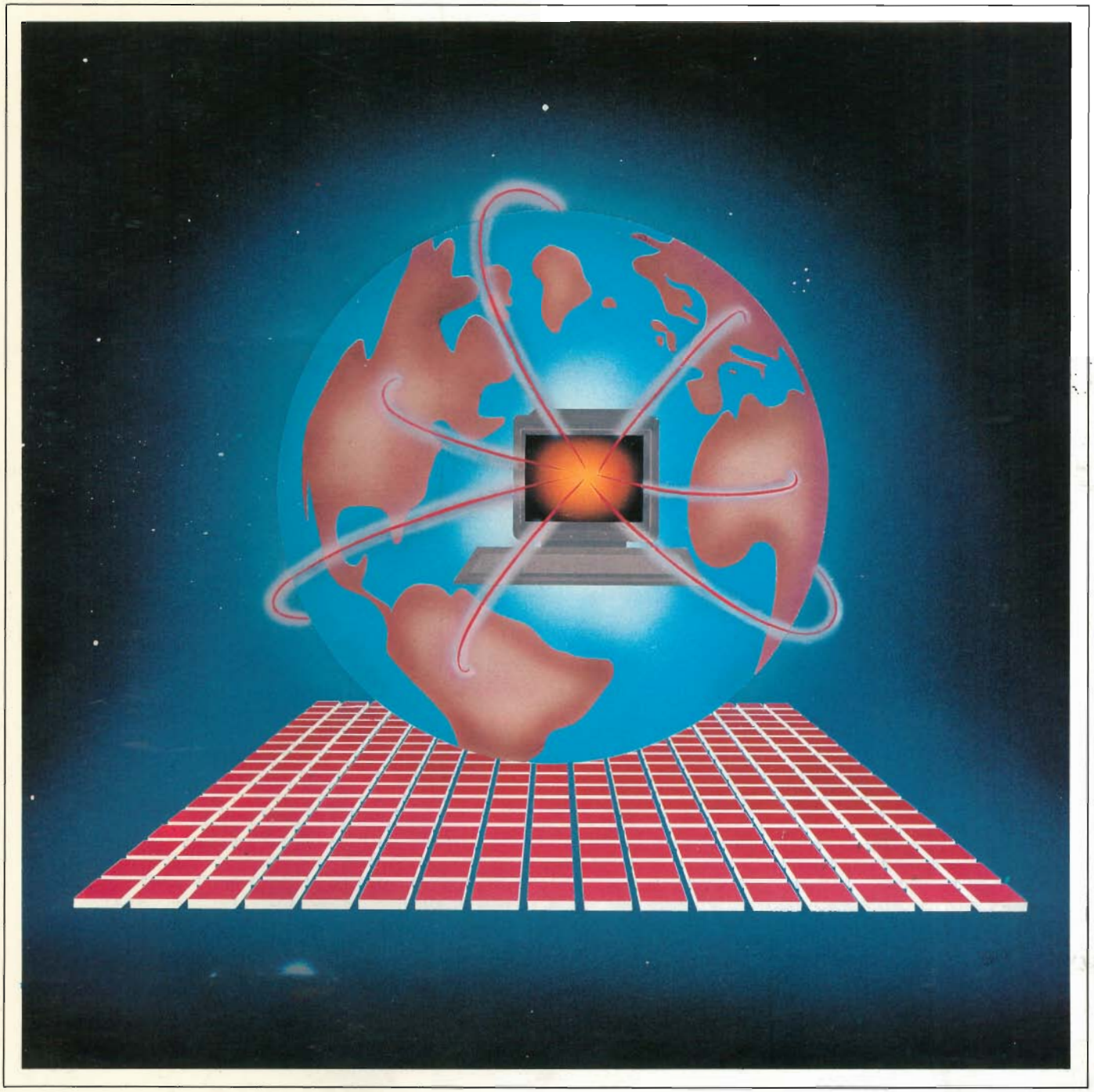
# HP 2334A MULTIMUX

## REFERENCE AND SERVICE MANUAL

HEWLETT PACKARD



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## HP2334A MULTIMUX
### REFERENCE AND SERVICE MANUAL

**02334-90001 December 1984**

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Are the concepts and wording easy to understand? ☐ YES ☐ NO

Is the format of this manual convenient in size, arrangement, and readability? ☐ YES ☐ NO

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# PREFACE

This manual provides all the information necessary to install, configure, operate and service the HP2334A Multimux. It provides the system engineer and programmer with the information required for a wide range of computer system configurations and applications using the HP2334A.

The contents of this manual are arranged as follows:

**Chapter 1. INTRODUCTION** This chapter provides a general description of the HP2334A, its Packet Assembler/Disassembler and statistical multiplexer functions and an introduction to Packet Switching Networks.

**Chapter 2. APPLICATIONS & CONFIGURATIONS** This chapter shows the principal system configurations using the HP2334A and the asynchronous and synchronous connection methods. Information is also provided on interfacing with the HP1000 and HP3000 computers.

**Chapter 3. SITE PREPARATION** This chapter details the required site preparation (environment, cables, etc.) prior to installing the HP2334A.

**Chapter 4. INSTALLATION** This chapter details the complete installation procedure including unpacking, identification, mounting, connection and initial testing of the HP2334A.

**Chapter 5. PSN SUBSCRIPTION** This chapter is intended as a quick reference guide and checklist when subscribing to a Packet Switching Network.

**Chapter 6. CONFIGURATION** This chapter provides all the information necessary to configure the HP2334A with the synchronous communication protocol parameters, the asynchronous (device) port profiles and the required facilities.

**Chapter 7. OPERATION** This chapter describes how to operate the HP2334A, make and clear a connection and provides user troubleshooting information.

**Chapter 8. USING THE TEST PORT** This chapter describes how to access the HP2334A test port, reconfigure the unit on-line, obtain line statistics and perform communications testing and a remote reset.

**Chapter 9. DETAILED PRODUCT DESCRIPTION** This chapter provides a detailed description of the HP2334A hardware, firmware and internal architecture.

**Chapter 10. DETAILED THEORY OF OPERATION** This chapter describes the HP2334A operation to block diagram/component level.

**Chapter 11. ROUTINE MAINTENANCE** This chapter describes the HP2334A routine maintenance.

**Chapter 12. POWER SUPPLY VOLTAGE & FUSE CHECKING** This chapter describes how to check the HP2334A d.c. power supply voltages and line fuses.

**Chapter 13. DEVICE INTERFACE/ADAPTER CARD INSTALLATION** This chapter describes how to install the Device Interface and Adapter Cards and upgrade the HP2334A for modem control operation.

**Chapter 14. TROUBLESHOOTING** This chapter provides all the information necessary to find and rectify suspected faults on the HP2334A.

**Chapter 15. REMOVAL & REPLACEMENT PROCEDURES** This chapter details the removal and replacement procedures for all the HP2334A hardware components.

**Chapter 16. REPLACEMENT PARTS & MODULES** This chapter provides information on ordering parts and the part numbers of all replaceable components.

**Appendix A. CONFIGURATION RECORD** This appendix is provided for the user to keep a written record of the HP2334A configuration.

**Appendix B. HP2334A/CCITT X.25 COMPARISON** This appendix provides a comparison between the implementation of X.25 (at Level 3) in the HP2334A and the CCITT X.25 Recommendation.

**Appendix C. PSN INTERNATIONAL NUMBERING PLAN** This appendix provides details of the national and international addressing of public Packet Switching Networks.

**Appendix D. ASCII CHARACTER SET** This appendix provides the complete ASCII Character Set or International Alphabet #5.

**Appendix E. REFERENCE DOCUMENTATION** This appendix is provided as a brief guide to other reference documentation.

**Appendix F. GLOSSARY OF TERMS & ABBREVIATIONS**

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# ROM HISTORY

| DATE | COMPONENT | PART NUMBER |
|---|---|---|
| | CPU PCA: | |
| December 1984 | ROM 0 | 02334-80300 |
| | ROM 1 | 02334-80310 |
| | ROM 2 | 02334-80320 |
| | ROM 3 | 02334-80330 |
| | DMA | 1820-2299 |
| June 1985 | ROM 0 | 02334-80300 |
| | ROM 1 | 02334-80311 |
| | ROM 2 | 02334-80320 |
| | ROM 3 | 02334-80330 |
| | DMA | 1820-2299 |
| September 1985 | ROM 0 | 02334-80300 |
| | ROM 1 | 02334-80312 |
| | ROM 2 | 02334-80320 |
| | ROM 3 | 02334-80330 |
| | DMA | 1820-2299 |
| | DEVICE INTERFACE CARD: | |
| December 1984 | ROM 0 | 5180-2039 |
| | ROM 1 | 5180-2040 |
| February 1985 | ROM 0 | 5180-2055 |
| | ROM 1 | 5180-2056 |
| June 1985 | ROM 0 | 5180-2058 |
| | ROM 1 | 5180-2059 |

# INTRODUCTION

CHAPTER 1

## 1.1 INTRODUCTION

The HP2334A Multimux allows up to 16 asynchronous, character mode, RS-232-C, point-to-point devices (such as terminals, personal computers, printers, plotters, etc.) to communicate with a remote HP1000, HP3000 or any other computer system supporting PADs (Packet Assembler/Disassembler). The HP2334A also provides a Computer Access Support (CAS) facility enabling the asynchronous point-to-point ports of non- X.25 host computers to be accessed through a Packet Switching Network (PSN). Asynchronous devices connected to an HP2334A can communicate simultaneously over a PSN to multiple remote computer systems or via a direct modem (or modem eliminator) link to a remote computer system.

The HP2334A to remote computer system link (PSN or modem) is generally referred to as the synchronous network throughout this manual. The communication (and PSN access) across the synchronous network is in synchronous, packet mode format complying with the protocols defined in the CCITT X.25 Recommendation (see Section 1.2).

