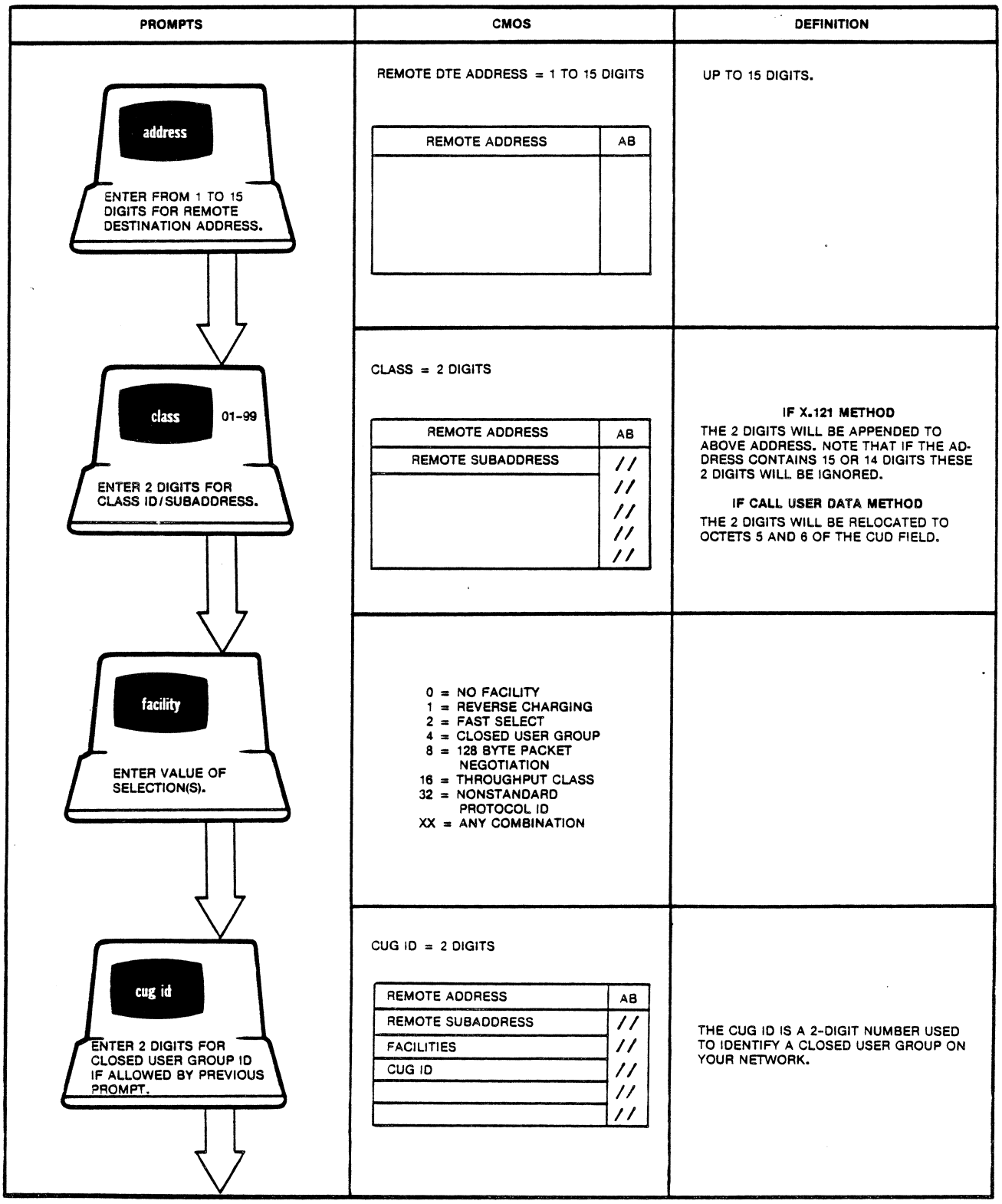
** = NOT DEFINED

SELECTION 7: ADDRESS ID

PROMPTS	CMOS	DEFINITION
entry id 1-12 ENTER MNEMONIC ID 1-12. SEE ABOVE. mnemonic ENTER TWO CHARACTERS FOR A MNEMONIC OR CR.	AB XX 12 1 MNEMONIC = ANY 2 ALPHANUMERIC CHARACTERS AB 4	A MNEMONIC ASSOCIATED WITH AN AUTOCALL CHANNEL CAN ALSO BE USED FOR ABBREVIATED CALLING. YOU CAN DELETE A MNEMONIC USING A CTRL-Y KEY.

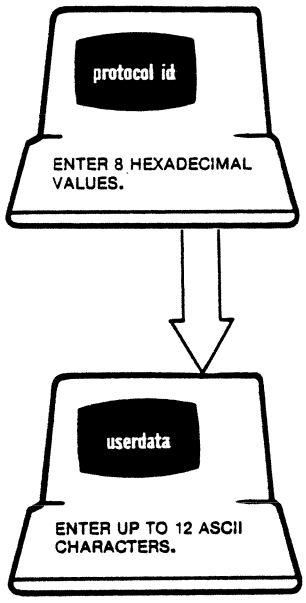
MI-1229-27

SELECTION 7: ADDRESS ID (continued)



MI-1229-28

SELECTION 7: ADDRESS ID (continued)

<table>
<tr><th>PROMPTS</th><th>CMOS</th><th>DEFINITION</th></tr>
<tr><td rowspan="2"> 
</td><td>8 HEXADECIMAL VALUES

REMOTE ADDRESS | AD
REMOTE SUBADDRESS | //
FACILITIES | //
CUG ID | //
CUD FIELD 1-4 | //
| //</td><td>THIS IS A NONSTANDARD 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.</td></tr>
<tr><td>"^ x" NOTATION TO ENTER CONTROL CHARACTERS

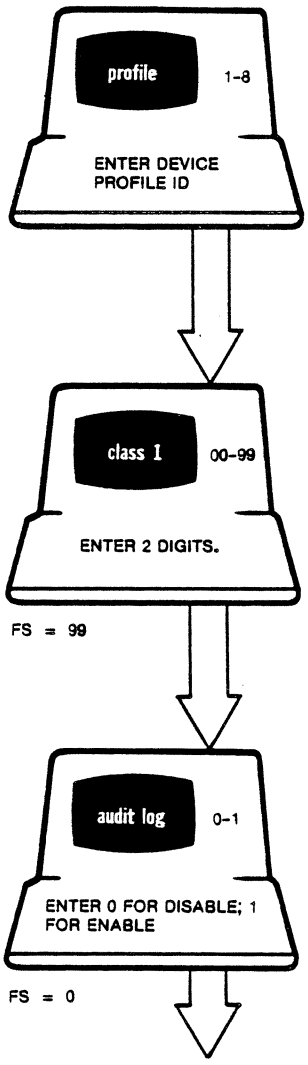
REMOTE ADDRESS | AB
REMOTE SUBADDRESS | //
FACILITIES | //
CUG ID | //
CUD FIELD 1-4 | //
CUD FIELD 5-16 | //</td><td>IF YOU ARE USING CALL USER METHOD FOR SUBADDRESSING, YOUR ENTRY WILL BE INSERTED IN OCTETS 7 THRU 16, i.e., ALLOWING YOU A MAXIMUM OF 10 CHARACTERS INSTEAD OF 12.</td></tr>
<tr><td colspan="3">DONE. . . .THE CONFIGURATION MENU WILL BE DISPLAYED.</td></tr>
</table>

MI-1229-29

5.7.8 CMDPORT

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 is needed to allow access to the Command Facility from the Network. You may also want to define whether the Command Port will be used for logging Events and Per-Call Accounting information.

SELECTION 8: CMDPORT

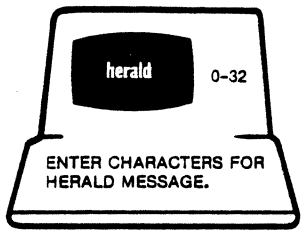
PROMPTS	CMOS	DEFINITION
	SELECT 1 OF 8 DEVICE PROFILES. 00 = ACCESS FROM NETWORK NOT ALLOWED NN = ANY 2 DIGITS (MUST BE DIFFERENT FROM CHANNELS CLASS IDS) 0 = DISABLE 1 = ENABLE	THIS STEP IS TO ASSOCIATE ONE OF EIGHT POSSIBLE DEVICE PROFILES WITH THE COMMAND PORT THIS STEP IS TO ASSIGN THE COMMAND FACILITY A CLASS ID SO IT CAN BE ACCESSED BY AN X.25 CALL. ¶ 3.4.4.3 THIS SELECTION ENABLES OR DISABLES LOGGING CALL ACCOUNTING AND EVENTS INFORMATION TO THE COMMAND PORT. ¶ 5.12.1 AND 5.12.2
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-30

5.7.9 Herald

In this procedure you can define the Herald message. Refer to paragraph 3.3.10.

SELECTION 9: HERALD

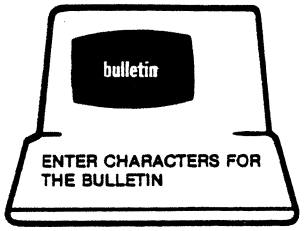
PROMPTS	CMOS	DEFINITION
 FS = micro800/x.25 channel	0-32 ASCII CHARACTERS	THE HERALD MESSAGE IS THE PAD'S WAY OF SAYING "HERE IS" WHEN A DEVICE CONNECTS TO ANY ONE OF THE PAD'S CHANNELS. YOU MAY TURN IT OFF ON CERTAIN CHANNELS VIA PARAMETER 6 OF THE DEVICE PROFILE.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-31

5.7.10 Bulletin

In this procedure you can define the Bulletin message. Refer to paragraph 3.3.10.

SELECTION 10: BULLETIN

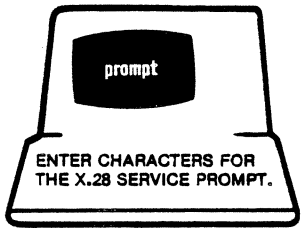
PROMPTS	CMOS	DEFINITION
 FS = (NONE)	ENTER UP TO 120 ASCII CHARACTERS	THE BULLETIN CAN BE USED AS AN INFORMATION MESSAGE.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-32

5.7.11 Prompt

In this procedure you can define the prompt that displays when the user is in X.28 mode. Refer to paragraph 3.7.2.

SELECTION 11: PROMPT

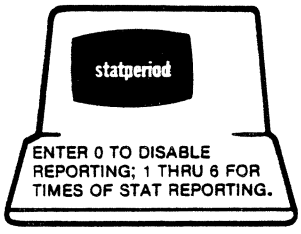
PROMPTS	CMOS	DEFINITION
 FS = *	ENTER UP TO 16 ASCII CHARACTERS	THE SERVICE PROMPT ADVISES THE USER THAT HE MAY ENTER AN X.28 COMMAND.
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-33

5.7.12 Statperiod

In this procedure you will define how often the PAD will output the Statistics Report to the Command Port. Refer to paragraph 5.10 for a description of this report.

SELECTION 12: STATPERIOD

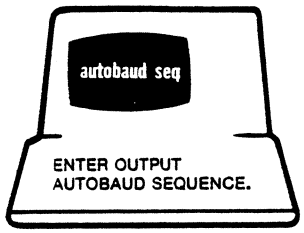
PROMPTS	CMOS	DEFINITION
	VALUES 0 = DISABLE 1, 2, 3. . .6 = 10 TO 60 MINUTES IN 10-MINUTE INCREMENTS	YOU MAY STILL REQUEST STATISTICS ON DEMAND, EVEN IF YOU DISABLE PERIODIC REPORTING. NOTE THAT THE COUNTERS ARE RESET TO 0 AT EACH PERIODIC REPORT. ¶ 5.10
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-34

5.7.13 Host Autobaud

With this procedure, you can select up to four ASCII character(s) that will be output to the host for autobaud purposes.

SELECTION 13: HOST AUTOBAUD

PROMPTS	CMOS	DEFINITION
 FS = 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. ¶ 3.6.5
DONE. . . . THE CONFIGURATION MENU WILL BE DISPLAYED.		

MI-1229-35

5.8 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 graphic explains the action, reason, and effect of the following selections:

	Select from Menu		
Command Menu Selection	**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 won't 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 the 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 to, the channel.

5.9 TRUNK MONITORING AND CONTROL

With these commands you can do the following:

- Enquire about trunk status
- Logically disconnect the trunk from the X.25 PDN
- Reenable X.25 trunk operation

The following graphic explains the action, reason, and effect of the following selections:

	Select from Menu		
Command Menu Selection	**5. trunk status**	**6. trunk down**	**7. trunk up**
Prompts	"trunk up" or "trunk down"	done	done
Reason for selection	To enquire if both the frame and packet level are operational.	To logically disconnect the trunk.	Use this command 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 via the LAPB setup procedure. The **LD** indicator will go OFF once the packet level is reestablished.

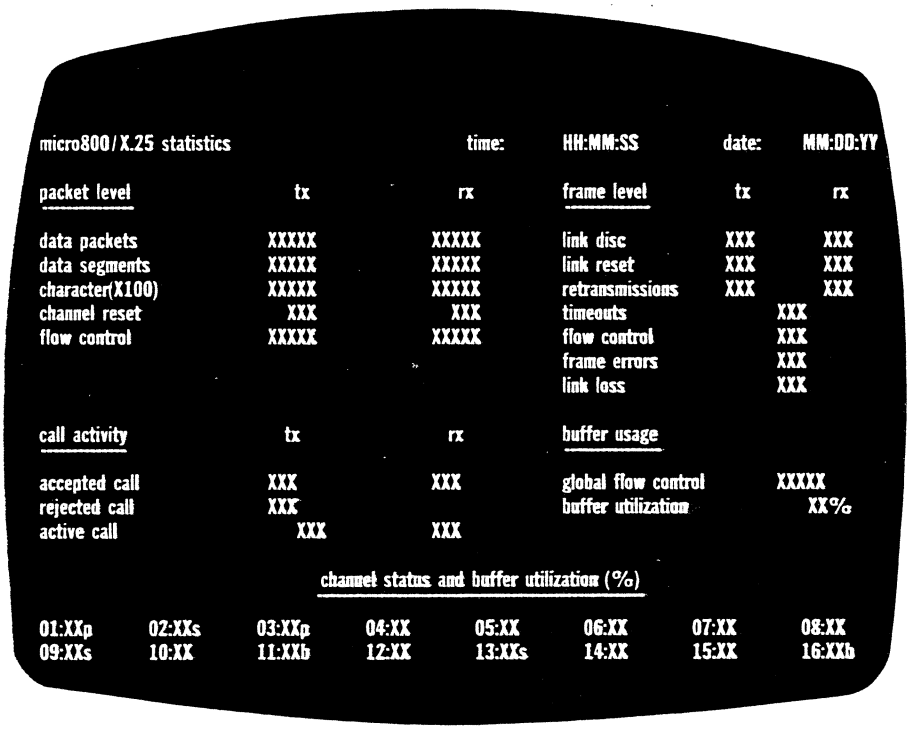
5.10 PERFORMANCE STATISTICS AND CHANNEL ACTIVITY

You may review, on demand, the following performance statistics report. The same report can also be generated periodically by the PAD via the Command Port. Refer to paragraph 5.7.12.

The statistics report allows you to

- monitor the PAD utilization
- monitor the Network usage
- monitor the X.25 trunk performance
- monitor channel activity and status

	Select from Menu	
Command Menu Selection	**8. list stats**	**9. reset stats**
Prompts	See figure 5-3	done
The reason for selection	To retrieve PAD statistics report.	To reset all the counters to zero.



MI-1229-36

Figure 5-4. Format of the Statistics Report

Table 5-1. Definition of the Micro800/X.25 Performance Statistics Report

Counter	Range of Values	Description
Data Packets	0 to 65,535	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	The number of data characters the PAD receives or transmits over the X.25 trunk
Channel Reset	0 to 65,535	The number of reset packets received and transmitted over the X.25 trunk
Flow Control	0 to 65,535	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 DISK (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	The number of times the PAD performs a SABM/UA sequence
Retransmissions	0 to 255	This is the number of frames retransmitted because of CRC errors or T1 expired. This is added to the number of frames.
Timeouts	0 to 255	The number of times the T1 timer expired
Flow Control	0 to 255	The number of RNR frames received or transmitted
Frame Errors	000 to 255	The number of times the PAD receives bad frame check sequences (CRC)
Link Loss	000 to 255	The number of times the link assurance procedure failed

Table 5-1. Definition of the Micro800/X.25 Performance Statistics Report (continued)

Counter	Range of Values	Description
Accepted Call	000 to 255	(TX) The number of times the PAD receives a Call Accept packet in response to a Call Request packet (RX) The number of times the PAD sends a Call Accept packet in response to an Incoming Call packet
Rejected Call	000 to 255	(TX) The number of times the PAD receives a Clear Indication packet in response to a Call Request packet (RX) The number of times the PAD sends a Clear Request packet in response to an Incoming Call packet
Active Call	000 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	000 to 255	The number of times the system exercises flow control on all asynchronous channels because the buffer utilization exceeded 62.5%
Buffer Utilization	00 to 99	Total buffer use (Instantaneous) = $\frac{\text{Total Number of Buffers in Use}}{\text{Total Buffer Pool Size}} \times 100\%$
Channel Status	(blank) ** p s b l	Channel Status: blank = Channel free ** = Channel not installed, or I/O serial chip is defective p = PVC enabled for that channel s = SVC in progress b = Channel busied-out or logically disconnected. l = channel engaged in a local connection.
Channel Buffer Utilization	00 to 25	% Channel Buffer use for each channel (Instantaneous) = $\frac{\text{Number of Buffers Assigned to Channel}}{\text{Total Buffer Pool Size}} \times 100\%$

5.11 SYSTEM INITIALIZATION

With these three commands you can do the following:

- Simulate the action of a hardware RESET switch, thus causing PAD reinitialization
- Initialize CMOS memory
- Check the integrity of the CMOS memory

The following graphic explains the action, meaning, and effect of the following selections:

	Select from Menu	
Command Menu Selection	**10. reset**	**11. reset cmos**
Prompts	are you sure? (y/n)	are you sure? (y/n) "done" or "faulty cmos"
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 PAD to do the following: a) zero out the CMOS. b) perform the CMOS memory test. c) check the battery voltage level.
The effect of selection	Calls will be cleared. The previously set configuration switch settings take effect. If switch group S1, position 4 is ON (COLD start), the factory default values will be reinstated. The **CA** indicator will BLINK.	After executing RESET CMOS, the CRC checksum is considered invalid; the **CA** indicator will BLINK until you reconfigure the PAD and validate the checksum. A "faulty CMOS" prompt indicates a bad CMOS or a low battery.
*Except the LGN/LCN numbering and the subaddressing method. Refer to appendix C.		