The HP2334A incorporates statistical multiplexer and PAD (Packet Assembler/ Disassembler) functions and it allows the connected asynchronous devices to both receive and originate calls over a PSN.

As each HP2334A requires only one PSN interface and can simultaneously connect up to 16 devices, PSN subscription costs can be substantially reduced.

## 1.2 PSN DESCRIPTION

A Packet Switching Network (PSN) is a telecommunications-system that can be privately owned or a public service. A public PSN is a type of Public Data Network (PDN) and is also known as a Value Added Network (VAN). Examples of PSNs are TELENET and TYMNET in the U.S., PSS in the U.K., DATANET 1 in Holland, DATEX-P in Germany and TRANSPAC in France. These and other nationwide public PSNs are linked via international "gateways" to provide connections between PSNs throughout the world.

A PSN consists of many geographically dispersed, high speed switching centers (known as switching nodes) which dynamically route data "traffic" along the path (or "virtual circuit") that is most likely to minimize the overall transmission time (see Figure 1-1). Should a path become congested or fail, then the data is automatically rerouted. PSNs also perform error checking, with automatic retransmission if any data corruption occurs.

Within the PSN, the data is transmitted in "packets" each of which has a header providing control and address information. The data packets from many users are dynamically interleaved over shared network facilities and routed to their destinations. This enables PSNs to offer a very fast store and forward response time and give precedence to high priority data.

X.25 is the name of the CCITT (Consultative Committee on International Telephone and Telegraph) Recommendation for the interface protocol used to access a PSN. It does not define how PSNs should operate, but is part of a "layered structure" that includes other recommendations such as the X.3, X.21 bis, X.28 and X.29 Recommendations.

Data Terminal Equipment (DTE) such as computers and programmable terminal controllers may be connected directly to the network using point-to-point synchronous circuits and the X.25 protocol (see Figure 1-1).

DTEs not capable of implementing this protocol, such as workstations, personal computers, printers, etc., must be connected to the network through a Packet Assembler/Disassembler (PAD). The PAD forms packets from the asynchronous data from the terminals and sends them over the network to the appropriate destination using additional, higher level protocols (X.3, X.28, X.29).

For further details on PSNs and the X.25 Recommendation refer to the HP publication "X.25: The PSN Connection", part number: 5958-3402. It should be noted that as far as the HP2334A is concerned, the PSN is a "black box" and its internal operation can be ignored by the general user.

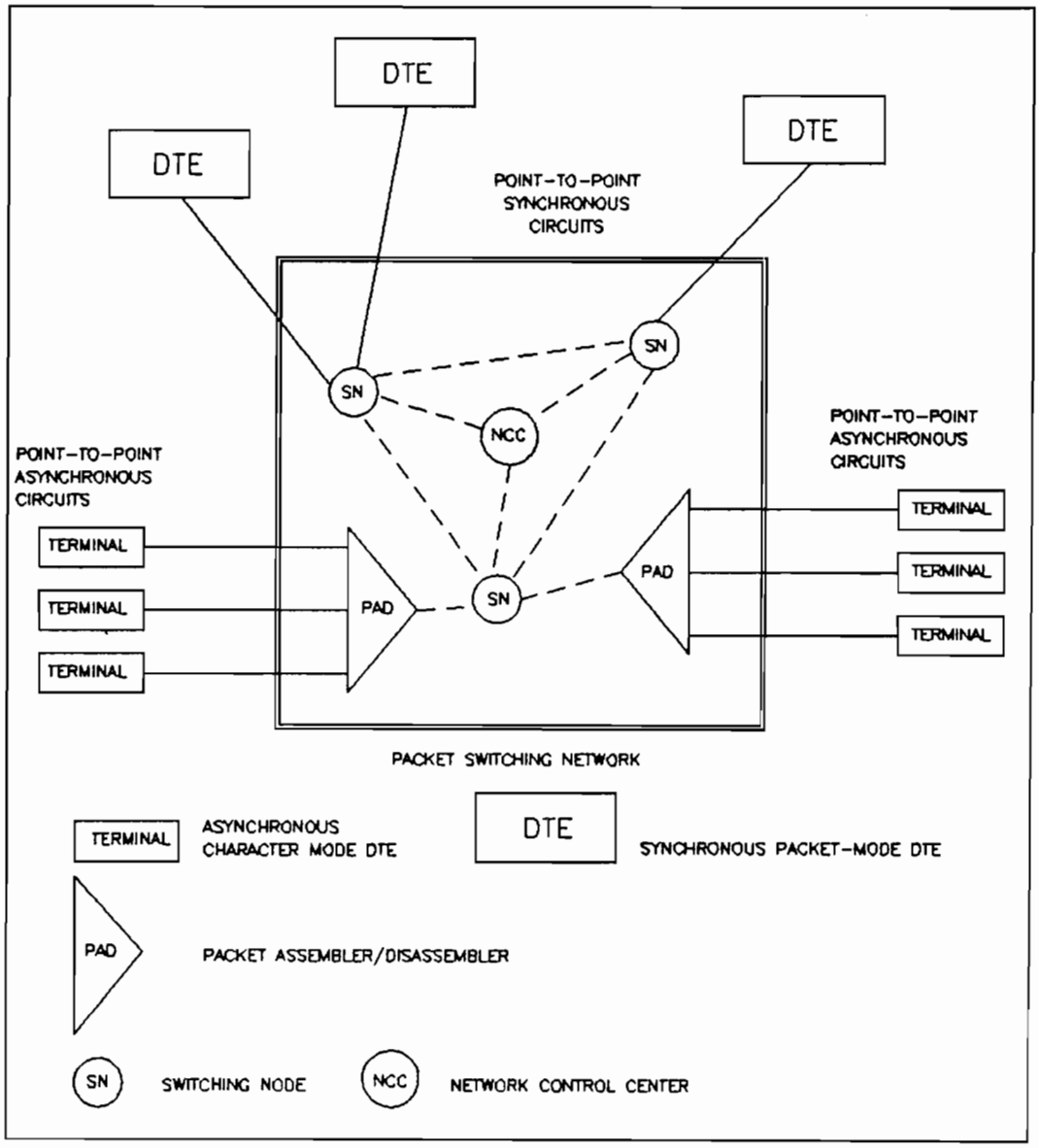



**Figure 1-1 Packet Switching Network**

## 1.2.1 PSN Advantages

Packet switching technology makes Value Added Networks (VANs) a significant departure from the alternative data transmission services (leased and dial-up telephone lines) currently available.

The alternatives are based on providing a physical data channel of dedicated bandwidth which may be permanently leased as a private line or periodically accessed as a switched (dial-up) line. Because the bandwidth is reserved whether or not data is being transmitted these services are often utilized inefficiently. For example, in terminal applications where there is no concentration of data, line usage may average at only 5-10% of the connection time.

In packet switching, bandwidth is only allocated (and charged for !) when a user is actively transmitting data. PSNs can also provide for connection between multiple host computers and multiple sites, whereas leased or dial-up telephone lines (using modem links) can only connect one host to one site.

PSNs are a cheaper alternative to leased or dial-up lines for "middle of the range" data volumes, as charges are normally based on a flat monthly connection fee plus incremental charges based mainly on the volume of data. Thus the charges are independent of transmission time (except when connected to the PAD of a public PSN; see Section 1.3) and distance.

Like public telephone networks, the use of public packet switching networks is open to any organization willing to pay the appropriate monthly connection and traffic usage charges. Hence, unlike private networks where the entire cost of the network is absorbed by one organization, the facilities and associated costs are shared among a large number of independent users. The resulting economies of sharing transmission facilities combined with the inherent higher line utilization enable significantly lower communications costs to be offered to a large segment of users.

Other benefits include:

- Communications interconnection flexibility.
- Accuracy.
- Reliability.
- Heterogeneous computer connections.

## 1.3 PAD DESCRIPTION

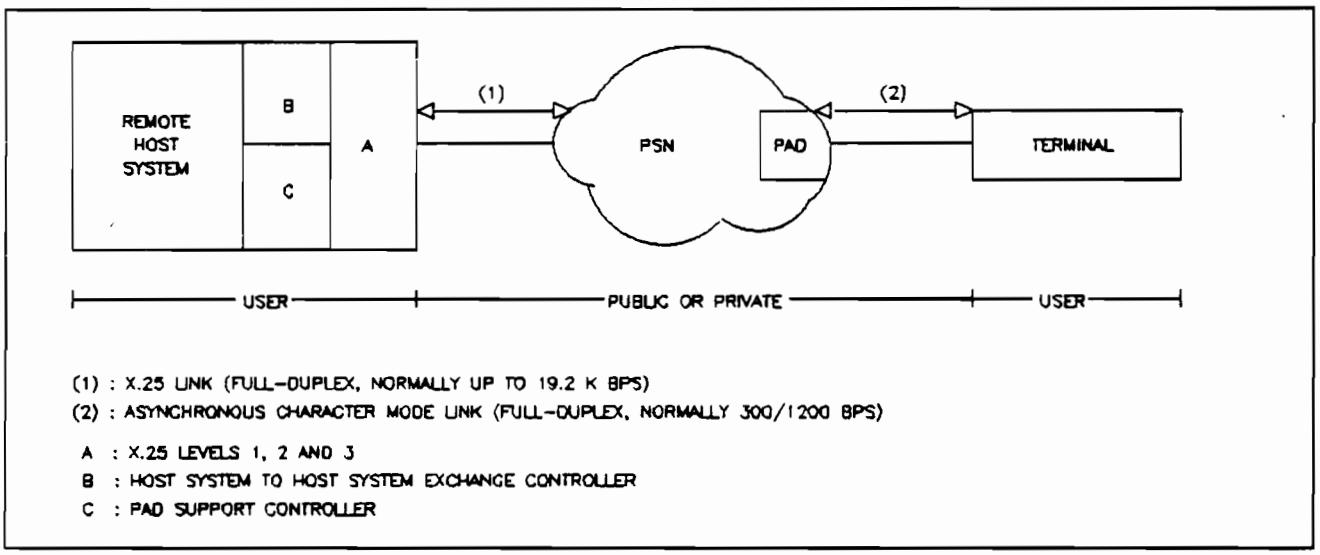



**Figure 1-2 Public PAD Connection**

A PAD (Packet Assembler/Disassembler) is needed to provide an interface between the operating mode of an asynchronous terminal and the X.25 protocol used to access a PSN.

The PAD responds to signals from the terminal requiring connection (switched virtual circuit) or disconnection across the PSN and will generate the appropriate Call Set up and Clear Request packets to establish/terminate communication.

Once a virtual circuit has been established the PAD accumulates data characters coming from the terminal and assembles them into X.25 data packets for transmission across the PSN to the remote DTE. Conversely, the PAD disassembles X.25 data packets coming from the remote DTE, via the PSN, into a character stream for transmission to the terminal.

The PAD's operating mode is under the control of a specific set of parameters (X.3). These parameters define specific characteristics of the terminals (devices) or actions that the remote DTE wants the PAD to perform on receipt of particular input (e.g. a BREAK) from the terminal.

Any complete set of PAD parameter values is called a "PAD profile". After an initial PAD profile has been set, PAD parameter values may be changed with PAD commands from either the remote DTE (X.29 commands) or the local terminal (X.28 commands), as shown in Figure 1-3.

For asynchronous terminal connection, the PAD normally resides in the PSN and may be considered as the means of access to the PSN. However, the baud rate is generally low with this type of connection (normally 300 to 1200 baud) and the terminal may only originate calls, not receive them.

The alternative is to connect asynchronous devices (e.g. terminals, printers, plotters, etc.) to a PSN via an external private PAD. This type of connection offers many advantages including a high baud rate (up to 9600 baud between the asynchronous device and the PAD; up to 19200 baud between the PAD and the PSN) and the ability to originate and receive calls (important for printers and plotters).

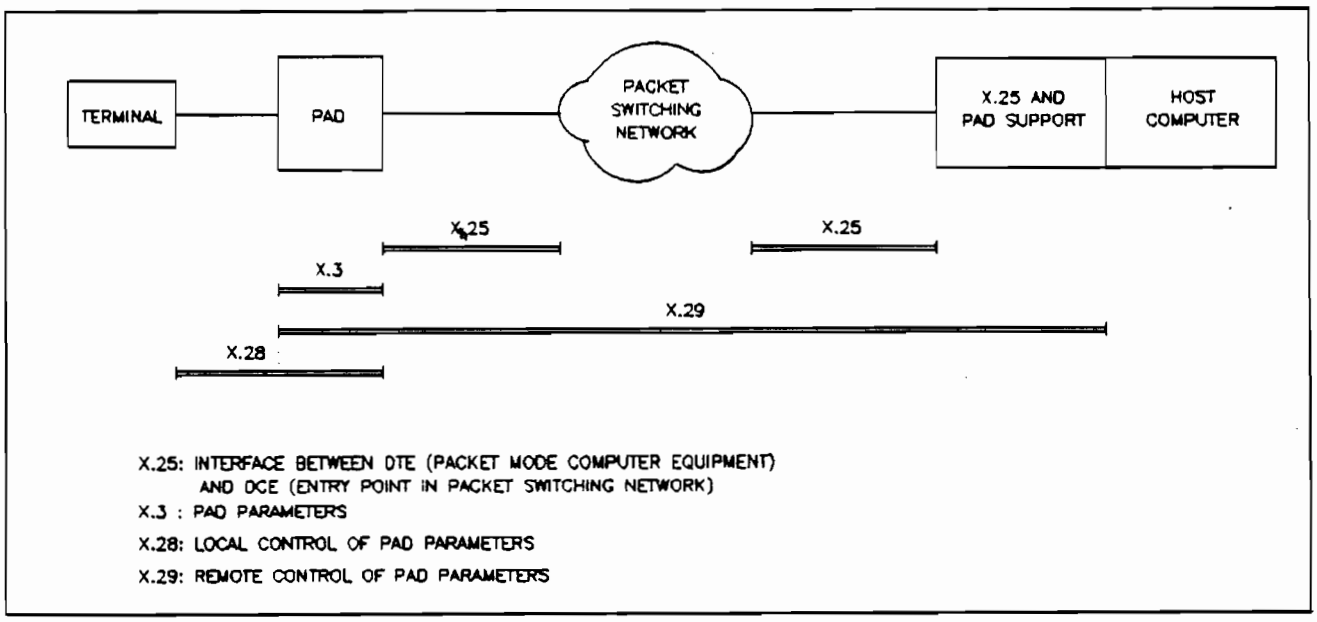



**Figure 1-3 PAD Related CCITT Recommendations**

## 1.4 STATISTICAL MULTIPLEXER DESCRIPTION

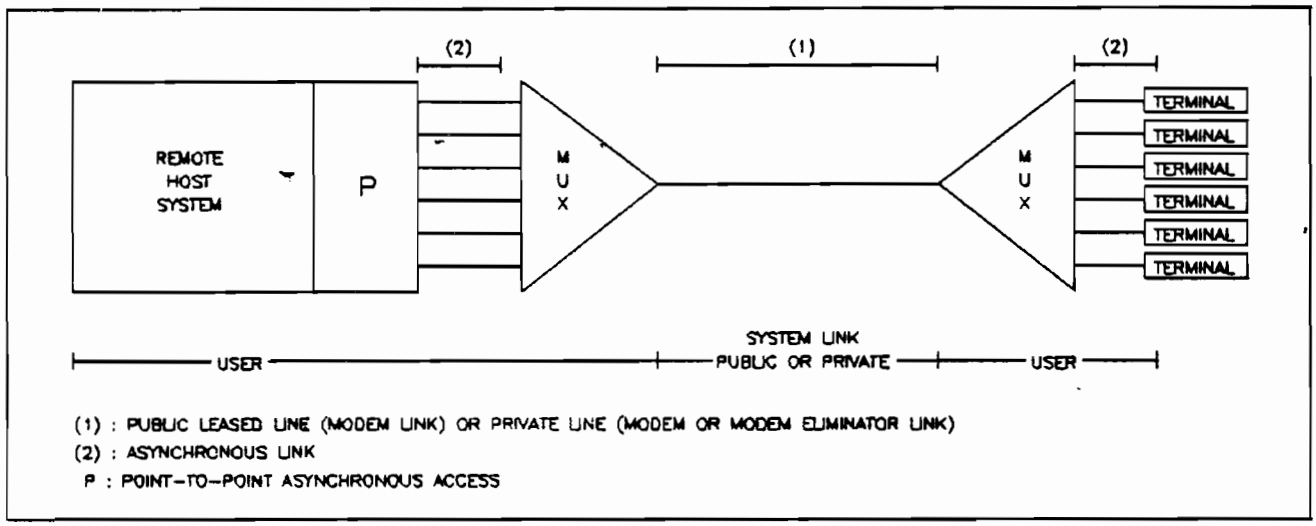



**Figure 1-4 Statistical Multiplexer Connection**

A statistical multiplexer is used to lower the cost of terminal connection to a computer system. It combines (muxes) multiple data paths into one physical path consisting of logically discrete data streams. Conversely, it separates (demuxes) the combined stream back into individual data paths.

The statistical multiplexer allocates portions of the high speed link only to terminals actually transmitting data, thus allowing a more efficient use of the link, and a larger number of terminals to be connected to it.

## 1.5 THE HP2334A SOLUTION

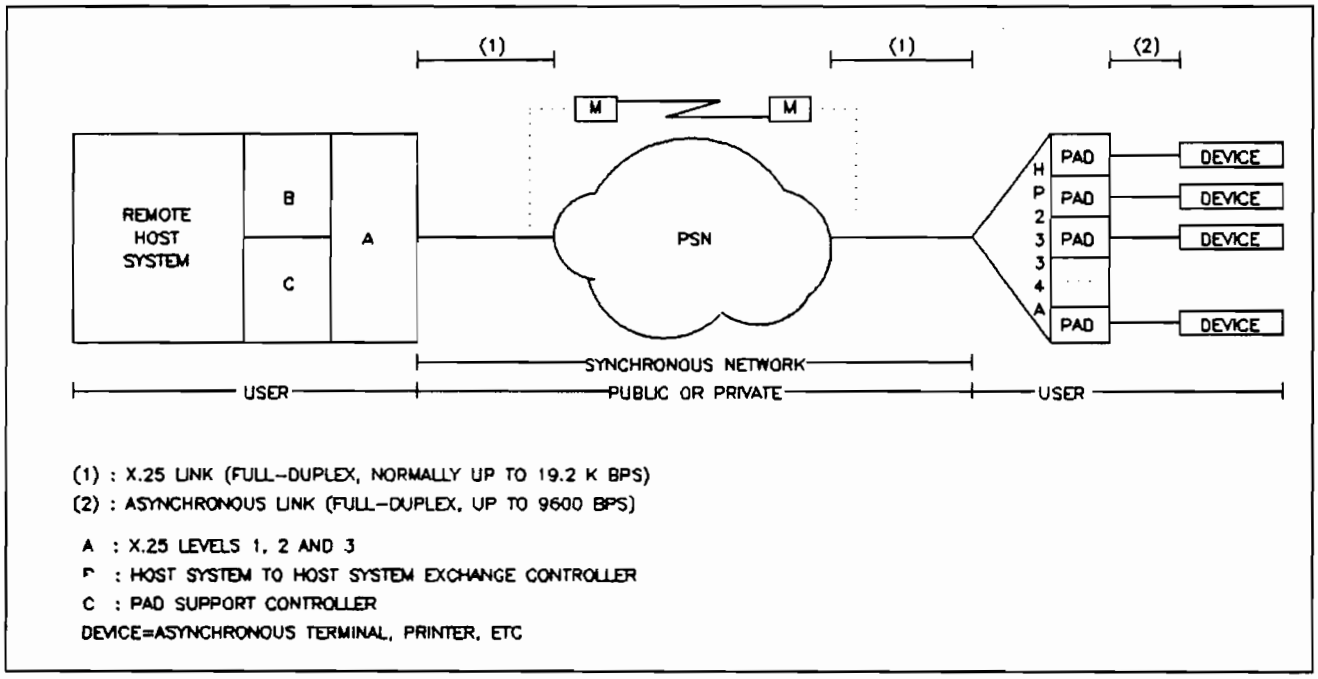



**Figure 1-5 HP2334A - X.25 Cluster Controller Configuration**

For asynchronous devices (such as terminals and printers), the HP2334A operates as an external private PAD, communicating across the synchronous network (PSN) using X.25 synchronous protocols and with the devices using the RS-232-C asynchronous protocol. For most applications the HP2334A/synchronous network (PSN) data communication link is entirely transparent to the local device which responds as if it is communicating directly with the remote host computer.