5.12 CALL ACCOUNTING AND EVENT REPORTING

In addition to providing performance statistics (refer to paragraph 5.5), the PAD can be configured to provide you with call accounting and events information.

5.12.1 Call Accounting

- A channel user can obtain call accounting information at the conclusion of his call. You enable this feature on a per channel basis via the "channel option." Refer to section 5.7.1.

  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, via the Command Port, the call accounting records of all calls handled by the PAD. You enable this feature via the Command Port "audit log." Refer to section 5.7.8.

The call accounting information is presented in this format.

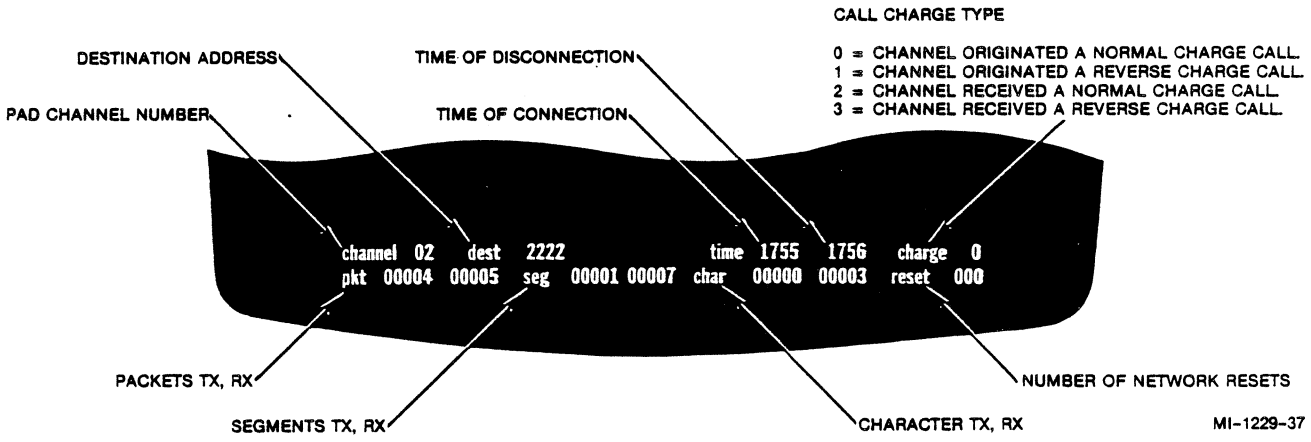


Figure 5-5. Call Accounting Record

5.12.2 Event Reporting

If you enable the Command Port Audit Log parameter, the PAD will also output to the Command Port the following events information.

- o trunk down hh:mm
- o trunk up hh:mm

where hh:mm depicts the time the event took place in hours and minutes.

5.12.3 Exit the Command Facility

	Select from Menu
Command Menu Selection	**12. 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 only accessible to authorized users

SECTION 6

DIAGNOSTICS

6.1 INTRODUCTION

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.

- Visual 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.

The first two are available through the Command Facility. Refer to paragraphs 5.10 and 5.11.

6.2 VISUAL INDICATORS

Alerting you to error conditions and changing states of activity, each PAD has eight system LED indicators. They are mounted on the Base Module printed circuit board. Besides the system indicators, the PAD provides an indicator for each channel. These are numbered 1, 2, 3, etc., and each indicates activity on a given channel. Each expansion module has its own channel indicators.

The following tables show the significance of each indicator.

Table 6-1. Visual System Indicators

NOTE

During normal operating conditions, the AT indicator is ON, and all other indicators are OFF.

Indicators	ON	OFF	BLINKING
AT Active Mode	Normal operation	Undefined problem	Downline load mode[1]
DA Downline Load Active	Test and DLL configuration mode[1]	Normal Operation	DLL of operating code in progress[1]
CL Channel Loopback	SVC established with DLL program[1]	Normal Operation	TACTR/TACTS tests active
CA Checksum Alarm	CMOS or battery problem	Normal Operation	CMOS DLL in effect[1] Cold start performed[2]
LA Trunk Alarm	Undefined problem	Normal Operation	Retransmission on trunk
BO Buffer Overflow	PAD is discarding data.	Normal Operation	Over 62.5% Buffer utilization
CO Self-Test Failure	When CA is also ON and AT is also OFF, it indicates a bad PROM[3]. When CA and AT are also OFF it indicates a RAM error.	Normal Operation	Undefined problem
LD Trunk Down	Trunk is down.	Normal Operation	Undefined problem

1. Prerequisite: The optional Feature F850/DLL

2. When the CMOS memory becomes corrupted, the PAD will automatically reload into CMOS the factory-set configuration values, regardless of the cold/warm start switch setting.

3. If PROM is corrupted, the status of the indicators is random — they may all be BLINKING.

Table 6-2. Visual Channel Indicators

Indicators	OFF	BLINKING
1, 2, 3, etc. Channel Activity	Normal operation for Idle	Normal operation for Transmit/Receive

6.3 TACT

During normal operation, the PAD is connected to a variety of data communication 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 a diagnostic capability called Terminal-Activated Channel Test (TACT) that permits the user to do this through simple and easy-to-understand tests. These tests can be performed via the dedicated Command Port or via any of the PAD's channels.

A user can initiate any one of four different tests using the MICOM X.28 extended commands*: TACTL, TACTT, TACTR and TACTS. These tests are non-disruptive, that is, they may be performed while other channels are engaged in active sessions. They can be terminated at any time by activating the Break key.

Two of these tests are local (between the PAD and the attached device) and can be initiated via the TACTL and TACTT commands. The other two 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 commands are invalid when an SVC is in progress or when the channel is defined for PVC operation.

Refer to paragraph 4.5.3 for TACT commands.

6.3.1 TACTL

You use this command to activate a loopback test on a local channel to demonstrate 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 6-1 demonstrates the format of this test.

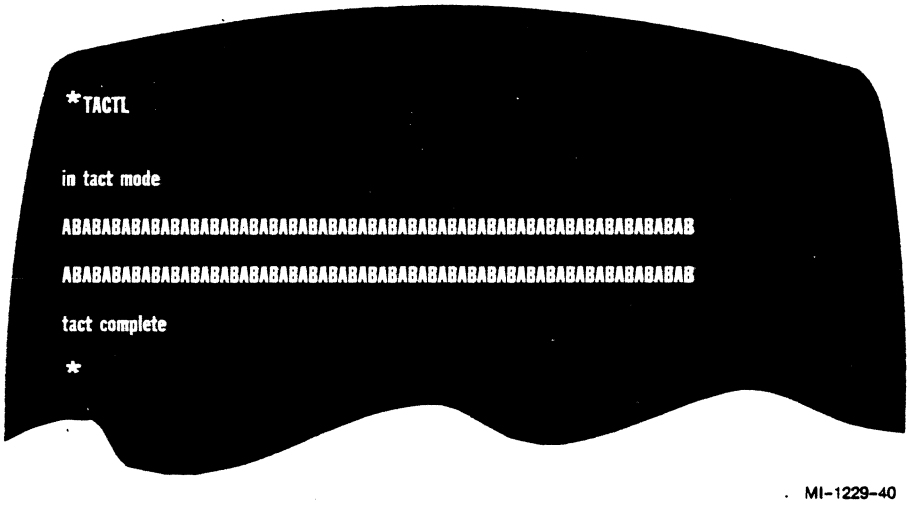


Figure 6-1. PAD User Dialogue for TACTL Test

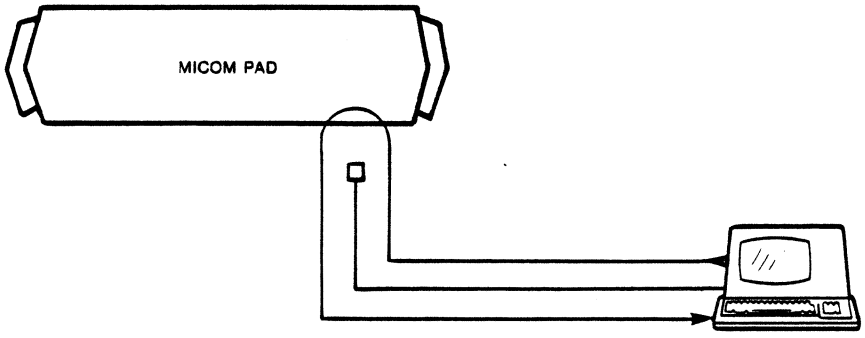
6.3.2 TACTT

You use this command to activate a loopback test for a local terminal. 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 6-2 provides a sample for a fox message TACTT test.

Figure 6-2. PAD User Dialogue for TACTT

6.3.3 Test Equipment Setup for TACTL and TACTT

Figure 6-3 shows you the equipment setup for a local test.



MI-1229-41

Figure 6-3. Equipment Setup for TACTL and TACTT Tests

6.3.4 TACTR

You use this command to activate a remote channel loopback test. 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 signalled to the user by the "tact call placed" service message.

On detecting the incoming test call, the PAD routes the call to the requesting 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 displays, all data generated at the device is transmitted through this loopback path back to the device.

Figure 6-4 is the format of the user/PAD dialogue for this test.

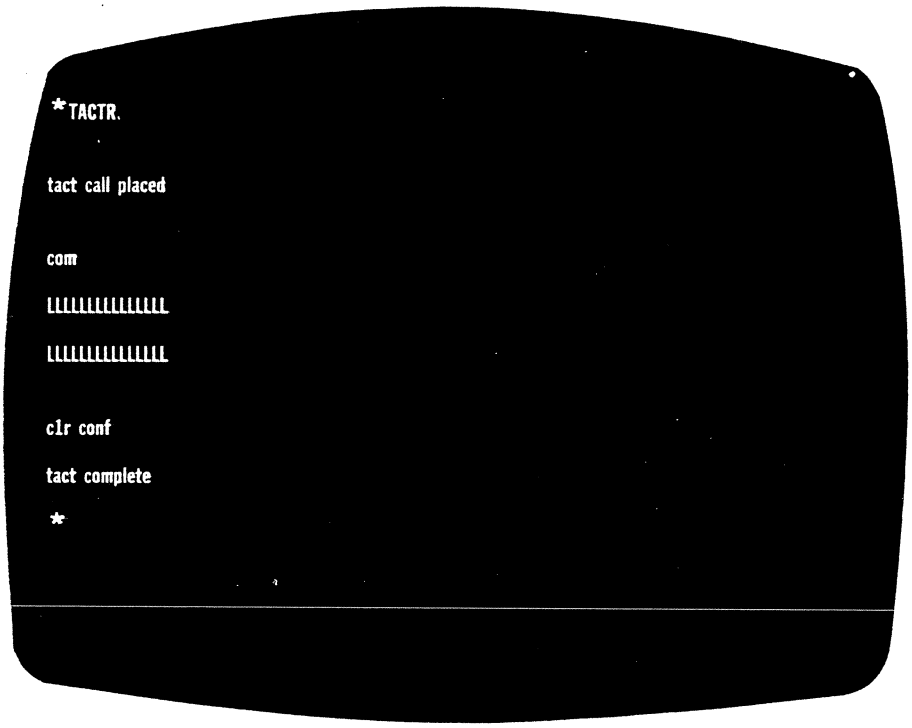


Figure 6-4. PAD User Dialogue for TACTR Test

6.3.5 TACTS

You use this command to activate a system 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 TACTR. 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 6-5 shows the format of the user/PAD dialogue for this test.

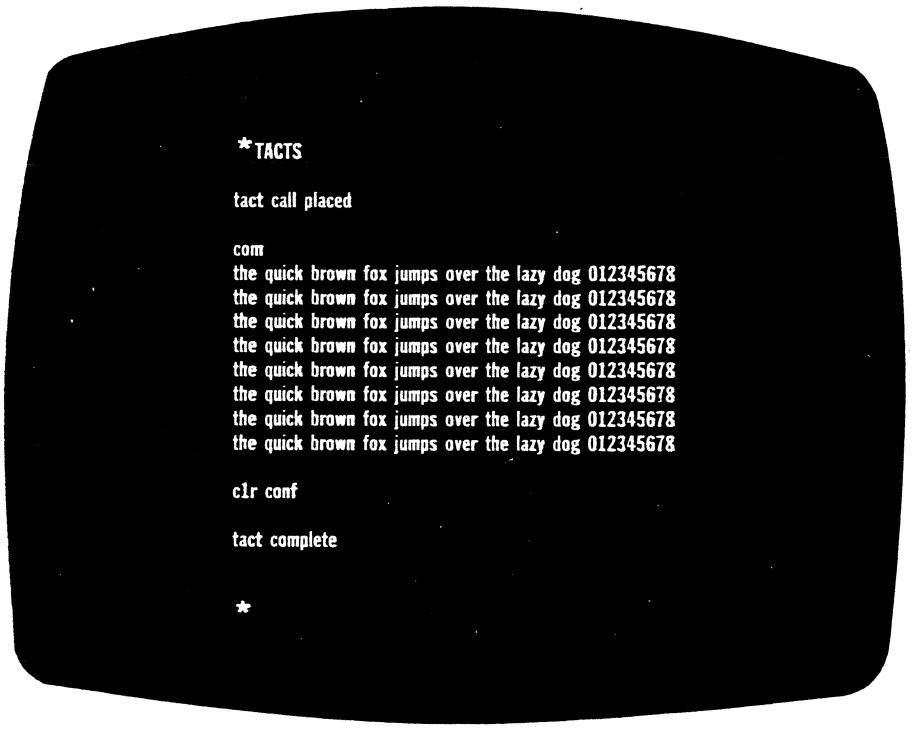


Figure 6-5. PAD User Dialogue for TACTS Test

6.3.6 Test Equipment Setup for TACTR and TACTT

Figure 6-6 shows you the equipment setup for a remote test.

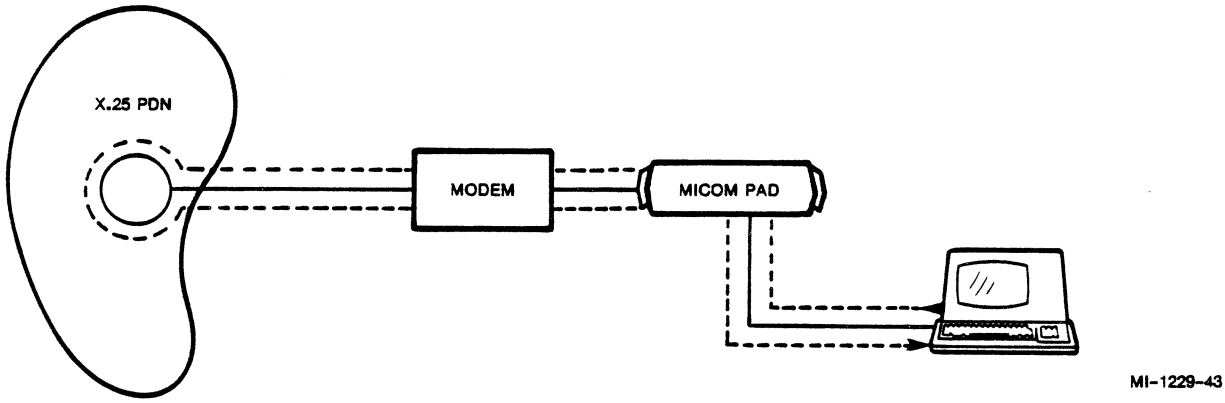


Figure 6-6. Equipment Setup for TACTR and TACTS Tests

NOTE

TACTS and TACTR commands initiate a loopback test through the Network. They therefore require two switched virtual circuits.

SECTION 7

DESCRIPTION AND INSTALLATION

Section 7 is designed to be used by experienced telecommunication technicians. Hence, it is assumed you know how to use basic electronic equipment and tools. It is also assumed you are familiar with the function of different types of electronic subassemblies -- power supply, etc.

The following table gives a brief synopsis of the installation paragraphs.

Table 7-1. Summary of Installation Paragraphs

Paragraph	Description
7.1	Describes the physical aspects of the PAD. This includes illustrations of cabling connections, configuration switch groups, and definitions of various PAD components.
7.2	Lists models, features, and upgrades
7.3	Describes the procedure for opening a PAD to access the interior components.
7.4	Lists major PAD components and gives a brief description of how to connect a PAD to a PDN (Public Data Network) and terminals.
7.5	Gives directions for PAD installation and describes the method of accessing the interior of the PAD and the major component groupings of a PAD.
7.6	Provides specifications and operating environment.
7.7	Provides detailed information on how to support 230 V ac input

The paragraphs of this section are self-contained. For this reason, you need only read the paragraph that explains the procedure you are doing. However, if this is the first PAD you have installed, it is strongly recommended that you read paragraphs 7.1 through 7.4 before proceeding to paragraph 7.5, PAD Installation. As indicated in table 7-1, paragraphs 7.1 through 7.4 contain general PAD terminology and descriptions of numerous PAD components. This background information must be completely understood before any PAD can be modified.