The HP2334A both increases the line speeds/data throughput (up to 19,200 bps on the X.25 line and 9,600 bps on the device lines) and reduces the connection cost for each device.

The HP2334A combines in one product all the advantages of a private PAD and a statistical multiplexer:

- Direct connection of up to 16 point-to-point asynchronous devices to a PSN.
- Multiple,selectable host system connections.
- Single connection to the PSN.
- Statistical data sharing on the host computer connection.
- High terminal connection baud rate.
- Capability to receive calls (important for printers).
- Lower connection costs per device.

## Additional Capabilities

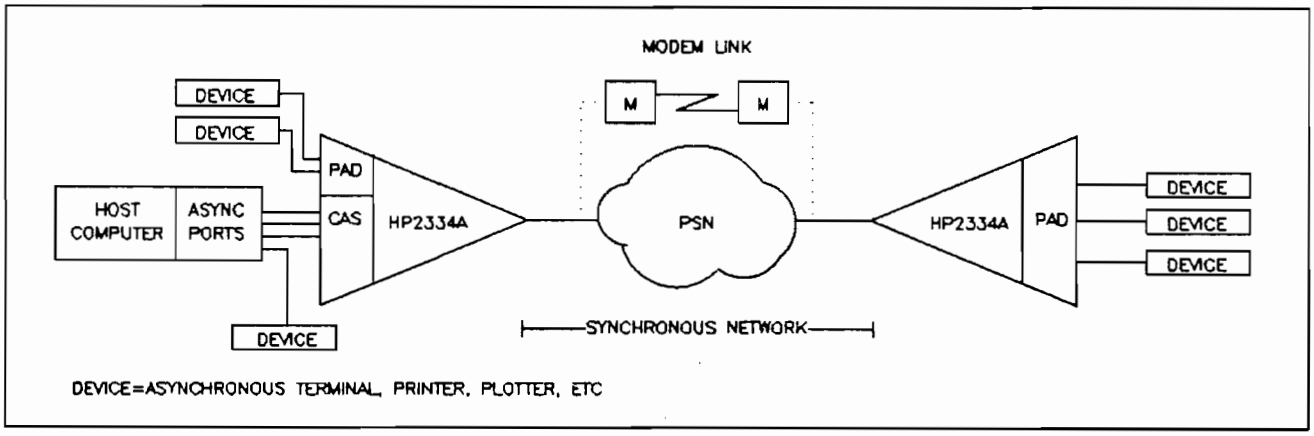



**Figure 1-6 HP2334A Computer Access Support**

For computer systems which are not X.25-compatible, the HP2334A offers a CAS (Computer Access Support) facility. For a PSN (synchronous network), the HP2334A acts as an external PAD, communicating across the network using X.25 protocols. On the host computer side, the HP2334A simulates a terminal (using asynchronous RS-232-C protocol); so the local host computer system assumes that it is communicating directly with the remote terminal(s), and not via the HP2334A and PSN (synchronous network).

Figure 1-6 shows the HP2334A capability to provide CAS in parallel with the PAD function.

The CAS feature allows the access to computer point-to-point asynchronous ports to be shared and to be connected to many terminals calling from a PAD (public or private). The transparency of the data communication link depends on the type of application and the PAD. Using another HP2334A as a remote, private PAD (as shown above) will always provide the maximum transparency for any given application.

The CAS feature is important for both non-X.25 computer system and personal computer data communication.

HP2334A additional capabilities include:

- Computer Access Support (CAS).
- Support of all CCITT X.3 parameters plus additional HP proprietary PAD parameters.
- User defined PAD profiles.
- Flow control flexibility (X-ON/X-OFF, ENQ/ACK or no handshake).
- Symbolic name addressing of the remote host computer allowing simple user access.
- Automatic dial and port disable facilities.
- Reverse charging request and acceptance.
- User defined private user group suppresses the need to use a costly subscribed PSN closed user group facility.
- Statistical information on X.25 data transfer accuracy.
- Configurations held in non-volatile RAM enabling automatic recovery from power failure and unattended operation.

## 1.6 HP2334 GENERAL DESCRIPTION

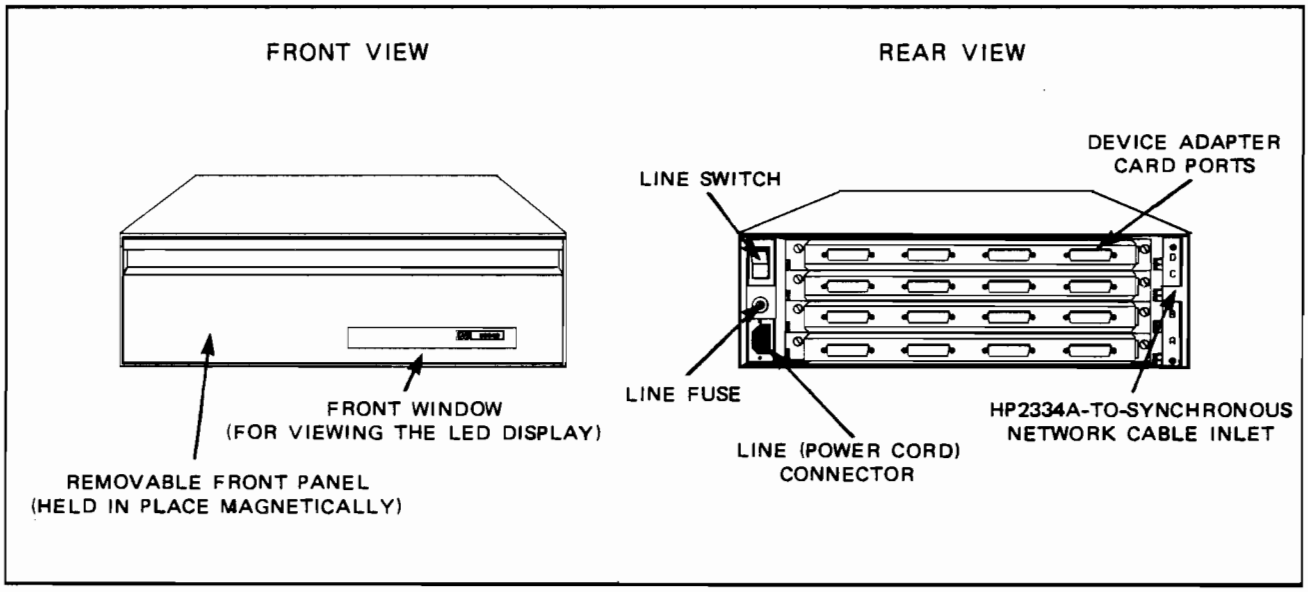



**Figure 1-7 HP2334A Multimux**

The HP2334A Multimux is housed in a cabinet which can be used "stand alone" or rack mounted.

At the front of the unit is a removable panel which is held in place magnetically and which contains a plastic window to give view to 21 LED status indicators (see Fig. 1-7). Removing the front panel gives access to the synchronous network connector port and the eight DIP switches (used for selecting the operating mode and self-tests), LEDs and reset push-button mounted on the CPU Card (see Fig. 1-8).

At the rear of the unit are the line (power cord) connector, switch and fuse together with up to 16 asynchronous RS-232-C device ports (incremented in modules of 4 ports per Device Adapter Card). The device ports are labeled as follows:

| Port # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 |

When the HP2334A is supplied with less than 4 Device Adapter Cards, blanking panels are fitted to cover the unused card slot positions.

Removing the fitted Device Adapter Cards and blanking panels gives access to the Voltage Selection Compartment and Device Interface Cards (see Fig. 1-8).

The HP2334A-to-synchronous network connecting cable enters the unit through an aperture at the rear and is routed to its connector at the front (accessed by removing the front panel).