7.1 PAD APPLICATION

The Micro800/X.25 PAD comes in four models: 4-, 8-, 12-, or 16-channels. Figure 7-1 shows how an X.25 host and two 4-channel PADs can be interconnected via an X.25 network.

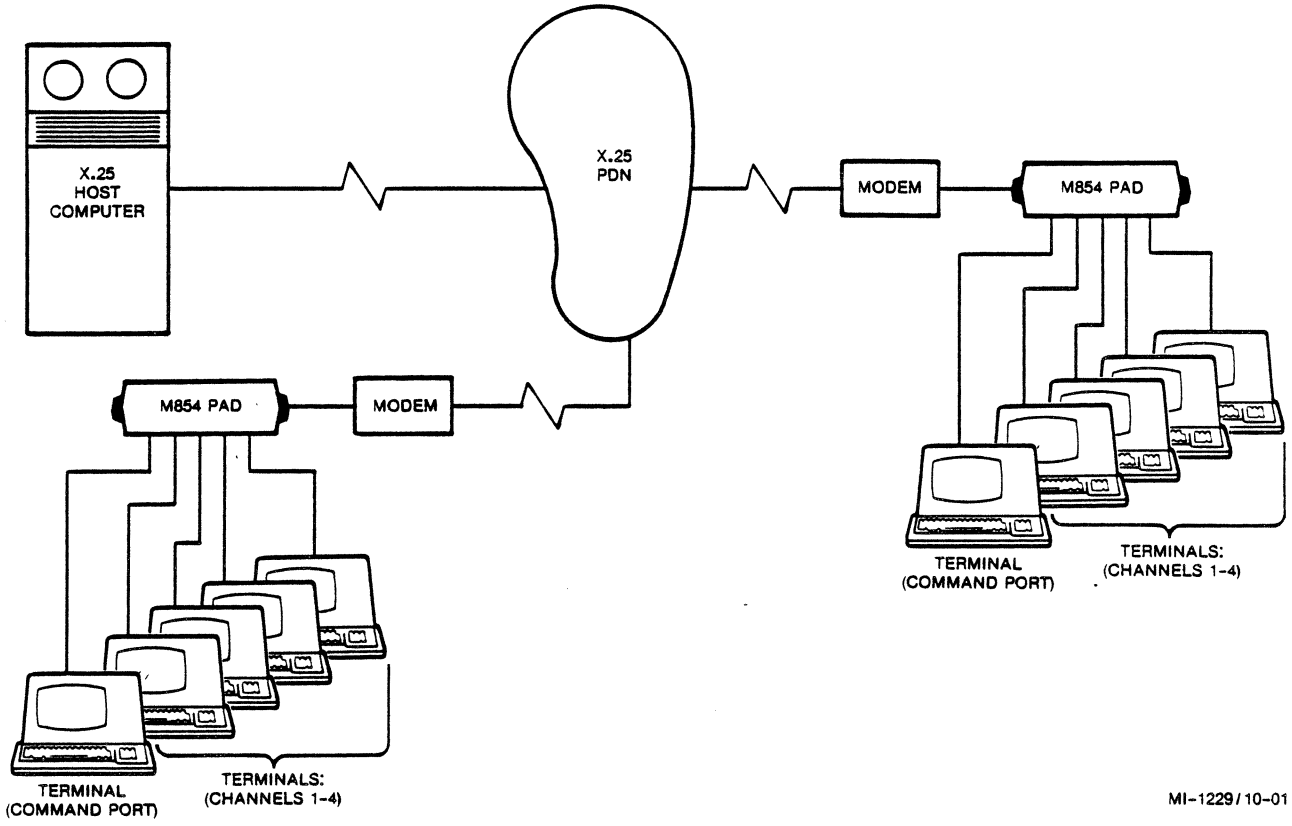


Figure 7-1. Typical X.25 Host-Based Network

7.2 MODELS, FEATURES, and UPGRADES

7.2.1 Models

Model M854, the 4-Channel Micro800/X.25, has the operating firmware resident in PROM. It has four asynchronous channels and a dedicated Command Port.

Model M858, the 8-Channel Micro800/X.25, has the operating firmware resident in PROM. It has eight asynchronous channels and a dedicated Command Port.

Model M8512, the 12-Channel Micro800/X.25, has the operating firmware resident in PROM, twelve asynchronous channels and a dedicated Command Port.

Model M8516, the 16-Channel Micro800/X.25, has the operating firmware resident in PROM. It has sixteen asynchronous channels and a dedicated Command Port.

7.2.2 Standard Features

Feature F850/ECHOX, the Extended Echo Control Option, provides special echo control for formatted screen applications.

Feature F850/IT, the Inactivity Timer Option, provides for automatic clearing of a call whenever a user-selectable period of inactivity occurs.

Feature F850/LOCAL, the Local Channel Switching Option, allows direct channel-to-channel connection within the same concentrator PAD.

Feature F850/PRI, the Priority Servicing Option, permits individual Micro800/X.25 channels to be configured for interactive or batch traffic.

7.2.3 Optional Features

Feature F850/ASYM, the Asymmetrical Channel Speed Option, permits support of terminals operating asymetrically at 1200/75 bps or any other speed combinations. This option requires a hardware modification at the factory.

Feature F850/DLL, the Downline Load Capability Option, provides the capability to downline load the PAD with operating software from an optional Network Control System. This feature provides a special "bootstrap" firmware program and 64K RAM. It provides the Micro800/X.25 concentrator PAD with the ability to interface with MICOM's Network Control System for configuration downline loading, call accounting, alarm reporting, and system management and control.

Feature F850/FSLECT, the Fast Select Option, allows the user to initiate and receive X.25 Fast Select Calls.

Feature F850/NCS, the Network Control System's Support Option, provides the Micro800/X.25 Concentrator PAD with the ability to interface with MICOM's Network Control System for configuration downline loading, call accounting, alarm reporting, and system management and control.

7.2.4 Upgrades

Upgrade U850/K4, the 4-Channel Upgrade Kit, allows an M854 to be expanded to an M858.

Upgrade U850/K12, the 12-Channel Upgrade Kit, allows an M8512 to be expanded to an M8516.

Upgrade U850/20mA, the Current Loop Adapter Kit, allows the PAD's channels to use the 20 mA interface. One is required for each channel. It is suitable for an external, 28-volt battery. It allows for data rates up to 9600 bps.

Upgrade U800/RMK22, the Field-Installable Rack-Mount Kit, is used to mount one 4- or 8-channel PAD. See figure 7-2.

Upgrade U800/RMK11, the Field Installable Rack-Mount Kit, is used to mount one 4- or 8-channel PAD.

Upgrade U435/1045, the Wall-Mount 12 V dc "Power Pack" Kit, provides for battery power for the current loop adapter, 110 V, 60 Hz only.

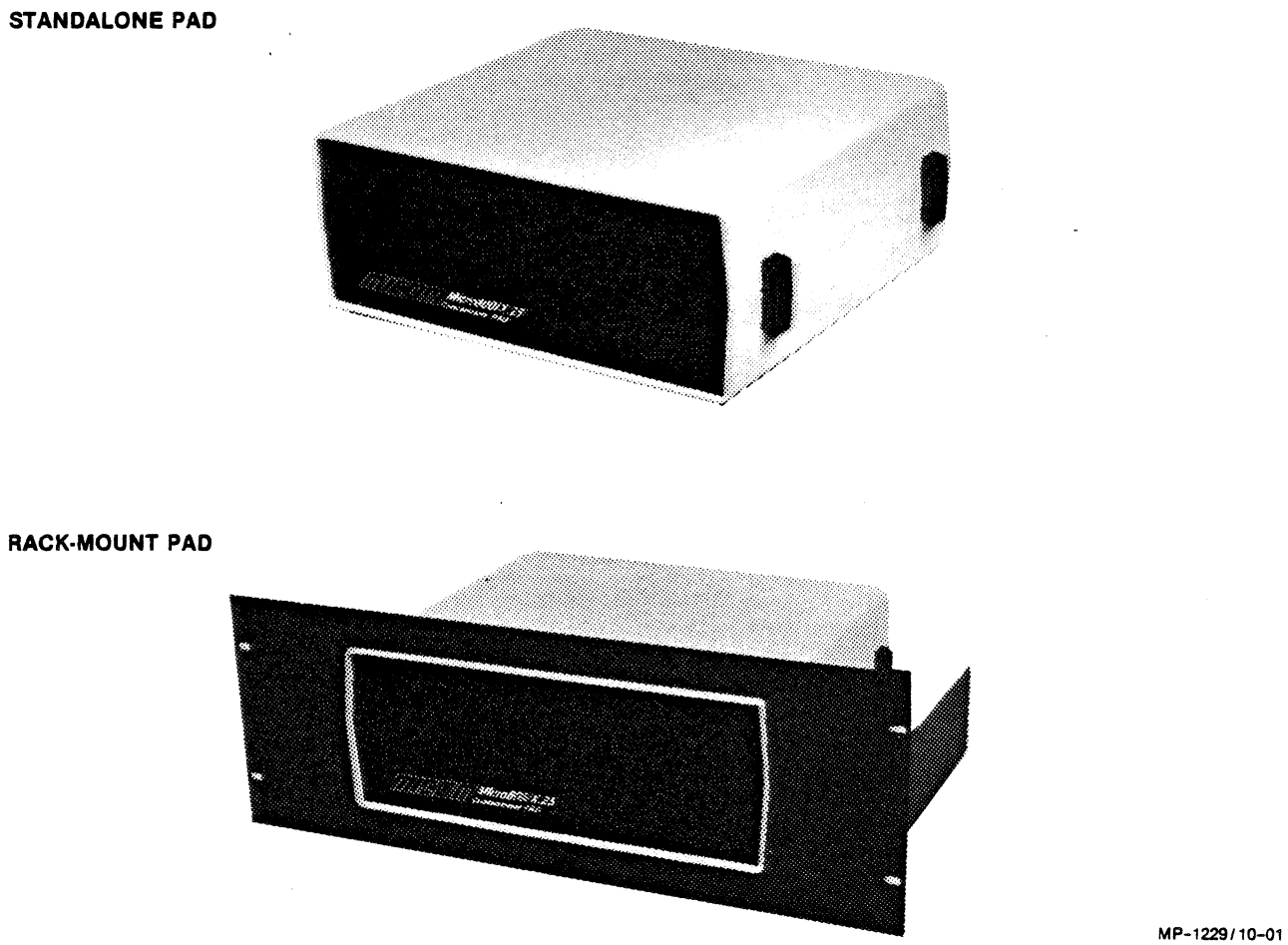


Figure 7-2. M8516 Concentrator PAD

NOTE

Before proceeding through this paragraph, make sure your PAD is disconnected from the ac power source.

7.3 PROCEDURE TO OPEN THE PAD

The PAD can be opened and inspected by two different methods. The easiest method is through the front panel. This is accomplished by pulling the small handle forward (located on top of the front panel). See figure 7-3. You now have access to the configuration switch groups (DIP switches) and other internal components.

The second method rquires you to remove the cover. This is done by unfastening the four clips on the sides of the PAD. This method is recommended when you want to inspect the modules (circuit boards) or other internal components, strap for PROMs, etc.

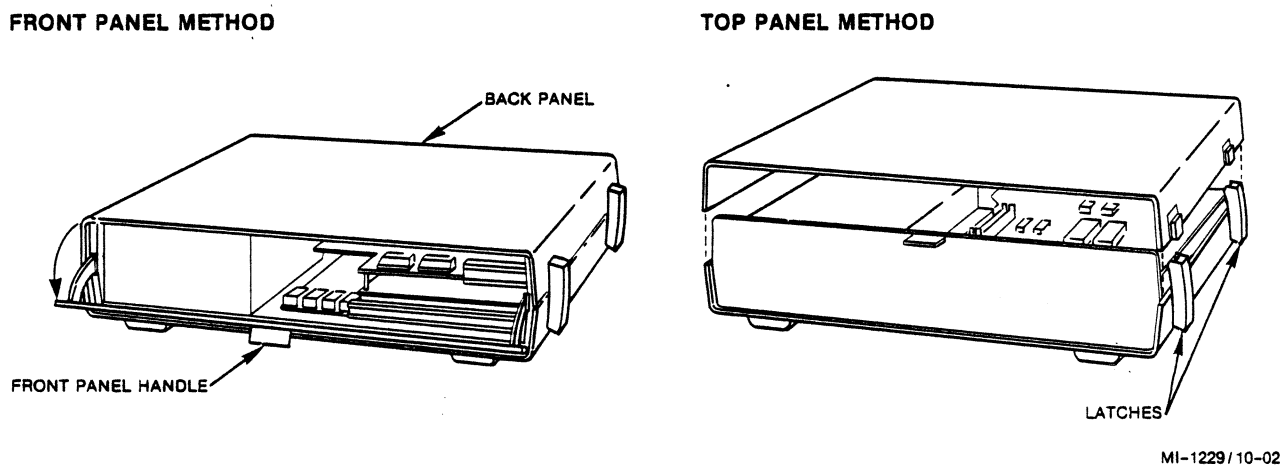


Figure 7-3. Opening a PAD

7.4 PAD COMPONENTS

The PAD has numerous components which can logically be grouped into seven functional areas.

- Modules -- These are populated circuit boards used for PAD operation.
- Configuration Switch Groups -- Contain individual DIP switches used for overriding certain factory configuration values. Refer to appendix C for their significance.
- Visual Indicators -- These LEDs are used to show the PAD. and channel status.
- Power Supply -- This is the power source used for PAD operation.
- Connectors/Cabling -- Different types of connectors and cables are used to interconnect the different PAD components.

See figure 7-4 for several annotated photos of a Micro800/X.25 PAD that shows these five functional areas. Also, see figure 7-5 for an illustration of how the modules and power supply are arranged within the PAD.

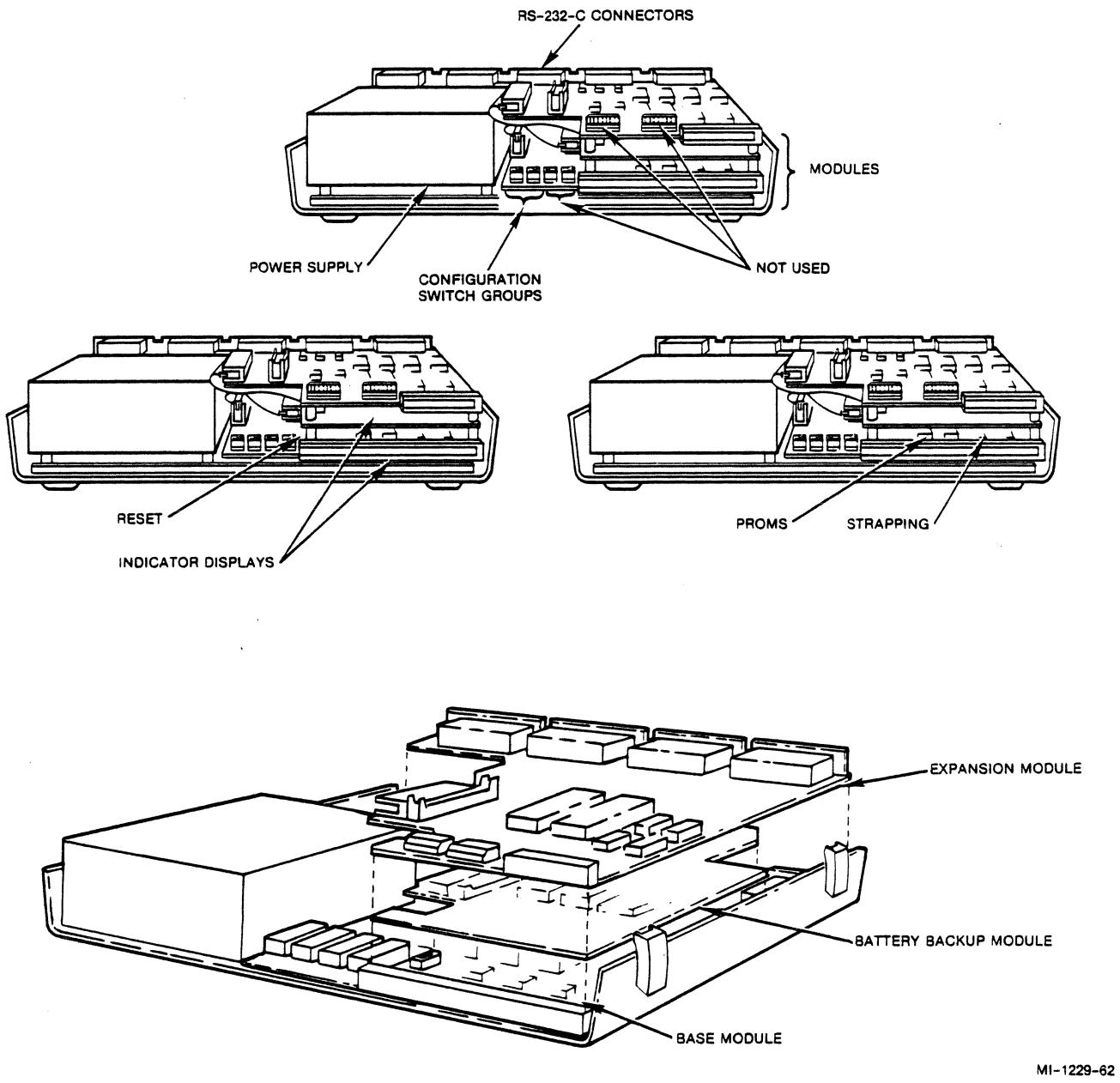
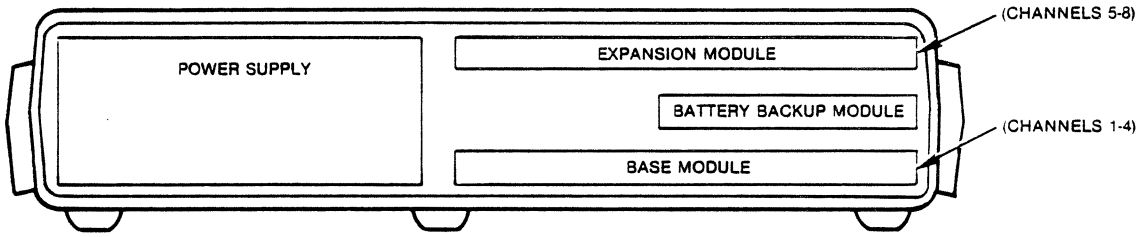


Figure 7-4. Components and Module Locations

MODELS M854 AND M858



MODELS M8512 and M8516

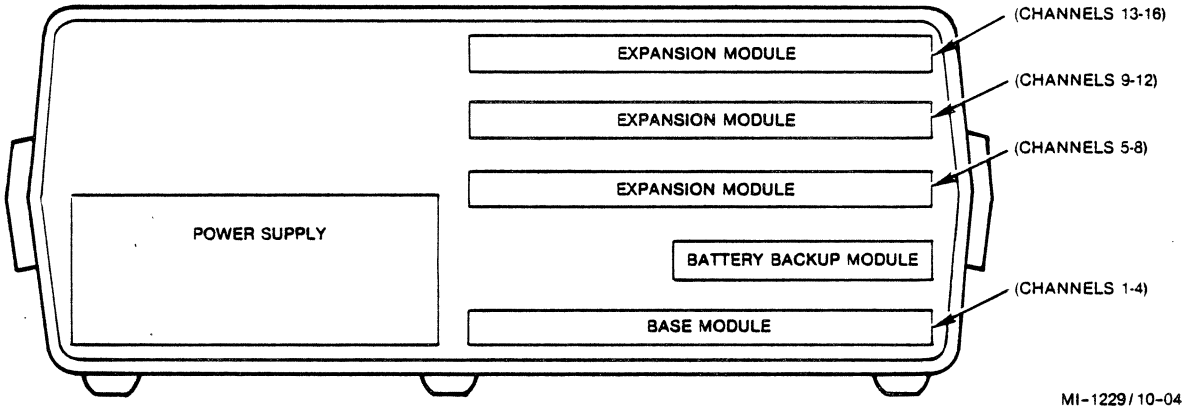


Figure 7-5. Stacking of Modules and Location of Power Supply

7.4.1 Modules

A module is a Printed Circuit Board (PCB) that contains the logic and support circuitry for PAD operation. The PAD contains three types of modules:

- Base Module (MICOM part number 100-2024). This module houses the Central Processing Unit (CPU) and the PROMs and RAM circuitry used for PAD operations. The CPU both monitors and orchestrates activity on all channels (including those on expansion modules).

- Expansion Module (MICOM part number 100-2032). An Expansion Module houses the circuitry used by four additional channels.

- Battery Backup Module (MICOM part number 100-2031). This module houses a lithium battery which acts as a source of backup power for the on-board CMOS memory. The CMOS memory contains all the PAD configuration parameters.

7.4.1.1 Base Module

The major components of the Base Module are:

- Z80 CPU
- Z80 SIO
- 64K Dynamic RAM - Models M854, M858, M8512, and M8516
- 32K or 40K PROM (Optional features require 40K)

See figure 7-6 for these components.

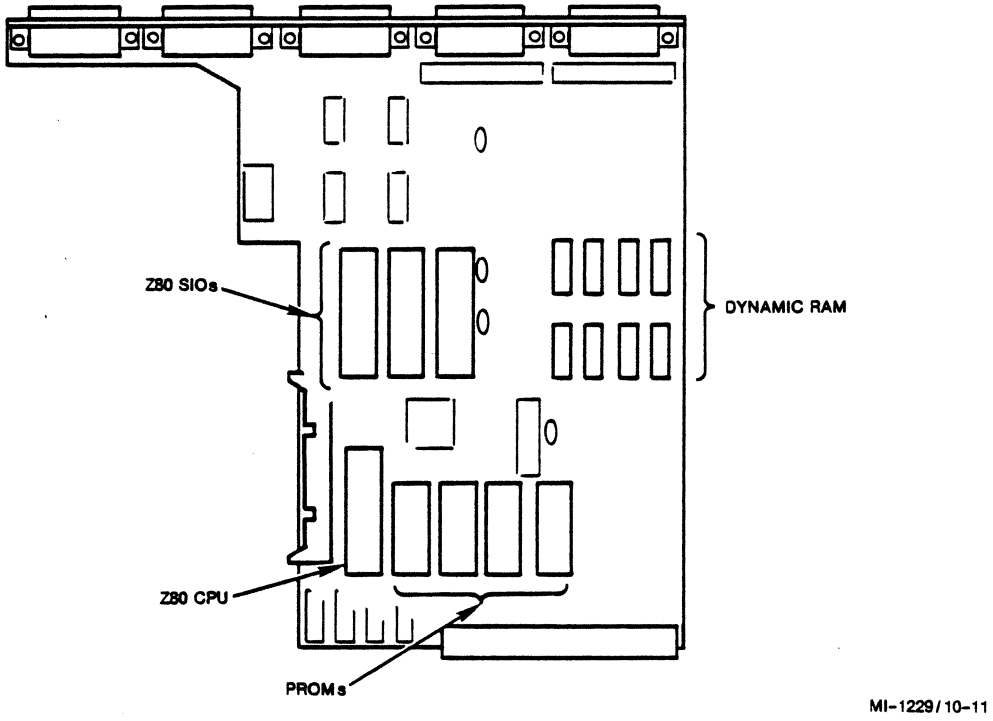


Figure 7-6. Base Module

The CPU is used to control the operation of the PAD. It manages SIO operation in addition to memory read/write activities. The SIOs are directly connected to the asynchronous serial channels. They convert parallel data into serial data and vice versa.

The dynamic RAM is used for several functions. It provides input and output buffers for data transfer. Portions of dynamic RAM are also used to support the operating software.

The nonvolatile PROM stores all the operating software and factory configurations. These configurations are loaded into nonvolatile CMOS memory (located on the battery back-up module) upon COLD-START.

PADs which contain optional features, such as F850/NCS, have a different set of PROMs. These PROMs contain operating code and other information which is unique to that PAD's configuration. All modules also contain areas that can be restrapped. Restrapping means one of three things:

- Moving a header block
- Inserting a jumper/header block
- Moving a jumper wire

By restrapping particular areas, the PAD can be configured to access different areas of PROM or RAM memory.

The following illustration and associated tables show the location of the strapping areas and the strapping choices for the Base Module.

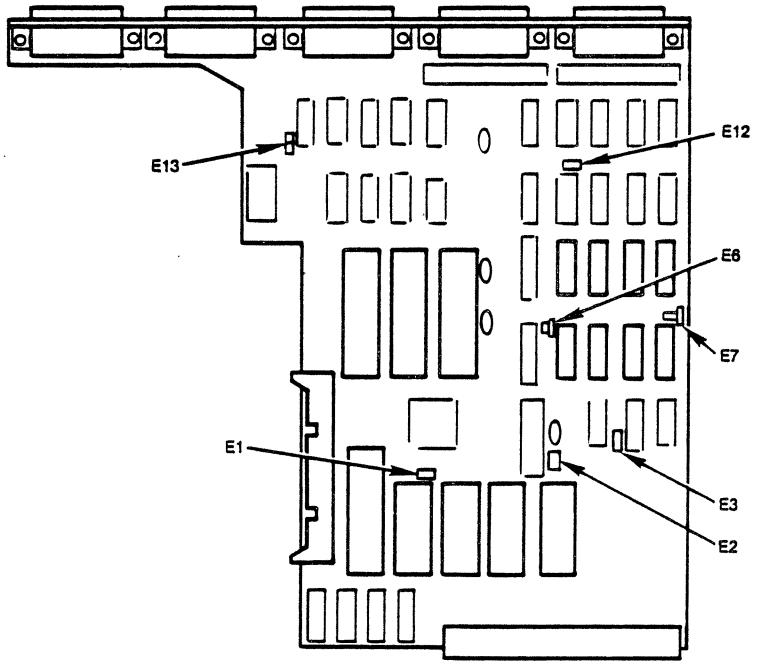


Figure 7-7. Strapping Locations on Base Module

Table 7-2. Strapping Settings for the Base Module

Models	Strap	Position 32K PROM/64K RAM	Position 40K PROM/64K RAM
M854, M858, M8512, and M8516	E1	2-3	2-3
	E2	OUT	1-2, 5-6
	E3	1-2	1-2
	E6	1-2	1-2
	E7	1-2	1-2
	E12	2-3	2-3
	*E13	1-2 Positive 2-3 Negative	1-2 Positive 2-3 Negative

* E-13 Biases the unterminated EIA control leads to a positive or negative Level. The normal position of this strap is 2-3.

7.4.1.2 Expansion Module Strapping

Each expansion module contains two SIOS. These ICs are used for the same purpose as on the Base Module -- conversion of asynchronous serial information into parallel PAD information, and vice versa.

See figure 7-8 and table 3 for the location of the strapping area on the expansion modules and the strapping choices.

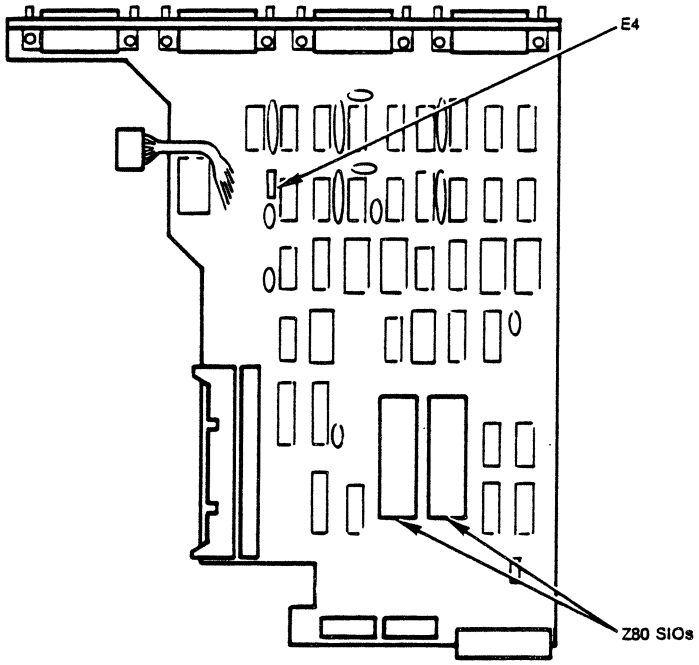


Figure 7-8. Strapping Locations on Expansion Module

Table 7-3. Strapping for the Expansion Module

Models	Strap	Position
M854, M858, M8512, and M8516*	E-4	1-2 Positive 2-3 Negative

* E-4 biases the unterminated EIA control leads to a positive or negative level.
The normal position of this strap is 2-3.

7.4.1.3 Battery Backup

The CMOS, located on the battery backup module, contains the configuration parameters used by the PAD. This memory is supported by a 3 V battery backup supply with associated control circuitry.

See figure 7-9 and table 7-4 for the strapping locations on the Battery Backup module and the strapping choices.

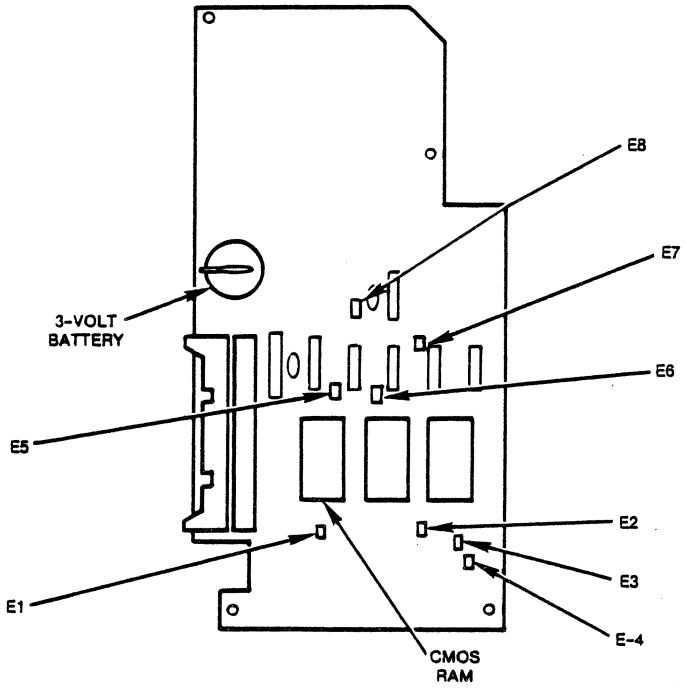


Figure 7-9. Strapping Locations on Battery Backup Module

Table 7-4. Strapping for the Battery Backup Module

MODELS	STRAP	POSITION
M854,M858,M8512, and M8516	E1	2-3
	E2	In
	E3	Out
	E4	Out
	E5	Out
	E6	In
	E7	Out

7.4.2 Configuration Switch Groups

The configuration switch groups can be used to override the PAD's factory configuration settings. A description of the switch settings is given in appendix C.

There are several types of switch groups. Your PAD may contain only one, two, or three different types. However, they all perform the same basic function. Figure 7-10 shows three types of switch groups.

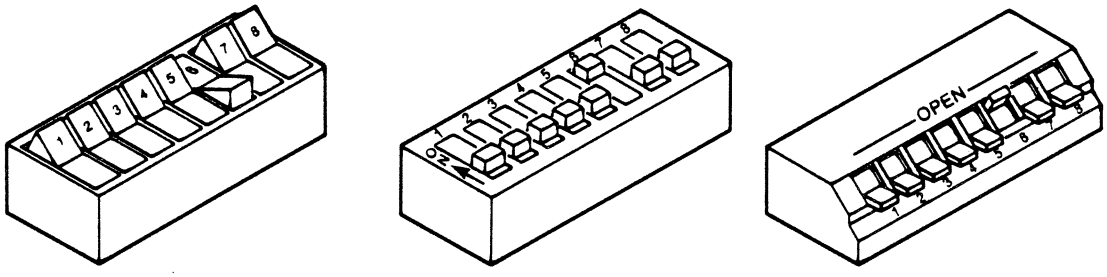


Figure 7-10. Types of Switch Groups

NOTE

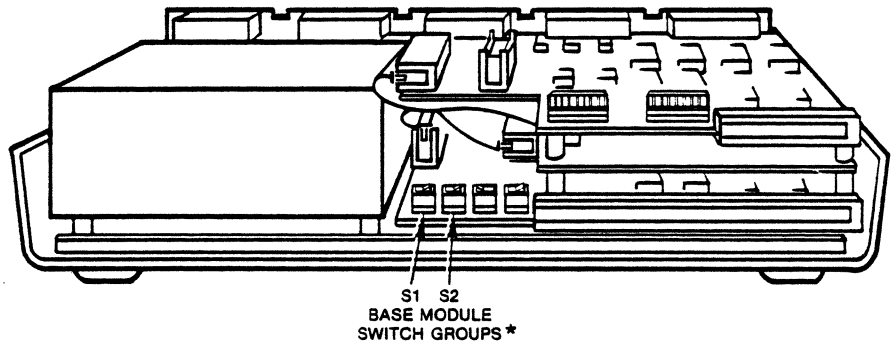
Switch groups on your unit may have different designators to indicate the on and off settings. In this manual, ON and OFF are used to designate the following equivalent terms:

ON: Down, Closed
OFF: Up, Open

All PADs contain four switch groups located on the base module. However, the PADs that contain expansion boards (M858, M8512, and M8516) have additional switch groups. See figure 7-11.

NOTE

In the PAD application, only the base module configuration switch groups S1 and S2 are used. The PADs are shipped from the factory with all switches, but with switch group S1, position 2 OFF.



*OTHER SWITCH GROUPS ARE NOT USED.

Figure 7-11. Location of Switch Groups

7.4.3 Visual Indicators

The PAD has indicator displays located on the base module and on each expansion board. See figure 7-12.

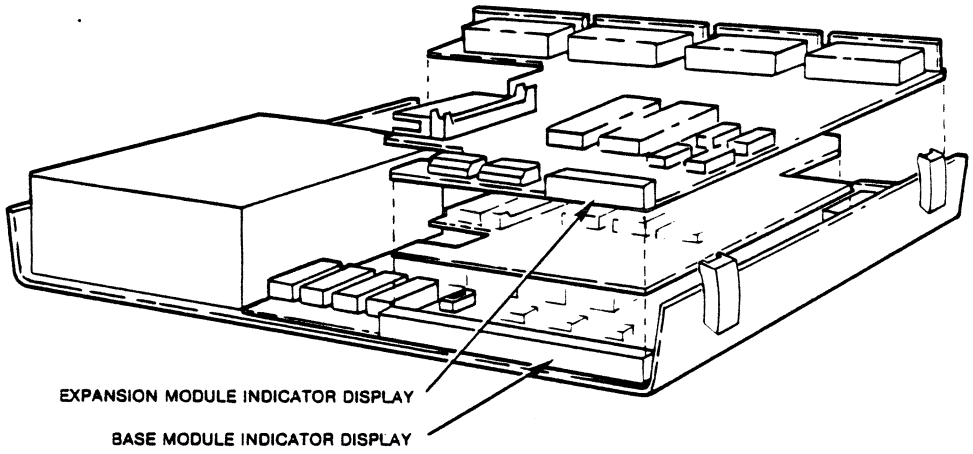


Figure 7-12. Indicator Displays

The Base Module Display consists of alphanumeric indicators. The alpha indicators display system status conditions, while the numeric indicators display data activity on channels 1 through 4.