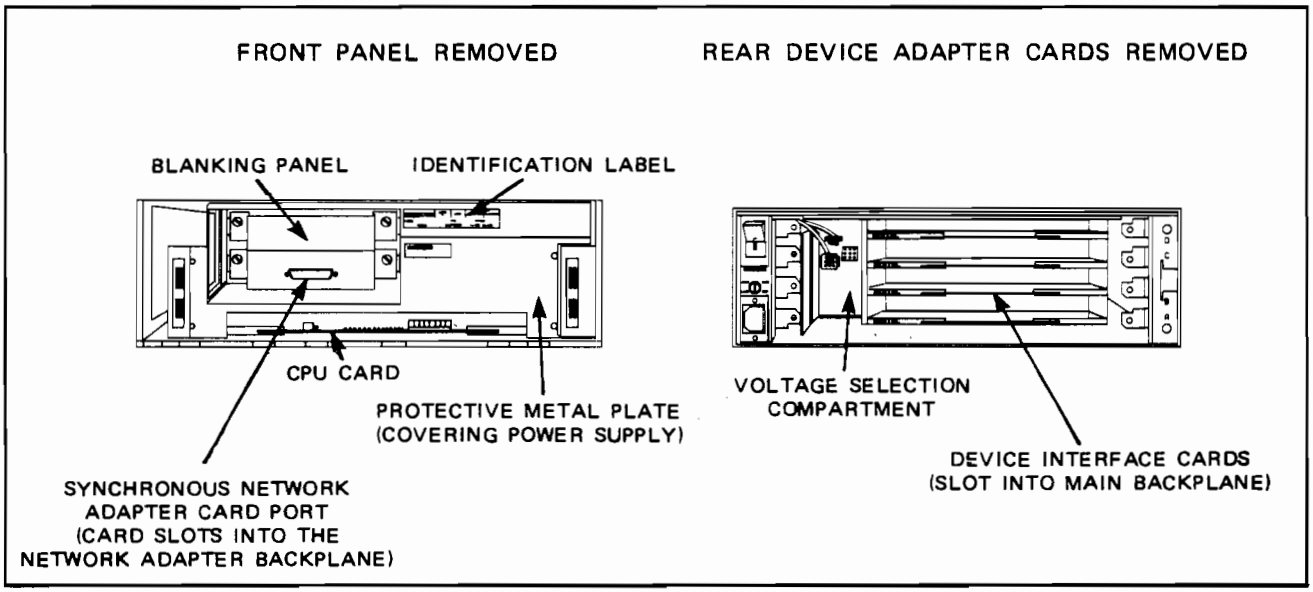



**Figure 1-8 HP2334A With Front Panel And Rear Cards/Panels Removed**

## 1.6.1 Operation

The HP2334A is an automatic unit providing interfacing between the connected asynchronous devices and any public/private synchronous network (PSN or modem link) employing the X.25 protocols.

It does not require an operator but must initially be configured with the synchronous network and asynchronous device(s)' communication parameters (e.g. baud rate, window size etc.). The communication parameters are stored in permanent (non-volatile) memory and are retained if the power supply is switched OFF.

For detailed information on how to configure the HP2334A with these parameters refer to Chapter 6.

The device communication parameters may be subsequently changed from a local or remote device as described in Chapter 7.

## 1.6.2 Architecture

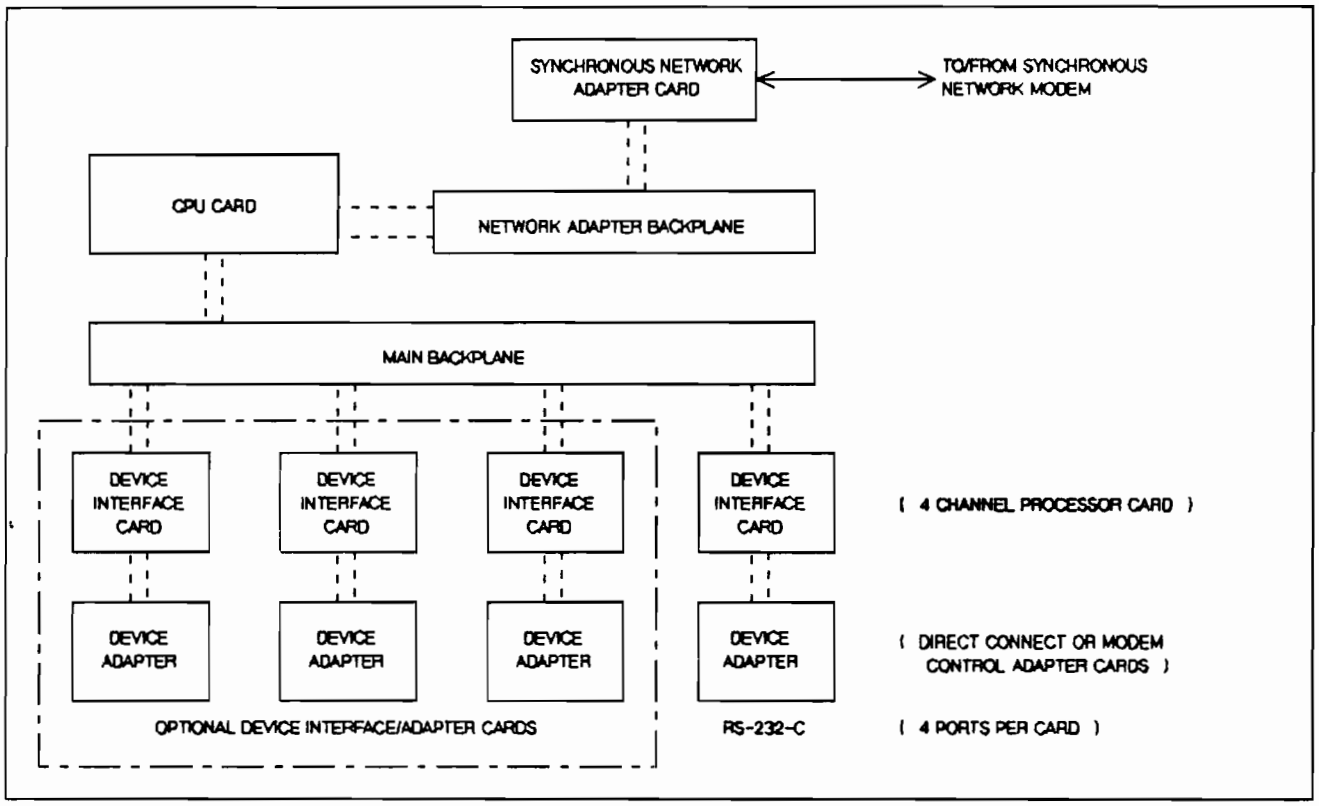



**Figure 1-9 HP2334A Internal Architecture**

The HP2334A internal architecture is shown in Figure 1-9; it comprises:

- A Synchronous Network Adapter Card which is connected via its backplane to:
- the CPU Card.
- A Main Backplane connecting the CPU Card to up to four Device Interface (4 Channel Processor) Cards. (The main backplane also serves the power supply and the fan.)
- Up to four Device Adapter Cards, each one connected to its associated Device Interface Card and offering four RS-232-C ports for asynchronous device connection.

  The Device Adapter Cards may be either the standard Direct Connect Adapter Card or the Modem Control Adapter Card when additional modem control signals are required (see Section 1.7).

**Synchronous Network Adapter Card.** Fitted with one RS-232-C connector, this card is connected directly to the synchronous network (PSN or modem link) and provides an interface between the network and the HP2334A. Operating at speeds of up to 19.2k bps it provides synchronous communication using the X.25 protocols and must be connected to the synchronous network via a full duplex synchronous modem. It is accessible and slides into the unit from the front (front panel removed), connecting with the Network Adapter Backplane.

**CPU Card.** The CPU Card controls the operation of the HP2334A, managing the X.25 protocols, the transfer of data and internal data buffering. Mounted on the CPU Card are:

- A Reset push-button switch that is used to effect a change in the HP2334A operating mode (selected using the DIP switches) and simulate a power-on condition to initialize the HP2334A.
- 21 LED indicators which provide status, self test and diagnostic information and which may also be used to monitor the HP2334A data communication.
- 8 DIP switches that are used to select the HP2334A operating mode (e.g. Configure mode, Run mode, etc.), the self tests and the diagnostic and status information which is displayed on the 21 LEDs. To test these switches refer to Section 4.9.

The CPU Card is accessible and slides into the unit from the front (front panel removed), connecting with the Main Backplane.

**Device Interface Card(s).** (i.e. 4 Channel Processor Card) Each Device Interface Card drives up to 4 channels, controlling the timing and software handshake to each asynchronous device (or computer port) and assembling /disassembling blocks of data. It interfaces the signals from its associated Device Adapter Card into one slot of the Main Backplane.

Each Device Interface Card is accessible and slides into the unit from the rear (Device Adapter Card removed), connecting with the Main Backplane and its associated Device Adapter Card.

**Device Adapter Card(s).** (i.e. Direct Connect Adapter Card or Modem Control Adapter Card) Each Device Adapter Card offers four RS-232-C connectors and provides an interface between the connected asynchronous devices (or computer ports) and the HP2334A.

The Device Adapter Cards are screw mounted at the rear of the unit and each card connects internally with its associated Device Interface Card.

For information on the applications of the Direct Connect Adapter and Modem Control Adapter Cards refer to Section 1.7.

# 1.7 TYPICAL CONNECTIONS

The HP2334A provides one RS-232-C port for connection to the synchronous network and up to 16 RS-232-C ports for asynchronous connections.

### SYNCHRONOUS NETWORK CONNECTION

The HP2334A is connected to a PSN through a full-duplex synchronous modem which is normally installed and supported by the PSN. The Synchronous Network Adapter Card is connected to the PSN modem using the RS-232-C cable supplied with the HP2334A. The HP2334A-to-modem link conforms with the CCITT X.21bis Recommendation while the communication protocols used are those defined in the X.25 Recommendation (for accessing a PSN).

Alternatively, the HP2334A can communicate with a remote host computer system over a synchronous network comprising a pair of full-duplex synchronous modems connected via a leased, switched or digital line. In this case the telephone line quality MUST match that required by the modems.

For cabling information refer to Section 3.5 and for details of the Synchronous Network Adapter Card signals refer to Section 4.10. For examples of HP2334A synchronous connections refer to Chapter 2.

### ASYNCHRONOUS CONNECTIONS

The HP2334A can accommodate up to four Device Adapter Cards, with each card offering four ports for connecting (up to 4) asynchronous devices/computer ports.