Models M858, M8512, and M8516 have additional numeric indicator displays. Each indicator display shows the activity of the channels for that expansion module. Table 7-2 shows the relationship of the indicator displays to the number of modules the particular PAD model contains.

Table 7-5. Indicator Displays

PAD Model	Number of Expansion Models	Display Locations	Display Functions
M854	0	Base Module	a. System status conditions b. Data activity for channels 1-4
M858	1	Base Module	a. System status conditions b. Data activity for channels 1-4
		Expansion Module	Data activity of channels 5-8
M8512	2	Base Module	a. System status conditions b. Data activity for channels 1-4
		1st Expansion Module	Data activity for channels 5-8
		2nd Expansion Module	Data activity for channels 9-12
M8516	3	Base Module	a. System status conditions b. Data activity for channels 1-4
		1st Expansion Module	Data activity for channels 5-8
		2nd Expansion Module	Data activity for channels 9-12
		3rd Expansion Module	Data activity for channels 13-16

7.4.4 Power Supply

The power supply comes strapped for the voltage that is used within your area. If it is necessary to change the input voltage, refer to paragraph 7.5 for a description of the restrapping procedure.

7.4.5 Connectors/Cabling

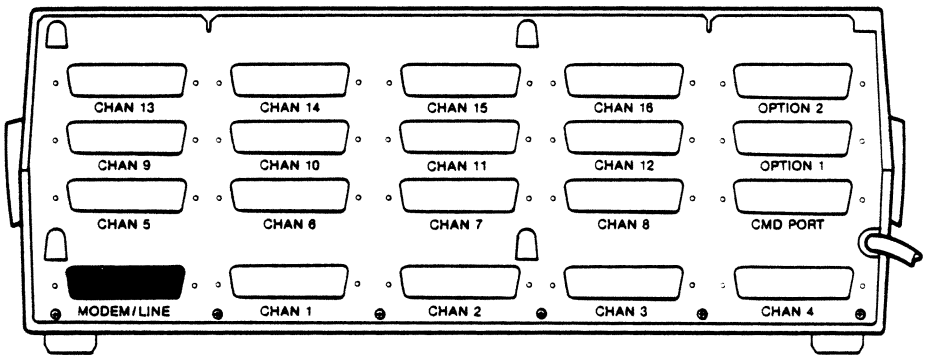
Position your PAD so you can easily view the back panel. The back panel is a metal frame that contains DB-25 connectors and a power cord.

There are two sizes of back panels: those used for Models M854 and M858, and those used for Models M8512 and M8516. See figure 7-13.

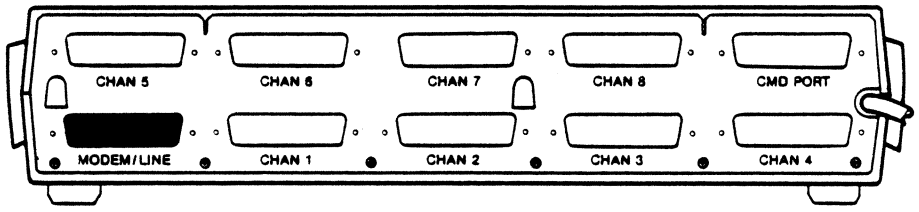
The connector, which is labeled Modem/Line, is an EIA RS-232-C, male 25-pin connector. This connector is wired as Data Terminal Equipment (DTE). This allows it to be directly connected to Data Communication Equipment (DCE), typically, a modem.

All the other connectors are EIA, RS-232-C, female 25-pin connectors. These connectors are wired as DCE. This allows you to directly connect a terminal.

MODELS M8512 AND M8516



MODELS M854 and M858



MI-1229/10-15

Figure 7-13. Back Panel Layouts

NOTE

By using different cables, you can physically connect one DCE with another DCE. Refer to paragraph 7.2.9 for a description of these connections.

In the standard PAD configuration (using a Model M854) the back panel connectors have the following characteristics.

Connector Label	Characteristics
CHAN 1–CHAN 4	Asynchronous channels used for terminal connections
CMD PORT	Asynchronous channel used for terminal connection
MODEM/LINE	Trunk line used for modem connection

NOTE

On 12- and 16-channel models, the back panel contains two connector openings, labelled Option 1 and Option 2. These openings are not presently used.

The PAD has internal cabling which is used to connect various components:

- Expansion modules
- Base module to the Command Port (CMD) connector
- The battery backup module

This cabling should not have to be changed or modified during PAD operation.

The PAD comes with one external 25-pin conductor cable (MICOM part number 100-2200-15) that has male and female DB-25 connectors. This cable is generally called a straight cable because the conductors are directly connected pin-for-pin, from one connector to the other. Refer to appendix E for the circuit pins for this cable.

The straight cable is used to connect the PAD to the modem that interfaces with the PDN. The terminals can also be connected to the PAD with a straight cable. However, some terminals have female connectors. These connections require a unique straight cable. This cable (MICOM part number 100-2199-15) has two male connectors.

See figure 7-14 for the different types of cable connections used to connect a PAD. As can be seen in the figure, there is another type of cable, called a crossover cable. This cable is used to connect modems to the channel connector. The crossover cable (MICOM part number 100-2219-15) switches "crosses over" the pins so that a DCE can communicate with the DCE. Refer to appendix E for the circuit pins of this cable.

NOTE

Other MICOM documents reference the straight cable by using a name which describes its function. For example, when this cable is used to connect the PAD to the modem, it is referenced as an "X.25 trunk cable."

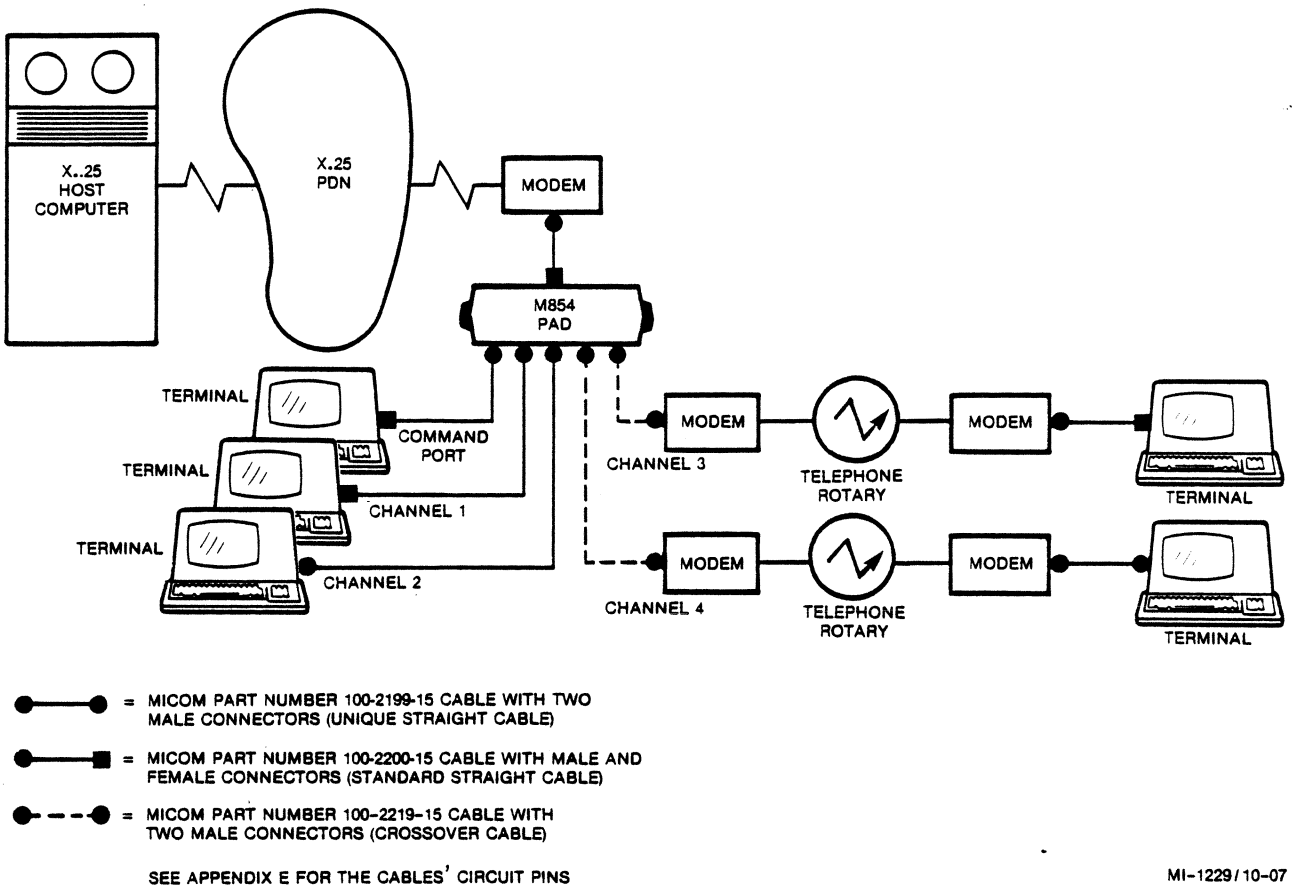


Figure 7-14. PAD Cable Connections

7.5 PAD INSTALLATION

This section shows you how to quickly get your PAD installed and running. If this is your first installation, or if you are not thoroughly familiar with your PAD, it is recommended you first read paragraph 7.1.

These instructions describe the physical connections used to install your PAD. Refer to sections 1 thru 6 for a complete description of how a PAD is configured.

7.5.1 Location of a PAD

Follow these guidelines when choosing a location for your PAD;

- Locate the PAD so that the front panel and top cover can be easily opened.
- Locate the PAD within six feet of a grounded ac power source.
- Locate the PAD so that it will have ample air circulation.

7.5.2 Installation Procedure

Before beginning this procedure, make sure your PAD is not connected to an ac power source.

1. If you have the standalone PAD, position it on the table or surface where it will be stationed.

2. If you have an optional standalone rack-mount kit, insert the standalone PAD into the rack-mount shelf. Secure the PAD to the rack-mount shelf using the plastic peg that attaches to the outer case of the PAD. Snap the peg into the pre-drilled hole on the rack-mount kit shelf.

3. Connect one end of the straight cable (X.25 Trunk Cable) to your modem and the other end to the connector that is labeled MODEM/LINE on the back panel of your PAD.

4. Connect the asynchronous interface cables (supplied with your terminals) to the back panel connectors of your PAD that are labeled CHAN 1 through the last channel for your particular model.

5. Determine which of your terminals, if any, will be assigned to the Command Port. Connect its asynchronous cable to the connector labeled CMD PORT on the back panel of your PAD.

6. Plug your PAD into the ac power source. You should hear the fan operating and see a few of the indicators go ON. If this doesn't occur, check your power cord, the ac source, and the fuse.

   If all connections are secure and the PAD is still not operating, contact your local MICOM Distributor for further troubleshooting procedures.

7. Open the hinged front panel, and press the reset switch (see figure 7-15). This will initialize the PAD. As you press the reset switch, the Base Module Indicator Display should be ON.

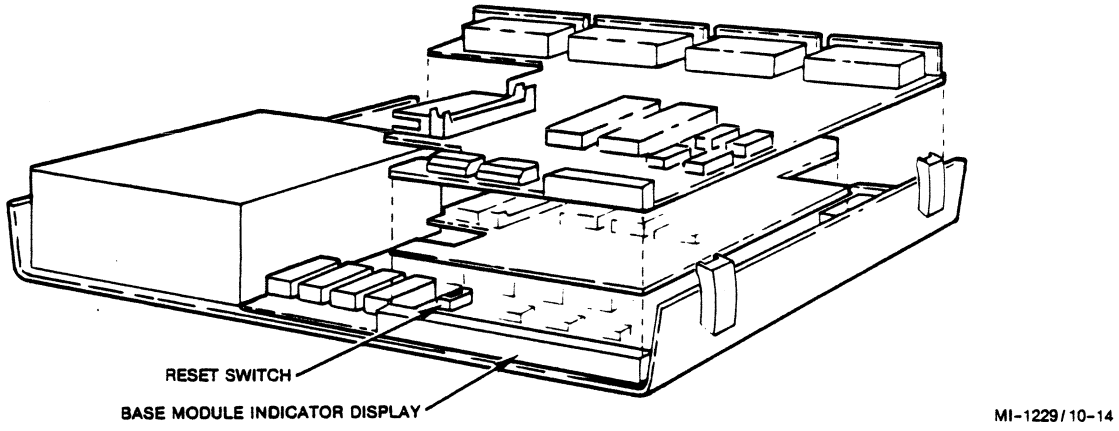


Figure 7-15. Reset Switch and Base Module Indicator Display

8. Continue to observe the Base Module Indicator Display. During this phase of the initialization process, the Base Module Indicator Display should be as follows:

   AT -- ON
   LD -- ON
   CA -- FLASHING if a cold-start has been performed; otherwise, it is OFF.

   All other indicators on the Base Module Indicator Display should be OFF. If this is not the case, refer to section 6 for possible causes.

9. After connection with the network has been established, the LD Indicator will be OFF.

7.6 TECHNICAL SPECIFICATIONS

Dimensions:

4- and 8-Channel

Standalone	Rack-Mount
12 3/4 inches (32.4 cm) wide	19 inches (48.3 cm) wide
3 inches (7.6 cm) high	3 1/2 inches (8.9 cm) high
11 1/4 inches (28.6 cm) deep	11 1/4 inches (28.6 cm) deep

Weight: 8 pounds (3.6 kg)

12- and 16-Channel

Standalone	Rack-Mount
12 3/4 inches (32.4 cm) wide	19 inches (48.3 cm) wide
5 inches (7.6 cm) high	7 inches (17.8 cm) high
11 1/4 inches (28.6 cm) deep	11 1/4 inches (28.6 cm) deep

Weight: 13 pounds (5.9 kg)

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

Operating Environment: 32 to 113°F (0 to 45°C)
0 to 95% relative humidity (non-condensing)

Power: 115/230 V ac ±10%, 47 to 63 Hz

4-Channel models, 25 watts
8-Channel models, 50 watts
12-Channel models, 50 watts
16-Channel models, 75 watts

7.7 CHANGING POWER SUPPLY INPUT VOLTAGE

The power supply is set at the factory for the voltage indicated in the Product Configuration Log included with this unit.

CAUTION

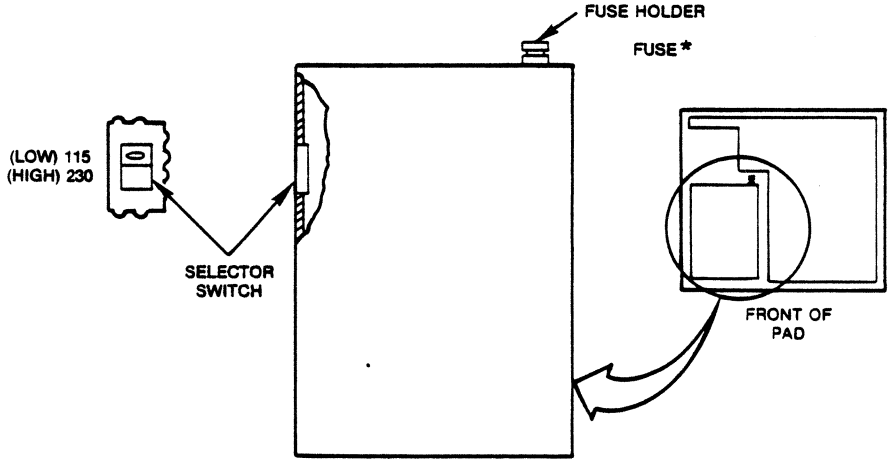
To avoid damage, verify that the selector switch is set for the voltage of the outlet before plugging in a PAD.

To access the power supply, unfasten the four latches on the sides of the enclosure and remove the top cover.

The 115/230 selector switch and fuse are located as shown in figure 7-16. The selector switch on your unit is set at the factory for the voltage used in your area. The installed fuse is appropriate for this voltage. See the serial number tag on the bottom of your unit for the fuse rating.

CAUTION

If you move the 115/230 selector switch you MUST change the fuse.



*SPECIFICATIONS ARE GIVEN ON THE SERIAL NUMBER TAG ON THE BOTTOM OF THE UNIT.

MI-1229-38

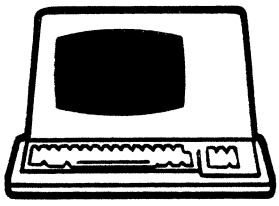
Figure 7-16. Input Voltage Selection Switch and Fuse

APPENDIX A

CONFIGURATION SHEETS

A.1 CONFIGURATION SHEETS

The configuration sheets summarize all the parameters that can be configured via 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. specsq
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

SELECT:

SELECTION 1

ASYNCHRONOUS CHANNELS

REMARKS	CHANNEL	PROFILE	CALL OPTION	ADDRESS ID MNEMONIC	CHANNEL OPTION	CLASS 1	CLASS 2	REMOTE PAR/ID
RS-232-C CABLES		1-8	TABLE 1		TABLE 2	00-99	00-99	
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							

SELECTION 2

SELECTION 4

SELECTION 7

TABLE 1 — CALL OPTION

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
128	=	Clear on data loss, if SVC. Reset if PVC
xxx	=	Any combination

TABLE 2 — CHANNEL OPTION

0	=	Dedicated
1	=	Support auto answer modems
2	=	Ring out upon incoming call
6	=	Raise DCD upon incoming call
8	=	Host port
16	=	Priority channel
32	=	Enable call accounting
64	=	Disable X.28 extended mode
128	=	Micro600 Line interface option
xxx	=	Any combination

SELECTION 2

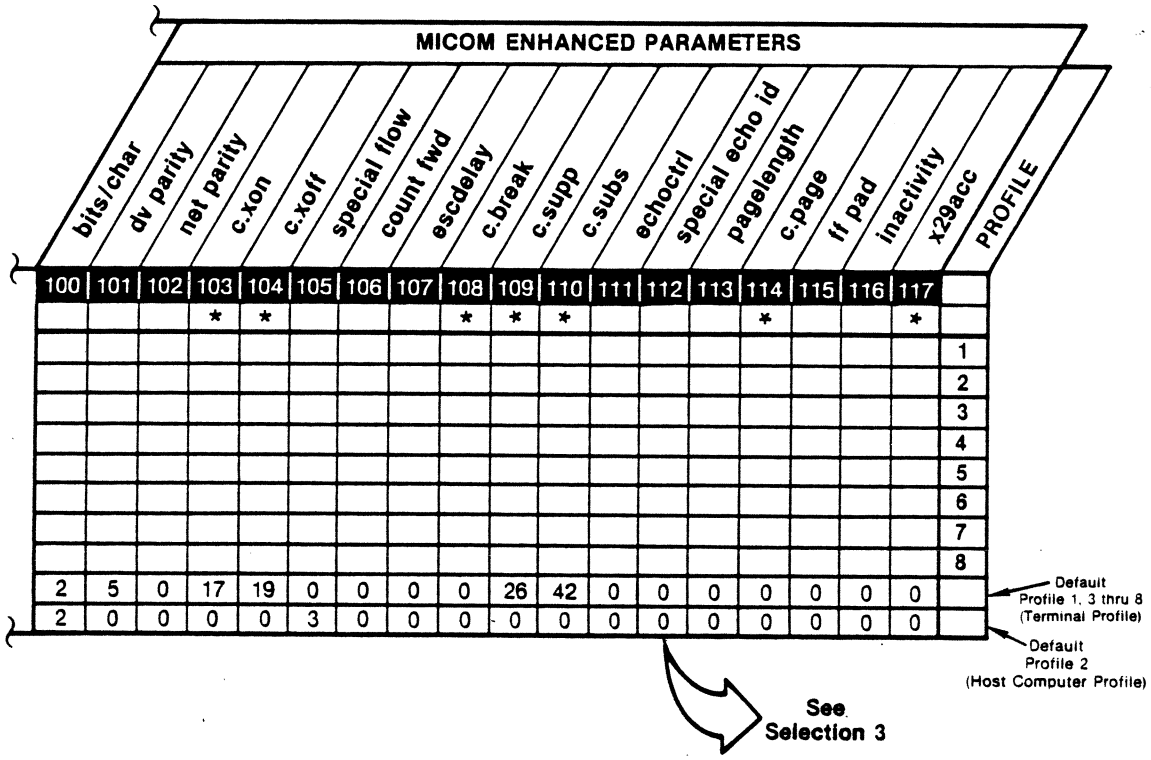
X.3 PARAMETERS

PROFILE	1 x28acc	2 echo	3 data fwd	4 idletimer	5 dv flow	6 s.signal	7 break	8	9 data flow	10 cr pad	11 l.fold	12 speed	13 p.flow	14 autolf	15 lf pad	16 edit	17 c.del	18 l.del	19 l.disp	20 dv.type	21 echomask
	*							N/A								*	*	*			
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
	1	1	2	0	1	5	21		4	80	32	1	4	4	1	8	24	18	2	131	← Default Profile 1, 3 thru 8 (Terminal Profile)
	0	0	0	20	0	0	0		0	0	12	0	0	0	0	0	0	0	1	255	← Default Profile 2 (Host Computer Profile)

PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
1	x28acc		0 = Not possible 1 = Possible by character DLE (Control 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 1 = Alphanumeric characters 2 = CR 4 = ESC, BEL, ENQ, or ACK 8 = DEL, CAN, or DC2 16 = EOT or ETX 32 = HT, LF, VT, or FF 64 = All other characters in columns 0 and 1 of the ASCII chart. XXX = Any combination of above values.
4	idletimer		0 = No idletimer 1-255 = multiple of .05 seconds, i.e., max = 12.75 seconds.
5	dv flow		0 = No flow control 1 = XON/XOFF flow control
6	s.signal		0 = No PAD messages or service prompt 1 = PAD outputs messages only 4 = PAD outputs service prompt only 5 = PAD outputs prompt and messages.
7	break		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 = 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 1 = 134.5 bps 2 = 300 bps 3 = 1200 bps 4 = 600 bps 5 = 75 bps 6 = 150 bps 7 = 1800 bps 10 = 50 bps 12 = 2400 bps 13 = 4800 bps 14 = 9600 bps 32 = Autobaud (110-9600 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 1 = LF after CR from remote DTE 2 = LF after CR sent to remote DTE 4 = LF after CR when echoing 5 = LF after CR to device when echo remote DTE sends CR 6 = PAD transmits LF when echoing or transmitting CR 7 = PAD transmits LF after all CR
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	dv.type		1 = Hard copy device 2 = Video display device
20	echomask		1 = Alphanumeric characters 2 = CR 4 = ESC, BEL, ENQ, ACK 8 = DEL, CAN, DC2 16 = ETX, EOT 32 = HT, LF, VT, FF 64 = All other control characters in columns 1 and 2 of the ASCII chart 128 = All remaining characters xxx = Any combination of above values

* THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE

SELECTION 2 (continued)

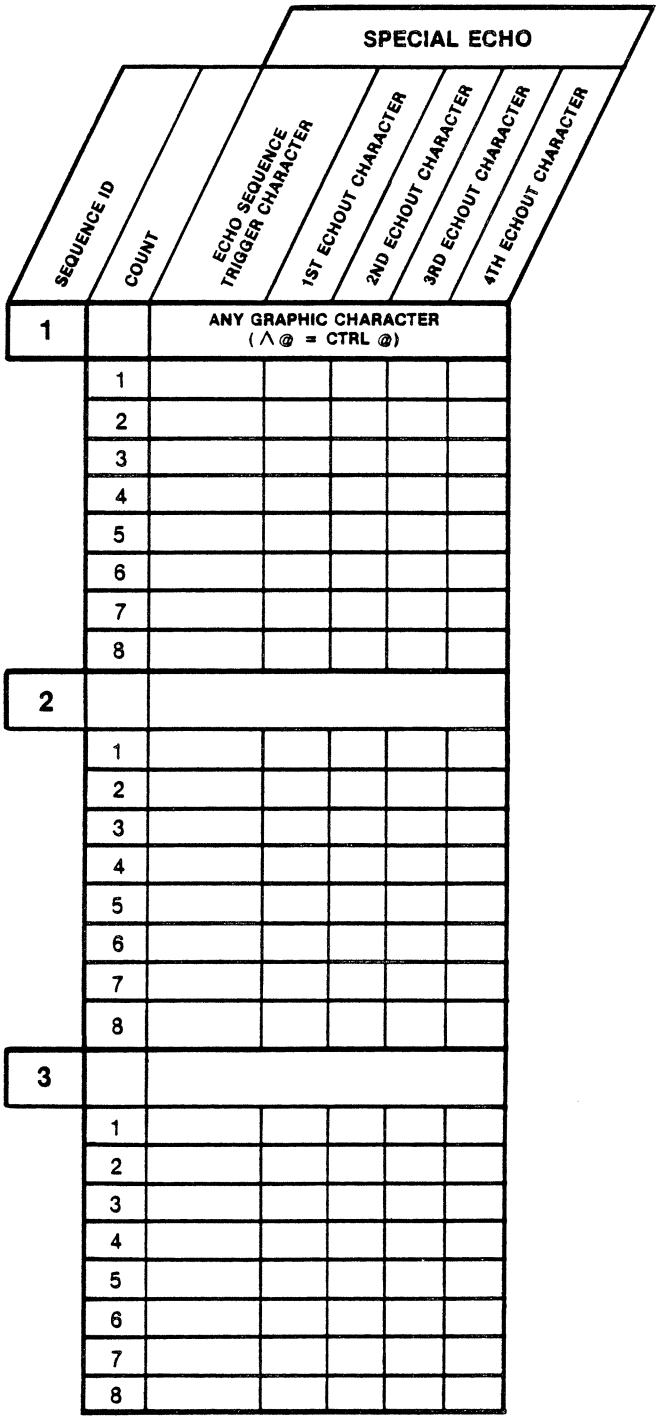


PARAMETER REFERENCE	PARAMETER	ASSIGNED PARAMETER VALUE	POSSIBLE PARAMETER VALUES
100	bits/char		0 = 5 bits 1 = 6 bits 2 = 7 bits 3 = 8 bits
101	dv parity		0 = Transparent parity 1 = Space 2 = Mark 3 = Even 4 = Odd 5 = Auto parity as determined by auto-baud sequence
102	net parity		0 = Pass data as received 1 = Space 2 = Mark 3 = Even 4 = Odd
103	c.xon		0 = Ignored 1-127 = Decimal value of character for ASCII 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 4 = PAD issues BEL character to device in flow control xx = Any combination
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 8 = 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 1-225 = 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

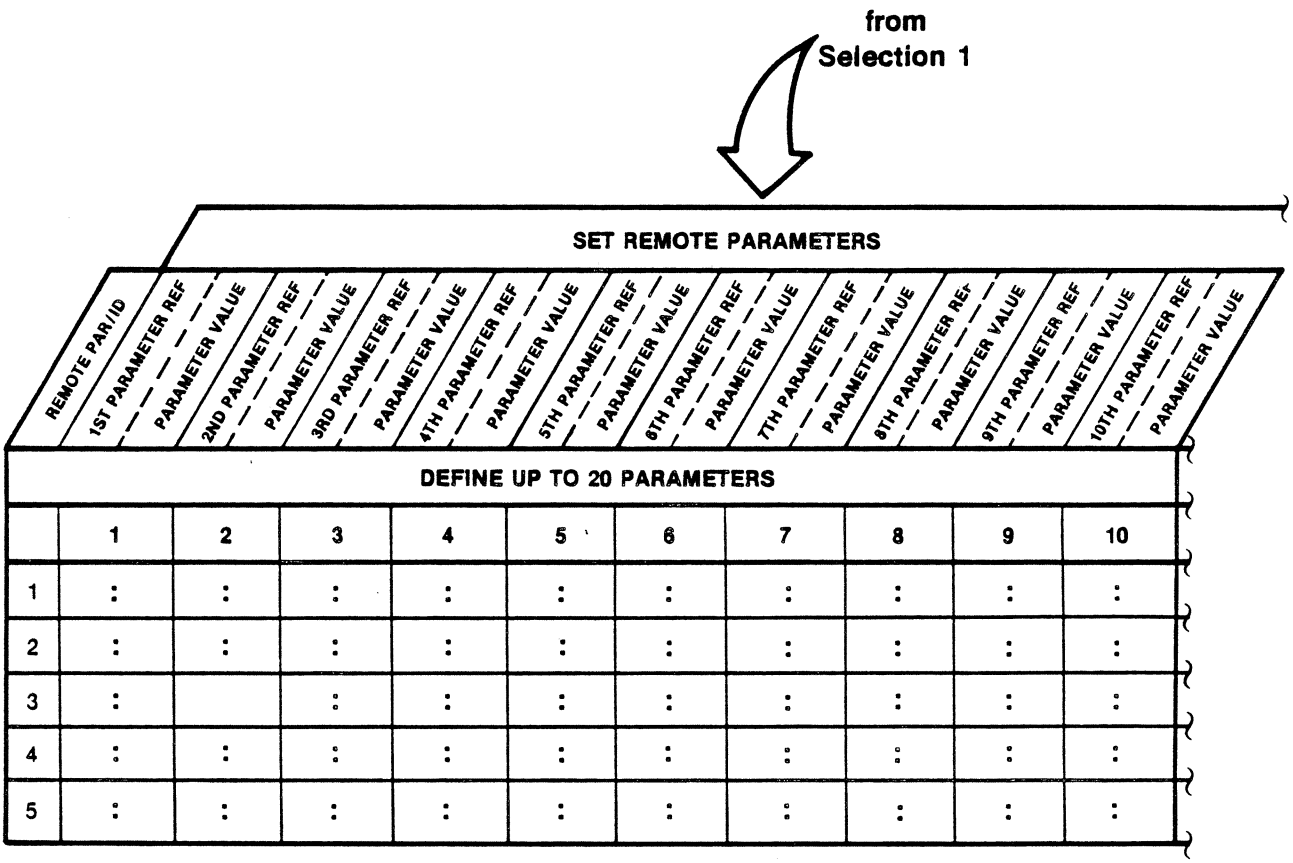
*THESE PARAMETERS SHOULD NOT BE ASSIGNED THE SAME VALUE

SELECTION 3

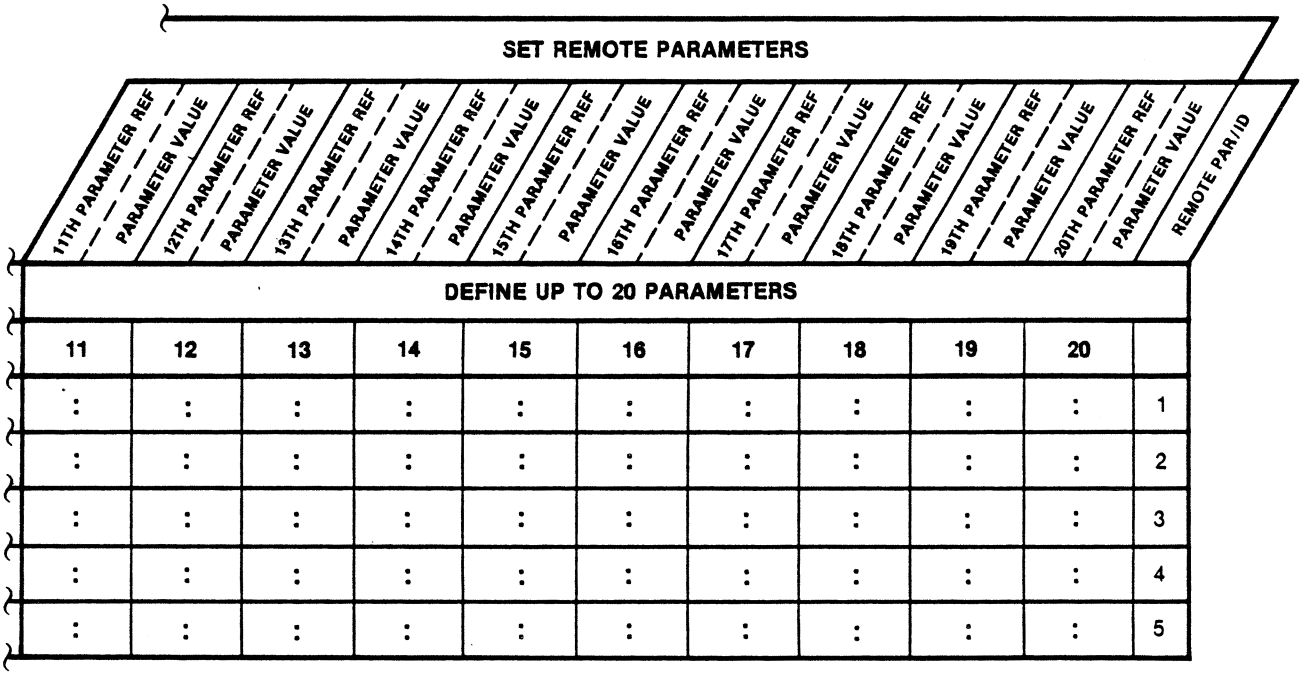
from Selection 2



SELECTION 4


from
Selection 1
SET REMOTE PARAMETERS
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

SELECTION 4 (continued)



SELECTION 5

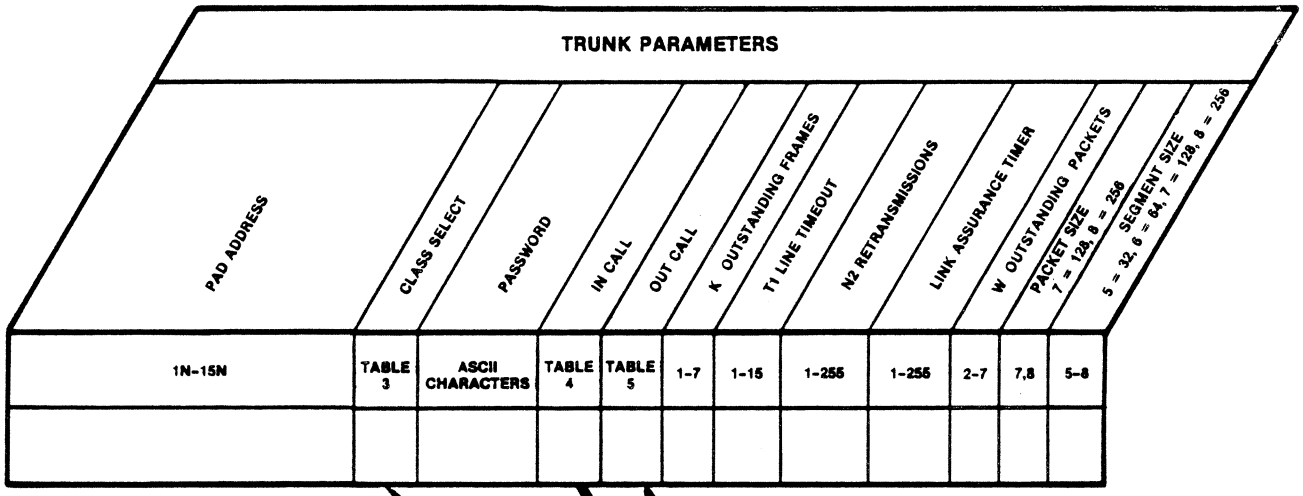


TABLE 3 — CLASS SELECT OPTIONS

0 = Use of call user data
1 = Use of X.121 subaddress field
2 = Disable class selection