Up to 16 asynchronous, RS-232-C, point-to-point devices such as terminals, personal computers, printers, plotters, etc. may be connected directly, or via asynchronous modems, to the HP2334A. For cabling information refer to Section 3.5.

The HP2334A enables a non-X.25 computer system to be connected to a PSN (or any synchronous network which supports X.25 protocols) by connecting its asynchronous ports to the asynchronous ports of the HP2334A. Using the CAS (Computer Access Support) facility, the HP2334A emulates a terminal for the host computer and provides the X.25 interface for the synchronous network.

In this case, the HP2334A must be configured with a special CAS/PAD profile and all the remote terminals (or devices) requiring computer access must be connected to the synchronous network through a PAD (preferably another HP2334A).

For further information on CAS and HP2334A asynchronous connections refer to the following subsection and Chapters 2 and 6.

## 1.7.1 Device Adapter Cards

The HP2334A offers two types of Device Adapter Card and may be supplied fitted with either type or a combination of both, according to the Options ordered (see Table 1-2).

Each Device Adapter Card is connected to the unit's main backplane via its associated Device Interface Card (i.e. the 4 Channel Processor Card) which is included as part of the ordered Option(s). The device adapter/interface cards can also be ordered as add-ons to an installed HP2334A (see Table 1-2). Refer to Chapter 13 for Device Interface and Adapter Card installation information.

The two Device Adapter Cards are as follows:

- Direct Connect Adapter Card
- Modem Control Adapter Card

Both of the Device Adapter Cards are fitted with four 25 pin female connectors (sub D type ISO 2110) and all signals comply with the EIA RS-232-C and CCITT V.24/V.28 Recommendations. Refer to Section 4.10 for details of the signals and connector pin functions for each card.

The Direct Connect Adapter Card uses only the transmit and receive data lines and does not support any of the control signals specified in the CCITT V.24 Recommendation.

The Modem Control Adapter Card supports the transmit and receive data signals plus the 5 main control signals specified in the CCITT V.24 Recommendation.

The two cards are interchangeable for applications that do not require modem control signals (if modem behavior is disabled). For applications that require control signals the Modem Control Adapter Card should be used (see Table 1-1).

<table>
<tr><th>APPLICATION / FACILITY AND CONNECTION METHOD</th><th>HP2334A ASYNCHRONOUS PORT CONFIGURATION</th><th>DEVICE ADAPTER CARD TO BE USED:</th></tr>
<tr><td>Direct connection of asynchronous devices. (terminals,printers etc)</td><td>PAD</td><td>DIRECT CONNECT ADAPTER<br>or<br>MODEM CONTROL ADAPTER</td></tr>
<tr><td>Direct connection of computer (HP1000,HP3000 with PVCs) async ports.</td><td>CAS</td><td>DIRECT CONNECT ADAPTER<br>or<br>MODEM CONTROL ADAPTER</td></tr>
<tr><td>Connection of asynchronous devices via a modem link.</td><td rowspan="2">PAD</td><td rowspan="3">MODEM CONTROL ADAPTER</td></tr>
<tr><td>Connection of asynchronous devices via data module & PBX.</td></tr>
<tr><td>Direct/modem connection of computer (HP3000 with SVCs) async ports.</td><td>CAS</td></tr>
</table>

**Table 1-1 HP2334A Device Adapter Cards**

## 1.8 NETWORK COMPATIBILITY

The HP2334A is certified for use (December '84) with the following public PSNs:

| | | |
|---|---|---|
| TELENET | - | U.S.A. |
| UNINET | - | U.S.A. |
| TYMNET | - | U.S.A. |
| TRANSPAC | - | France |
| DATEX-P | - | Germany |
| PSS | - | United Kingdom |
| DCS | - | Belgium |
| DATANET 1 | - | Holland |
| TELEPAC | - | Switzerland |
| SAPONET-P | - | South Africa |
| VENUS-P | - | Japan |
| IBERPAC | - | Spain |
| DATAPAK | - | Canada |
| DATAPAK | - | Norway |
| PACNET | - | Taiwan |

The HP2334A is compatible with most public PSNs; the above list shows only those on which certification tests have been completed. HP provides a full product support service for the HP2334A when used with any certified PSN.

Some PSNs require the sub-address requirement to be specified at subscription time in order that the PSN can recognize any sub-address in an incoming call to the HP2334A. For further details on configuring network parameters in the HP2334A refer to Chapter 6, Configuration.

The HP2334A may also be used in a private network of HP2334As, HP1000s and/or HP3000s, using the X.25 protocol over modem (or modem eliminator) links.

The network type must be specified when configuring the HP2334A.

## 1.9 REFERENCES

For further details on the CCITT (Consultative Committee on International Telephone and Telegraph) X.3, X.25, X.28 and X.29 Recommendations refer to the *CCITT X.1 TO X.29 RECOMMENDATIONS*, available from:

Secretariat General,
Union Internationale des Telecommunications,
Place des Nations,
CH-1211 GENEVE 20.

For an introductory guide to data communications see the HP publication:

*TOURING DATACOMM* . . . . . part number 5957-4622.

For an explanatory guide to the CCITT X.25 Recommendation refer to the HP publication:

*X.25: THE PSN CONNECTION* . . . . . part number 5958-3402.

The following guides provide additional information when using the HP2334A with HP1000 or HP3000 computer systems:

*HP1000 DATA COMMUNICATION PRODUCT GUIDE* . . . . . part number 5953-7494.
*DSN/X.25/1000 REFERENCE MANUAL* . . . . . part number 91751-90002.
*DSN/X.25/1000 ADVANCED GUIDE* . . . . . part number 91751-90003.

*HP3000 DATA COMMUNICATION PRODUCT GUIDE* . . . . . part number 5953-7444.
*HP3000 COMMUNICATIONS HANDBOOK* . . . . . part number 30000-90105.
*DSN/X.25/3000 REFERENCE MANUAL* . . . . . part number 32191-90001.

## 1.10 OPTIONS AND ACCESSORIES

The HP2334A product options and the main accessories are detailed in Tables 1-2 and 1-3. For ordering information and details of the HP2334A replacement parts and modules refer to Chapter 16. For further details contact the nearest HP Sales and Support Office (listed at the back of this manual).

| PRODUCT NO | OPTION | DESCRIPTION |
|---|---|---|
| HP2334A | - | Standard MULTIMUX.<br>1) Includes:<br>a) Synchronous Network (PSN) Adapter Card and CPU Card.<br>b) Setting for 115 V a.c. line supply (see option 015).<br>c) Power cord.<br>d) Synchronous Network Adapter Card-to-modem cable (part number 02333-60008), 5 m/16 ft.<br>e) HP2334A Reference and Service Manual (this manual).<br>2) Does NOT include:<br>a) Device Interface/Adapter Cards (see Option 122/123).<br>b) Device cables (see Accessories, Table 1-3). |
| | X.25 | HP Manual: "X.25: THE PSN CONNECTION". |
| | 015 | HP2334A set for 230 V a.c. line supply. |
| | 100 | HP2334A initial configuration done by Hewlett Packard AEO (includes labor and travel). |
| | 122 | Direct Connect (RS-232-C) Processor Module<br>1) Includes:<br>a) One Device Interface (4 Channel Processor) Card.<br>b) One Direct Connect Adapter Card (provides four RS-232-C ports for asynchronous device connection).<br>2) Does NOT include:<br>a) Device cables (see Accessories, Table 1-3). |
| | 123 | Modem Control (RS-232-C) Processor Module<br>1) Includes:<br>a) One Device Interface (4 Channel Processor) Card.<br>b) One Modem Control Adapter Card (provides four RS-232-C ports for asynchronous device connection).<br>2) Does NOT include:<br>a) Device cables (see Accessories, Table 1-3).<br><br>NOTE: Any combination of up to four Option 122s or 123s may be supplied fitted in each HP2334A, providing connections for up to 16 devices (or computer ports) |
| HP40260A | - | Same as option 122, can be ordered as an add-on to an installed HP2334A. |
| HP40261A | - | Same as option 123, can be ordered as an add-on to an installed HP2334A. |
| | 001 | Modem Control Upgrade. To upgrade an installed option 122 to option 123. Comprises one Modem Control Adapter Card. |

**Table 1-2 HP2334A Options**

| ACCESSORY | PART NUMBER | DESCRIPTION |
|---|---|---|
| Synchronous Network Card to modem cable | 02333-60008 | RS-232-C cable, length 5m (included with the HP2334A). |
| Device Adapter Card to device cables; 1)for PAD Function: | | To connect an HP264X terminal, use: |
| | 5061-2409 | HP13232M European modem cable (length 4.5m) |
| | 02640-60131 | HP13232N US modem cable (length 4.5m) |
| | 02640-60218 | HP13232Y EMP protect cable (length 4.5m) (for lightning induced transient protection) |
| | | To connect an HP262X terminal, use: |
| | 13222-60002 | HP13222M European modem cable (length 5m) |
| | 13222-60001 | HP13222N US modem cable (length 5m) |
| | 13222-60005 | HP13222Y EMP protect cable (length 5m) (for lightning induced transient protection) |
| | | To connect an HP2621B or HP2392A terminal: |
| | 40242-60004 | HP40242M modem(RFI filter) cable (length 5m) |
| | | To connect an HP2382A terminal, use: |
| | 13242-60002 | HP13242M European modem cable (length 5m) |
| | 13242-60001 | HP13242N US modem cable (length 5m) |
| | 13242-60005 | HP13242Y EMP protect cable (length 5m) (for lightning induced transient protection) |
| | | To connect HP260X, HP263X, HP268X or HP293X printers use: |
| | 13242-60002 | HP13242M European modem cable (length 5m) |
| | 13242-60001 | HP13242N US modem cable (length 5m) |
| | 13242-60005 | HP13242Y EMP protect cable (length 5m) |
| | 02631-60065 | Standard HP263X cable (length 3.8m) |
| 2)for CAS Function: (or asynchronous modem connection) | | Use: |
| | 40220-60001 | HP40220A cable to connect the HP2334A to a point-to-point computer port or an asynchronous modem (25 pin, length 5m). |
| | 30152-60001 | HP30152A RS-232-C Extension/Adapter cable 3 pin/M to 25 pin/F connects an ATP Direct Connect port to HP40220A cable (length 5m). |
| RS-232-C Extension Cables: | | HP31391A 25 pin/M to 25 pin/F (length 5m).<br>HP31391B 25 pin/M to 25 pin/F (length 10m).<br>HP31391C 25 pin/M to 25 pin/F (length 15m). |
| Rack Mounting Accessories: | 5061-0077 | Rack mounting kit without front handles. |
| | 5061-0083 | Rack mounting kit with front handles. |
| | 5061-0089 | Front handles kit. |

**Table 1-3 HP2334A Accessories**

# APPLICATIONS & CONFIGURATIONS

CHAPTER 2



## 2.1 INTRODUCTION

This chapter may be used as a guide to typical data communication network configurations employing one or more HP2334A Multimux(s).