TABLE 4 — INCOMING CALL CHARACTERISTICS

0 = No trunk password, no incoming facilities allowed
1 = Accept reverse charge
2 = Trunk password required
4 = Accept fast select
8 = Allow use of LGN = 0 LCN = 0
16 = Ignore incoming calls on undefined logical channel
xx = Any combination

TABLE 5 — 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
xxx = Any combination

SELECTION 6

	TYPE OF VIRTUAL CHANNEL	LOGICAL CHANNEL NUMBERS		PAD CHANNEL NUMBER
		LOGICAL GROUP	LOGICAL CHANNEL	
	SVC OR PVC	00–15	00–255	1–24
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

IF PVC, DEFINE PAD CHANNEL NUMBER

SELECTION 7

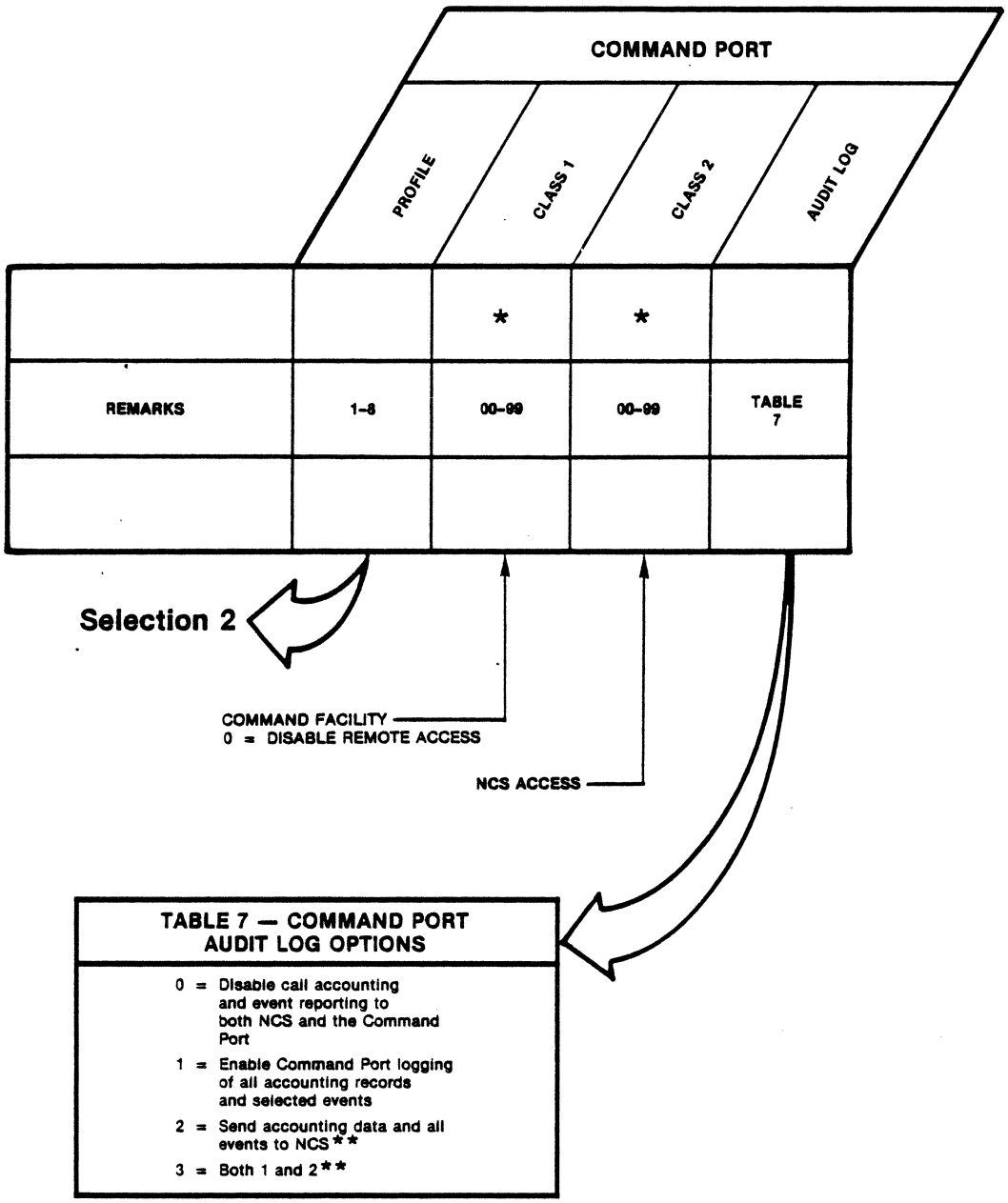
	ADDRESS ID DEFINITION						
	MNEMONIC	ADDRESS	SUBADDRESS (CLASS)	FACILITY	CUG ID	PROTOCOL ID	USER DATA
	2 A/N	DTE ADDRESS 1-13 NUMERIC	00-99	TABLE 6	00-99	8 HEXADECIMALS	0-12 ASCII CHARACTERS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

TABLE 6 — FACILITY OPTIONS

0 = No facility
1 = Reverse charging
2 = Fast select
4 = Closed user group
8 = 128 byte packet negotiation
16 = Throughput class
32 = Nonstandard protocol ID
xx = Any combination

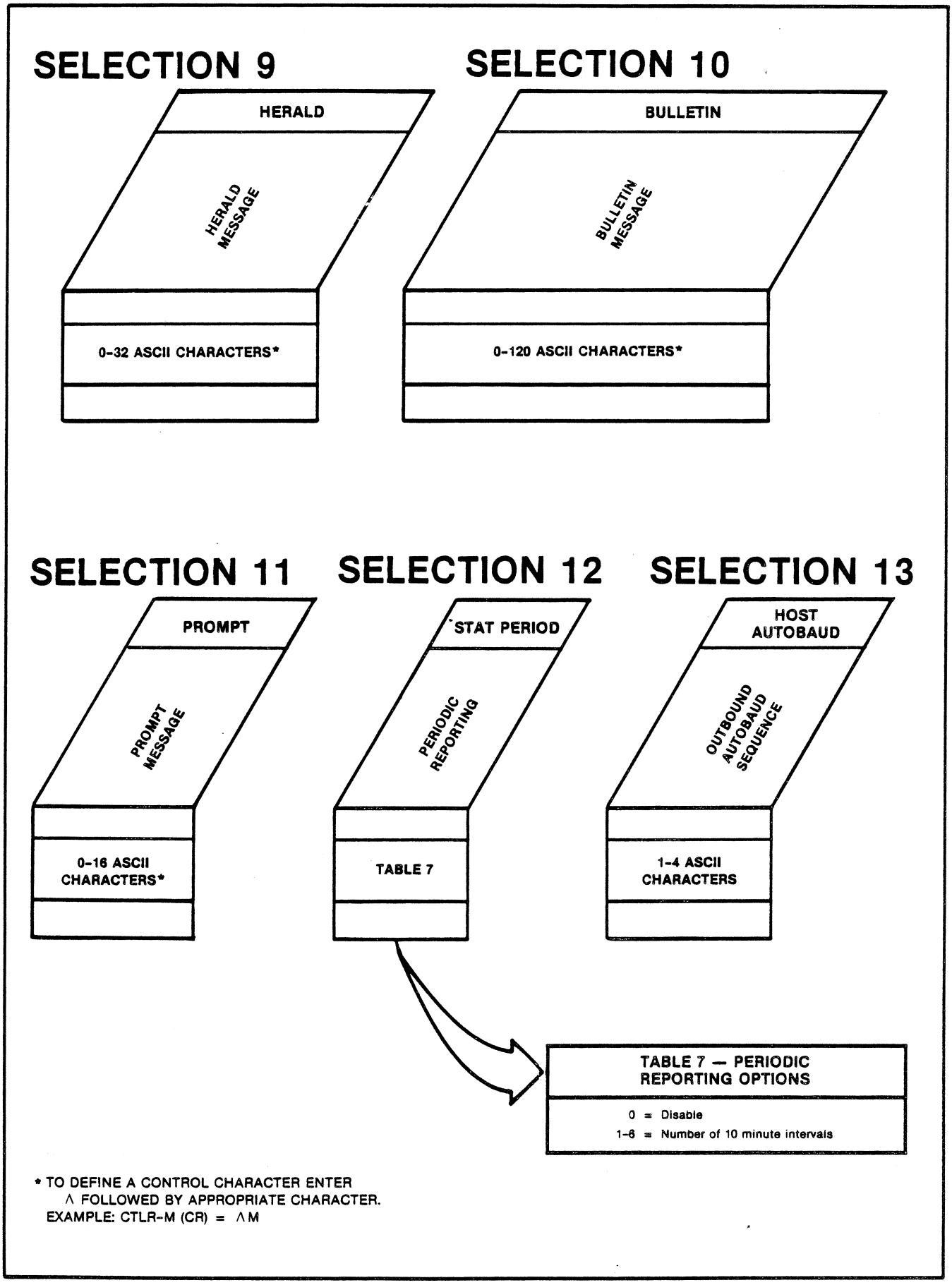
NOTE: AN = ALPHANUMERICS

SELECTION 8



* MUST NOT BE ASSIGNED THE SAME VALUE

** PREREQUISITE: THE OPTIONAL FEATURE F850/NCS OR F850/DLL


SELECTION 9
HERALD
HERALD MESSAGE
0-32 ASCII CHARACTERS*
SELECTION 10
BULLETIN
BULLETIN MESSAGE
0-120 ASCII CHARACTERS*
SELECTION 11
PROMPT
PROMPT MESSAGE
0-16 ASCII CHARACTERS*
SELECTION 12
STAT PERIOD
PERIODIC REPORTING
TABLE 7
SELECTION 13
HOST AUTOBAUD
OUTBOUND AUTOBAUD SEQUENCE
1-4 ASCII CHARACTERS
TABLE 7 — PERIODIC REPORTING OPTIONS
0 = Disable
1-6 = Number of 10 minute intervals
* TO DEFINE A CONTROL CHARACTER ENTER
Λ FOLLOWED BY APPROPRIATE CHARACTER.
EXAMPLE: CTLR-M (CR) = ΛM

APPENDIX B

FACTORY PARAMETER SETTINGS

B.1 PARAMETER VALUES

Besides the settings that can be altered by configuration switch group settings, the PAD is conditioned on cold-start with the following parameter values:

1. All channels are set to:

   - Long form call only
   - Dedicated connection
   - All channels are associated with device Profile 1
   - For subaddressing: Class 1 = 0
     Class 2 = Channel number (i.e., Class 2 of Channel number 3 = 3)

2. The trunk parameters are set to:

   K = 7
   T1 = 5
   N2 = 10
   W = 2
   AT = 15
   Packet size = 128 bytes
   Segment size = 64 bytes

3. The Command Port parameters are set to:

   - Class 1 = 99
   - Ability to make long-form or abbreviated calls
   - The Command Port is associated with device Profile 1

4. The Herald Message is: micro800/x.25 channel.

5. The Bulletin Message is not defined.

6. The X.28 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

11. There are two different types of default device profiles. All 8 profiles are initialized as follows:

    Profile 1 - Terminal type (Default Profile Number 1)
    Profile 2 - Host Computer type (Default Profile Number 2)
    Profile 3 - Terminal type (Default Profile Number 1)
    Profile 4 - Terminal type (Default Profile Number 1)
    Profile 5 - Terminal type (Default Profile Number 1)
    Profile 6 - Terminal type (Default Profile Number 1)
    Profile 7 - Terminal type (Default Profile Number 1)
    Profile 8 - Terminal type (Default Profile Number 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. They are to be used where the PAD is front-ending the asynchronous host computer. See table C-1.

B.2.1 Terminal Profile

The Terminal Profile supports the following operational environment:

- The PAD will perform autobaud up to 9600 bps and autoparity. Parameter 11.
- The user can access X.28 mode by the CTRL-P character. Parameter 1.
- The PAD will echo the terminal input. (The terminal should be set to full-duplex.) Parameter 2.
- 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. Refer to 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 Backspace key is used to delete a character. Parameter 16.

  The CAN key is used to delete the user buffer. Parameter 17.

  The CTRL-R character is used to redisplay the user's input. Parameter 18.

- The PAD will assume that the terminal is a display for service signals in the editing mode. That is to say, the sequence of BS SP BS characters will be transmitted to the device in response to a Backspace key. Parameter 19.

- The PAD will echo all terminal-transmitted characters except the following:

  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. Refer to Parameter 20.

- The user can make the PAD 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 operational environment:

- 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. This follows the last byte from the host computer. Parameter 4.

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
Device Type	19	2	1
Echo Mask	20	131	255
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	1
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

* All MICOM-enhanced parameters are assigned 100 numbers while CCITT parameters are numbered from 1 thru 20.

APPENDIX C

CONFIGURATION SWITCH GROUPS

C.1 CONFIGURATION SWITCH GROUPS

The PAD has two configuration switch groups. Each switch group has eight switches as shown in figure C-1. You may set them to override some of the factory predefined configurations.

C.1.1 Switch Group S1

C.1.1.1 Switch Group S1, Position 2

The PAD is preset to rely on an external clock for its trunk operation.

For the PAD to provide the clocking signal, you must set position 2 OFF. The clocking speed is fixed at 9600 bps.

C.1.1.2 Switch Group S1, Position 4

The cold-start setting (position 4) causes the PAD to set all its parameters to factory predefined values whenever

- The PAD is powered off and on
- The PAD is reset via the reset switch or the reset command

You would use this setting whenever you need to restore the original factory values to the PAD parameters (i.e., if you fail to remember your own access password).

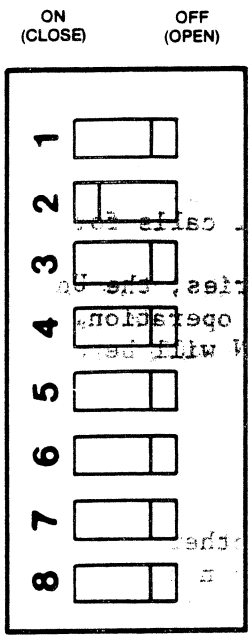
Once you have reconfigured your PAD, set this switch to the warm-start setting. Otherwise, each time you initiate a reset or a power failure occurs, the parameters will be set back to their original values.

C.1.1.3 Switch Group S1, Position 8

The X.25 trunk is preset to have a DTE appearance, thus making the PAD suitable for connection to Packet Data Networks.

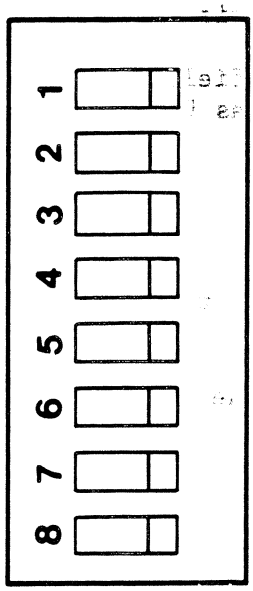
You must set position 8 ON (DCE appearance) for connection to other X.25 equipment (front ends or host computers) which are configured for DTE appearance.

SWITCH GROUP S1:



	1	RESERVED
ENABLE EXTERNAL CLOCK	2	DISABLE EXTERNAL CLOCK
DLL MODE	3	DLL TEST AND CONFIGURE MODE [1]
COLD START	4	WARM START
	5	RESERVED
	6	RESERVED
	7	RESERVED (FIRMWARE DIAGNOSTICS)
TRUNK DCE APPEARANCE	8	TRUNK DTE APPEARANCE

SWITCH GROUP S2:



	1	
	2	
	3	
	4	
SUBADDRESSING VIA THE CALL USER DATA FIELD	5	X.121 SUBADDRESSING
	6	RESERVED
DATAPAC PRIORITY	7	X.25 PACKET SIZE NEGOTIATION
50 Hz	8	60 Hz

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

SELECT THE SWITCH SETTINGS WHICH CORRESPOND TO THE LOGICAL GROUP NUMBER TO BE USED FOR THE SWITCHED VIRTUAL CIRCUITS UPON COLD START.

[1] PREREQUISITE: THE OPTIONAL FEATURE F850/DLL

MI-1229-69

Figure C-1. Configuration Switch Groups

C.1.2 Switch Group S2

C.1.2.1 Switch Group S2, Positions 1 thru 4

The PAD is preset 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 LCN=1 through n + 2, allowing 18 virtual calls for 16 channels.

While an LGN = 0 is suitable for most countries, the United Kingdom PSS network, for one, requires an LGN=4 for SVC operation. You can preset the PAD switches so that upon cold-start the LGN will be set to a value between 0 and 15.

NOTE

When the LGN is set to a value other than 0 the LCN range will be 0 thru n + 1 where n equals the number of physical channels installed.

C.1.2.2 Switch Group S2, Position 5

The PAD is preset to support subaddressing via X.121 method.

You must set position 5 ON (call user data field method) if your Network does not support X.121 subaddressing, such as DATAPAC and other similar implementations.

C.1.2.3 Switch Group S2, Position 7

The PAD is preset to support the packet-size negotiation facility coding as per CCITT 1980.

You must set position 7 ON to accommodate the 128-bytes priority operation over the Canadian DATAPAC network.

C.1.2.4 Switch Group S2, Position 8

The PAD assumes a 60 Hz environment in updating the time and date counters.