There are three principal methods of employing the HP2334A; these are used as examples for the configuration dialogues and listings in Chapter 6, CONFIGURATION and will also be referred to in Chapter 7, OPERATION.

The principal configurations are as follows:

### X.25 CLUSTER CONTROLLER CONFIGURATION

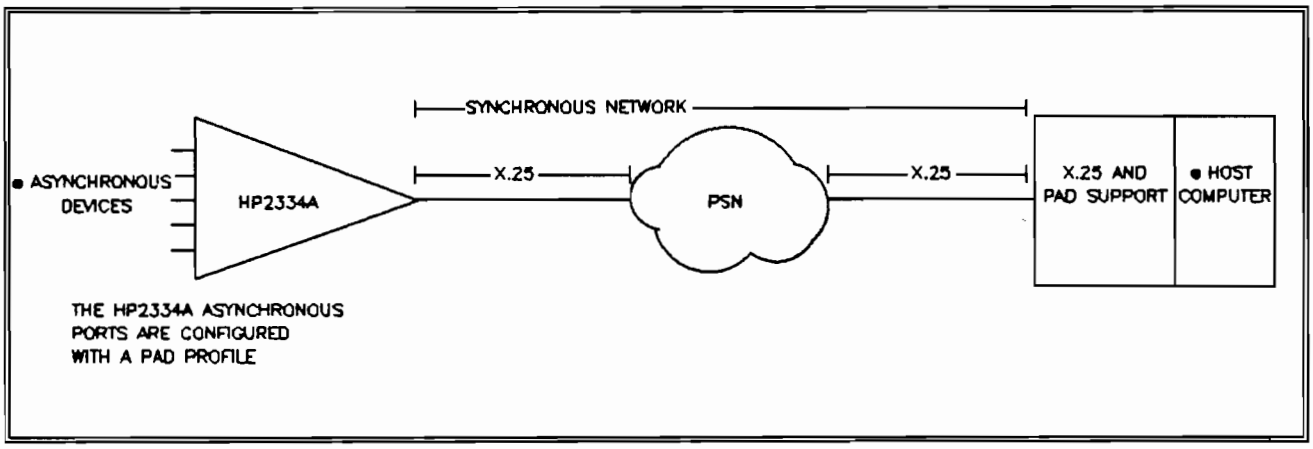



**Figure 2-1 X.25 Cluster Controller Configuration**

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc.(must be supported by the Host Computer; and refer to Section 2.5).

- Host Computer = HP3000 with DSN/X.25/3000 and PAD support software + INP Interface Card.
  Host Computer = HP1000 with DSN/X.25/1000 and PAD support software + LAP-B Interface Card.
  Host Computer = Any computer with X.25 and PAD support software.

**NOTE**

THE PSN SHOWN MAY BE REPLACED BY A SYNCHRONOUS MODEM LINK OVER A LEASED, DIAL-UP OR DIGITAL LINE.

## X.25 STATISTICAL MULTIPLEXER CONFIGURATION

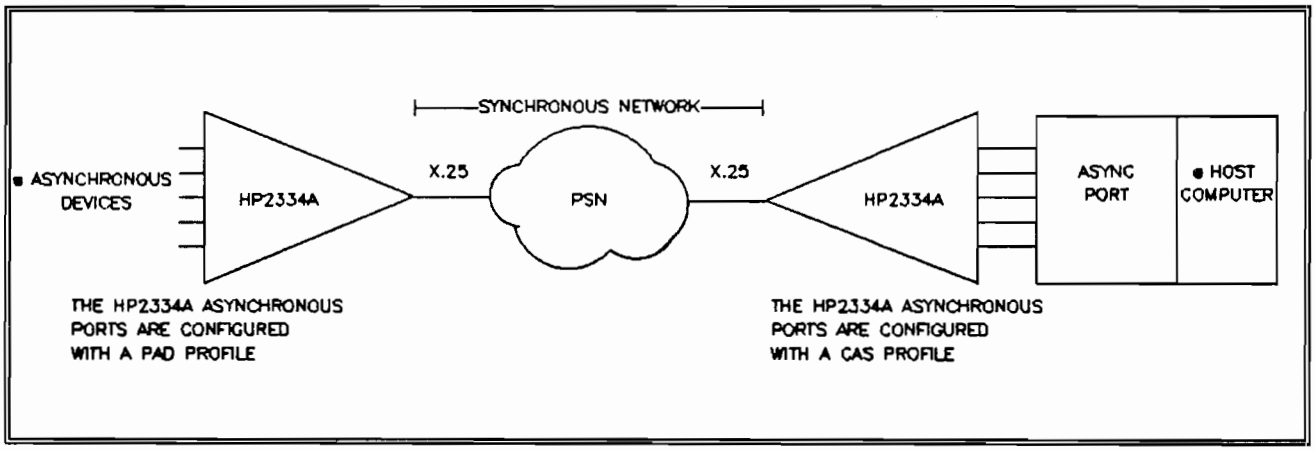



**Figure 2-2 X.25 Statistical Multiplexer Configuration**

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc.(must be supported by the Host Computer; and refer to Section 2. 5).

- Host Computer = HP3000 with ATC, ADCC or ATP asynchronous terminal controllers.
  Host Computer = HP1000 with HP12040B or HP12792B asynchronous terminal controllers.
  Host Computer = Any computer with ports offering asynchronous terminal access.

## STATISTICAL MULTIPLEXER CONFIGURATION

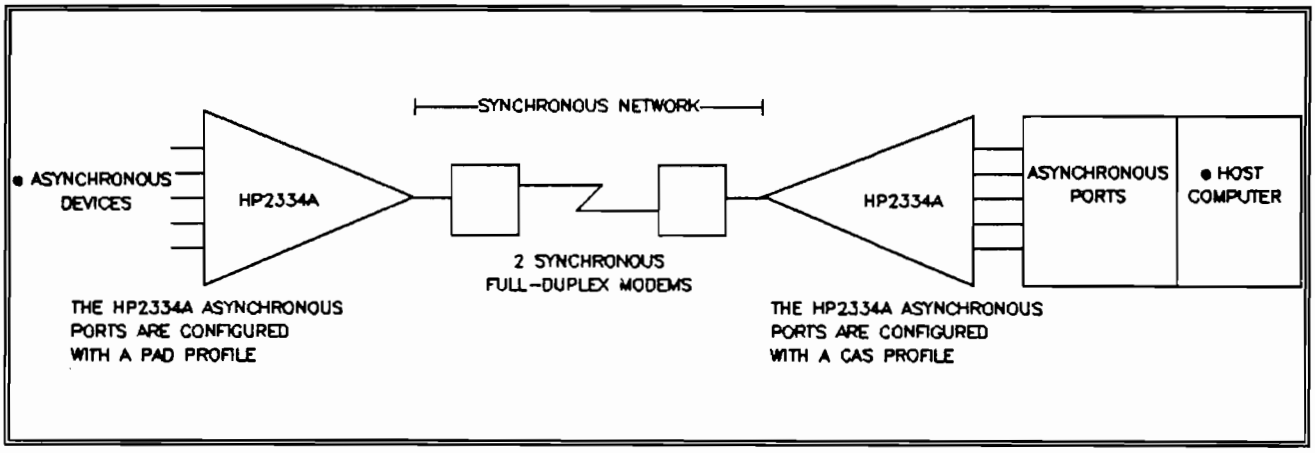



**Figure 2-3 Statistical Multiplexer Configuration**

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc.(must be supported by the Host Computer; and refer to Section 2. 5).

- Host Computer = HP3000 with ATC, ADCC or ATP asynchronous terminal controllers.
  Host Computer = HP1000 with HP12040B or HP12792B asynchronous terminal controllers.
  Host Computer = Any computer with ports offering asynchronous terminal access.