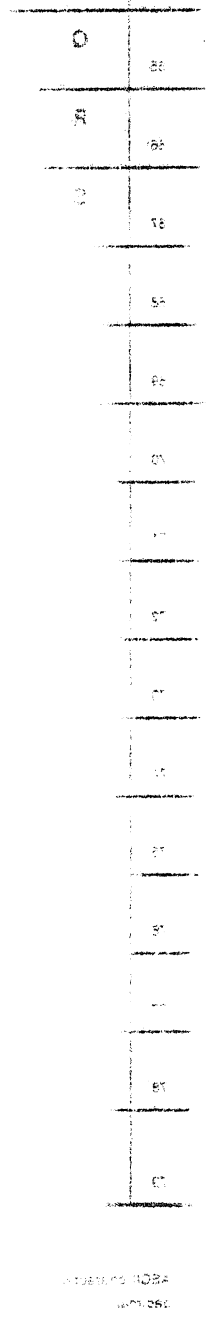
You must set it to the ON position to support a 50 Hz environment if your power source frequency is 50 Hz (i.e., Europe, Australia).

C.2 RESERVED SWITCH POSITIONS

All reserved switch positions MUST be set to OFF.

NOTE

Switch Group S2, Positions 1 thru 4 and Position 5 take effect upon cold start.

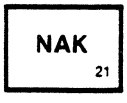


APPENDIX D

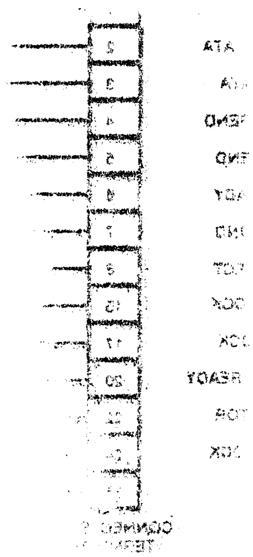
ASCII CHART

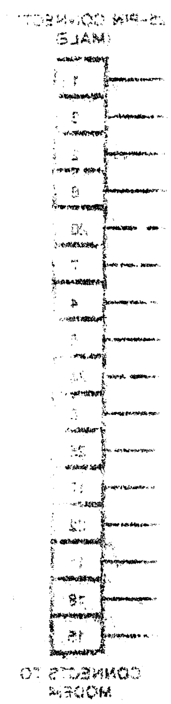
CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
NUL 0	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112
SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113
STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
ETX 3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
EOT 4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116
ENQ 5	NAK 21	% 37	5 53	E 69	U 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



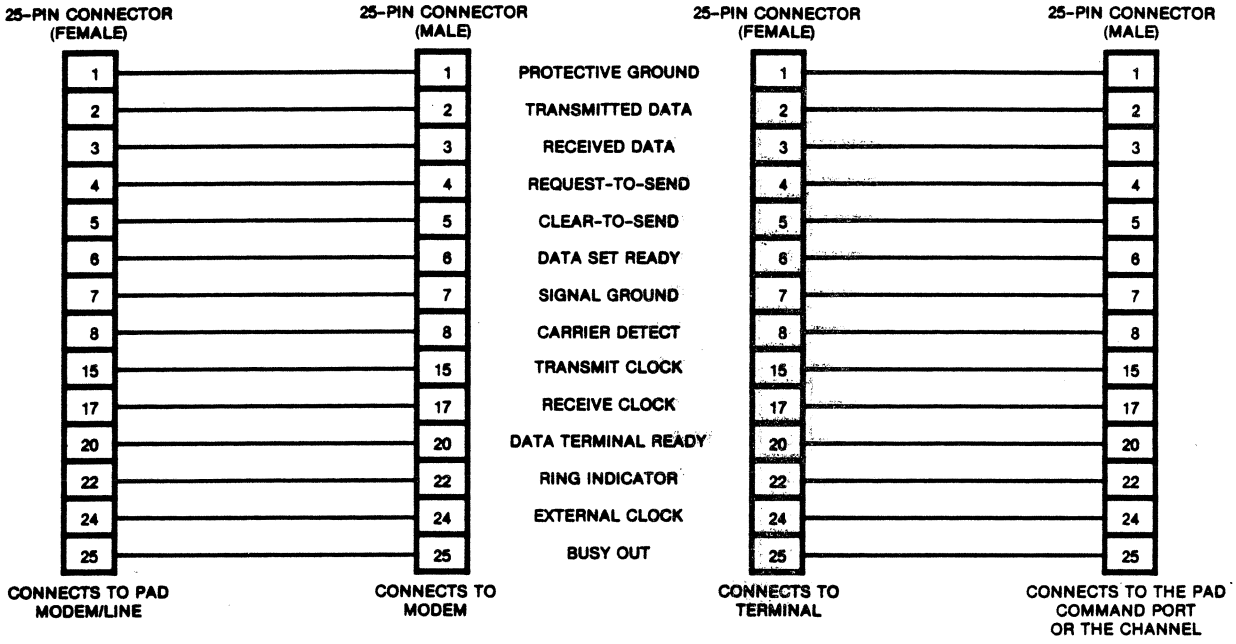
ASCII character
decimal



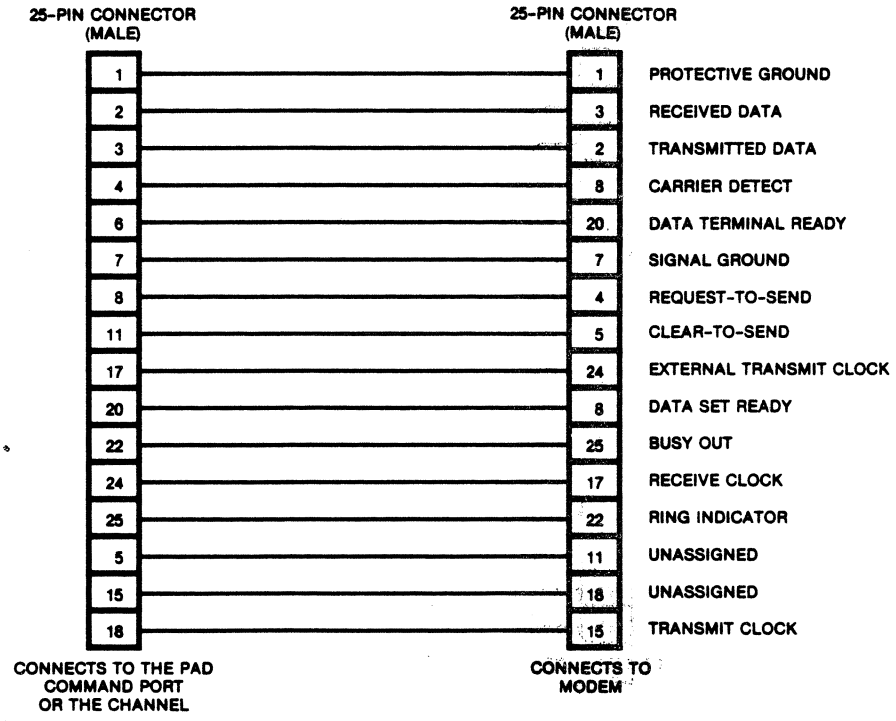


APPENDIX E

STANDARD STRAIGHT CABLE
(MICOM PART NUMBER 100-2200-15)



CROSSOVER CABLE
(MICOM PART NUMBER 100-2219-15)



REFER ALSO TO ¶ 7.2.12

MI-1229/10-09

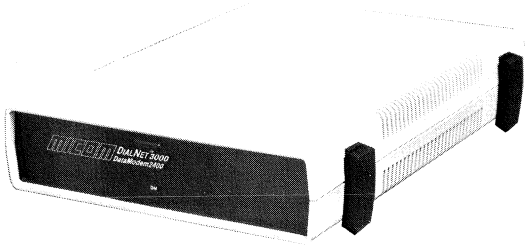
Figure E-1. Cable Circuit Pins

INTERESTED IN OTHER MICOM DATA COMMUNICATIONS PRODUCTS?

Modems

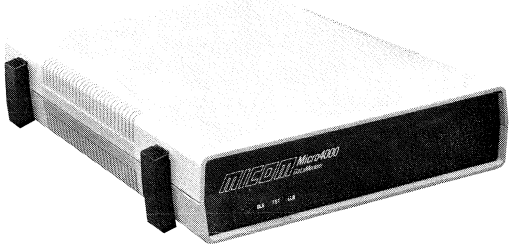
3000 • DIAL NETWORK COMMUNICATIONS

The DIALNET™3000 product line contains very attractively priced modems designed to transmit data effectively over the direct distance dial (DDD) network at speeds of 2400 or 1200 bps. Models are available that are compatible with CCITT V.22 *bis*, Bell 212, Bell 103, or Racal Vadic 3400. All models (except Models M3012TA and M3212TA, which operate in manual answer or auto-answer mode only) operate in a manual originate and an auto-answer mode and are offered in standalone or rack-mount versions. *Plus* series models add auto-dial features.



4000 • HIGH-SPEED COMMUNICATIONS

The Micro4000 Data Modem family is a series of inexpensive data modems operating at speeds from 2400 to 9600 bps. The modems conform fully to CCITT specifications and *all* models are suitable for both multipoint and point-to-point applications. Both 4800 and 9600 bps models feature a *speedshift* fast poll operation. A unique *asynchronous* 2400 bps modem is offered for use with teletype-compatible, "dumb" CRT and printing terminals.



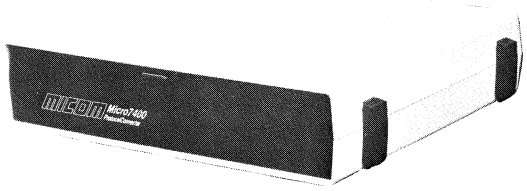
8000 • MULTI-TERMINAL COMMUNICATIONS

The Micro8000 Concentrator Modem is the world's first high-speed modem series with built-in data concentrator and automatic retransmission-on-error. The model range supports from 2 to 16 asynchronous or synchronous terminals and operates at speeds of 2400, 4800, and 9600 bps point-to-point or multipoint, over any standard telephone line. Concentrator PAD models are also offered for access to Packet Data Networks.

Protocol Conversion

7400 • IBM 3270 EMULATION

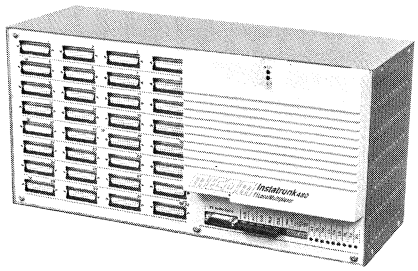
MICOM's Micro7400 is a low-cost substitute for IBM's 3274 Model 61C terminal controller that allows *asynchronous* terminals, printers, teleprinters, and personal computers to be used as IBM 3270-type terminals. The Micro7400 provides asynchronous terminal users with a *gateway* into IBM and provides IBM users with a means of accessing asynchronous devices.



Multiplexing

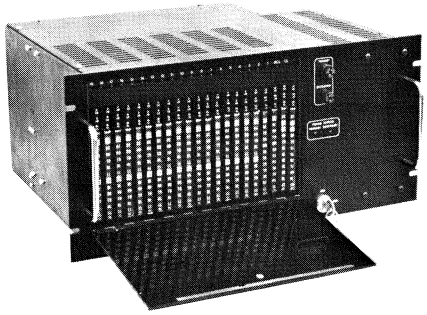
480 • LOCAL MULTIPLEXOR

MICOM's INSTATRUNK™480 T1 Local Multiplexor is a time-division multiplexor with a 1.544 Mpbs bandwidth—which allows it to carry *up to 128 channels, each of which can operate at up to 9600 bps.* Its signal can be transmitted over two twisted wire pairs for a distance of more than 1 mile. And, since the INSTATRUNK multiplexor uses standard T1 format, its signal can also be carried over longer distances by T1 repeaters, microwave links, or telephone company lines.



750 • WIDEBAND MULTIPLEXING

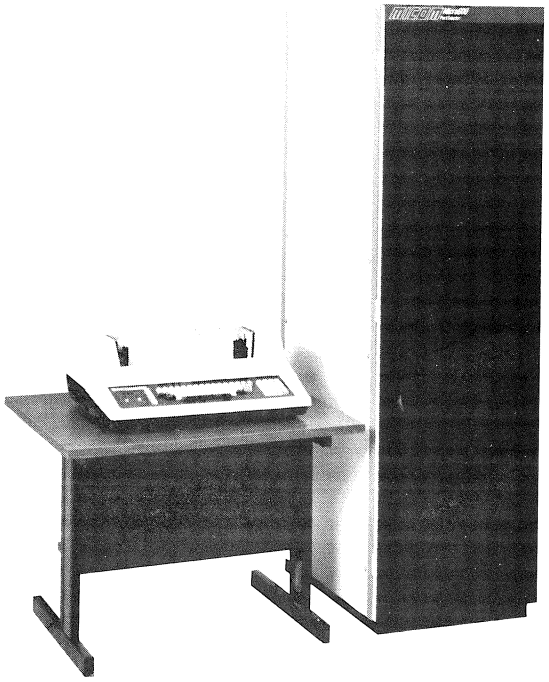
The Micro750 Wideband Multiplexor is a time-division multiplexor (TDM) designed to derive multiple synchronous channels from a single wideband circuit operating at 40.8, 48, 50, 72, or 256 kbps—or a DDS circuit operating at 56 kbps. The Micro750 can also be used to provide speed conversion between 50 and 56 kbps—or any other two wideband rates. EIA RS-232-C (CCITT V.24/V.28), CCITT V.35, Bell 303, CCITT V.11, and EIA RS-449 high-speed composite interfaces are supported.



Network and Switching

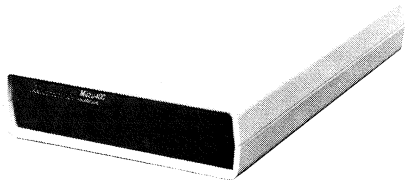
600 • DATA SWITCHING

The Micro600 Port Selector is a data PABX, providing switching capabilities of contention and port selection for up to 1504 asynchronous lines/ports. With its plug-in INSTAMUX and INSTATRUNK multiplexors and Micro800/2 concentrators plus its Interconnect Facility, the Micro600 is the heart of MICOM's INSTANET approach to local networking. (The Micro650 provides a similar capability for up to 126 *synchronous* lines/ports.)



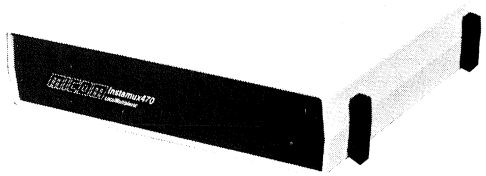
400 • SHORT-HAUL COMMUNICATIONS

The Micro400 Local Dataset family provides low-cost, full-duplex asynchronous or synchronous data transmission over distances up to 20 miles, point-to-point or multipoint. A special *smart* asynchronous model provides dial-up emulation for use with timesharing systems. All synchronous models can be connected directly to a Micro600 Port Selector quad module, providing a very low-cost solution for local data distribution applications. (For example, Model M400/600 is specifically designed for inexpensive terminal-controlled applications with the Micro600.) Local Dataset models are Bell 43401-compatible and operate over telephone company unloaded metallic circuits.



470 • SHORT-HAUL MULTIPLEXING

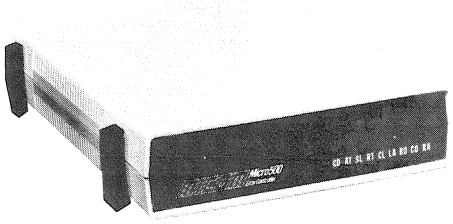
The INSTAMUX™470 is an extremely low cost *multiplexing line driver* which allows up to eight asynchronous terminals to communicate over two twisted pairs of wires at distances of up to 5000 feet. The INSTAMUX™470 is transparent to terminal code and speeds to 19,200 bps. MICOM also offers integral module versions of the INSTAMUX™470 for installation in the Micro600 Port Selector.



Error Control

500 • ERROR-FREE COMMUNICATIONS

The Micro500 Error Controller eliminates transmission errors for teletype-compatible CRT and printing terminals and interactive graphics terminals communicating over telephone lines at speeds to 9600 bps. It also provides *asynchronous-to-synchronous* conversion allowing asynchronous terminals to operate with synchronous modems, and permits *full-duplex* asynchronous interactive terminals to operate with *half-duplex* synchronous modems at 2400 or 4800 bps on the dial network. MICOM offers an error controller with built-in modems (at 2400, 4800, or 9600 bps) called the Micro5000 Intelligent Modem.



460 • DATA/VOICE MULTIPLEXING

The INSTALINK™460 Data/Voice Multiplexor allows simultaneous voice and data transmission utilizing *existing* in-plant telephone wiring. The INSTALINK™460 system consists of data/voice multiplexors at the users' telephones and a central chassis at the telephone PABX equipment room which connects to the user's computer or data PABX. INSTALINK™460 units operate at speeds up to 19,200 bps over distances up to 5000 feet and are *FCC Part 68 registered.*

MICOM®

TELEMATION

Zentrale
TELEMATIONS-Haus
Eschborner Straße 4 · Postfach 1250
D-6242 Kronberg/Ts.
☎ (06173) *6001-0 · Tx 415616 tem d

Regional Sales/Service
Atlanta, GA (404) 435-2999
Boston, MA (617) 527-4010
Chatsworth, CA (818) 998-8844
Chicago, IL (312) 964-0551
Dallas, TX (214) 258-0774
San Francisco, CA (415) 327-0890
St. Louis, MO (314) 576-7626
Teaneck, NJ (201) 836-4000

United Kingdom
MICOM-Borer Ltd.
Bel Court, 15 Cradock Road
Reading, Berkshire RG20JT
Telephone (0734) 886801
Telex 847135

Europe
MICOM Europe
Northbrook House
39 Oxford Street
Newbury, Berkshire RG13IJU
Telephone (0635) 832441
Telex 8461555