## COMBINATION EXAMPLE

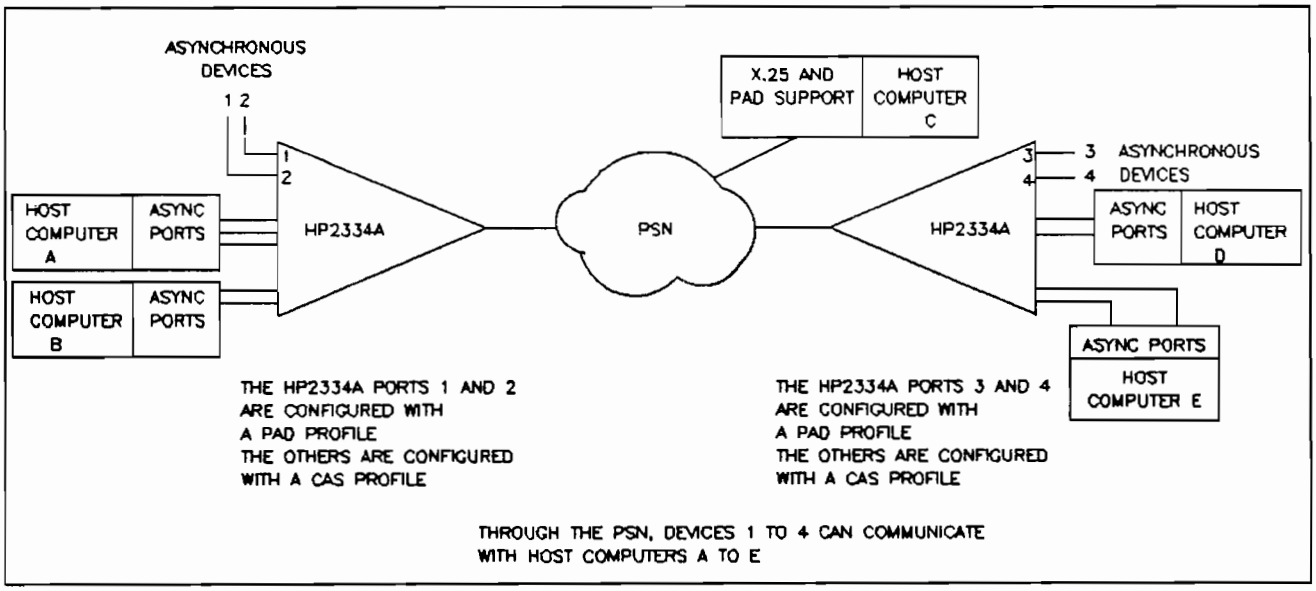



**Figure 2-4 Combination Configuration Example**

The example shown in Figure 2-4 is a combination of the X.25 Cluster Controller Configuration (see Fig. 2-1) and the X.25 Statistical Multiplexer Configuration (see Fig. 2-2).

# 2.2 HP2334A ASYNCHRONOUS CONNECTIONS

## 2.2.1 Connection Of Asynchronous Devices

### DIRECT CONNECTION

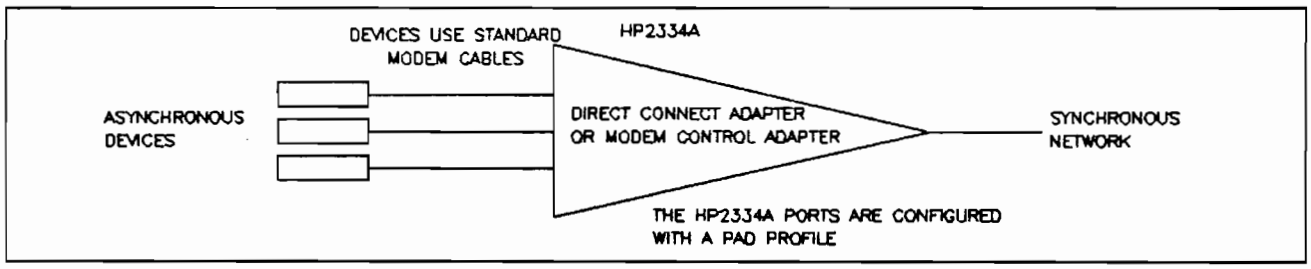



**Figure 2-5 Direct Connection of Asynchronous Devices**

### MODEM CONNECTION

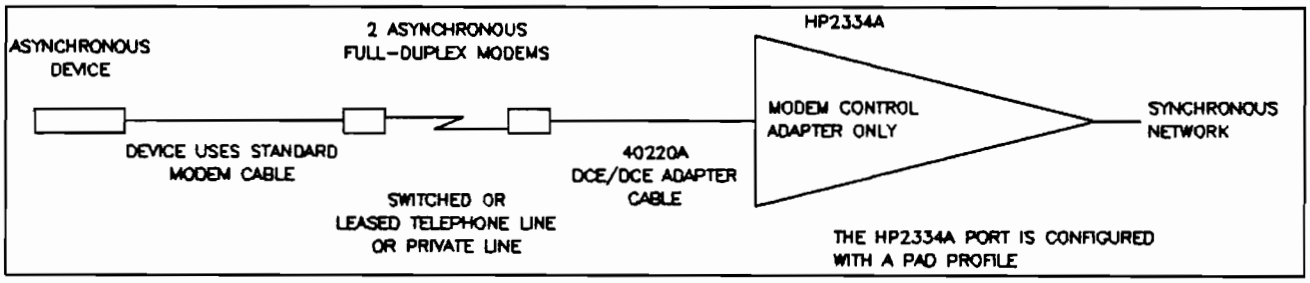



**Figure 2-6 Modem Connection of Asynchronous Devices**

### PBX CONNECTION METHOD

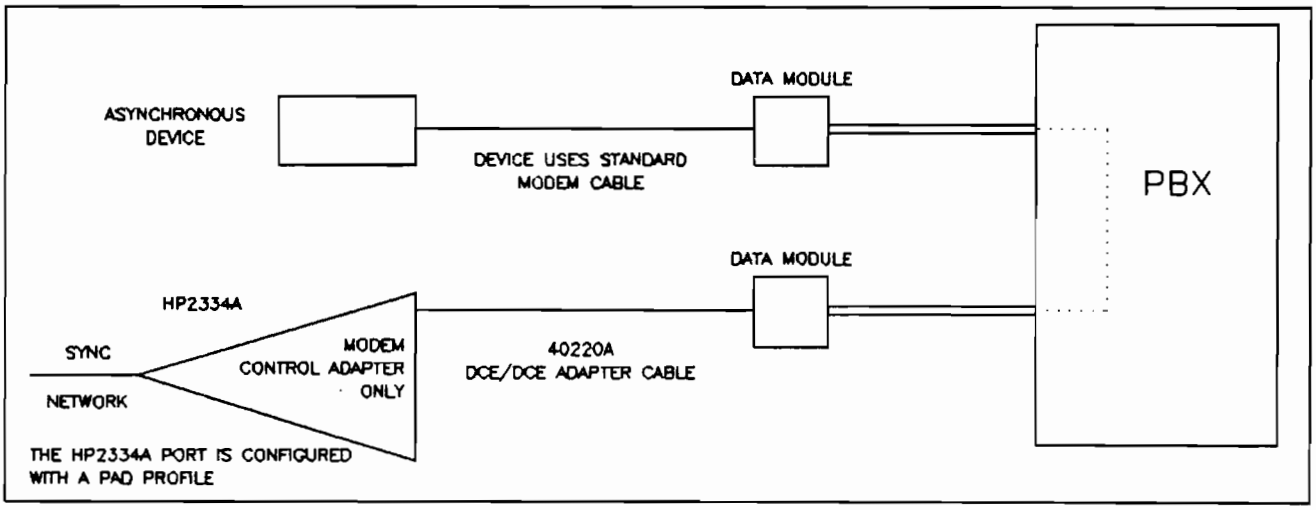



**Figure 2-7 PBX Connection of Asynchronous Devices**

## 2.2.2 Connection Of Asynchronous Computer Ports

**NOTE**

FOR THE HP3000 AND MOST OTHER COMPUTER SYSTEMS THE MODEM CONTROL ADAPTER CARD SHOULD BE USED ON THE HP2334A AND THE CONNECTED HOST COMPUTER PORTS SHOULD BE CONFIGURED FOR USE WITH A MODEM WHEN SWITCHED VIRTUAL CIRCUITS ARE USED. THIS IS NECESSARY IN ORDER THAT ANY SESSION ON THE HOST COMPUTER IS CORRECTLY TERMINATED WHEN A DISCONNECTION OCCURS ON THE SYNCHRONOUS NETWORK (OR ON THE REMOTE DTE).

### DIRECT CONNECTION

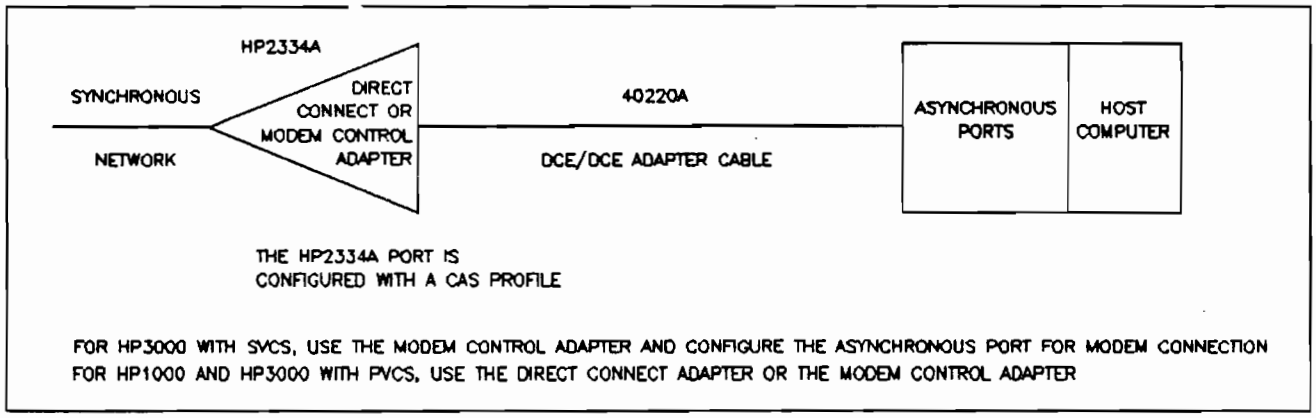



**Figure 2-8 Direct Connection of Asynchronous Computer Ports**

### MODEM CONNECTION

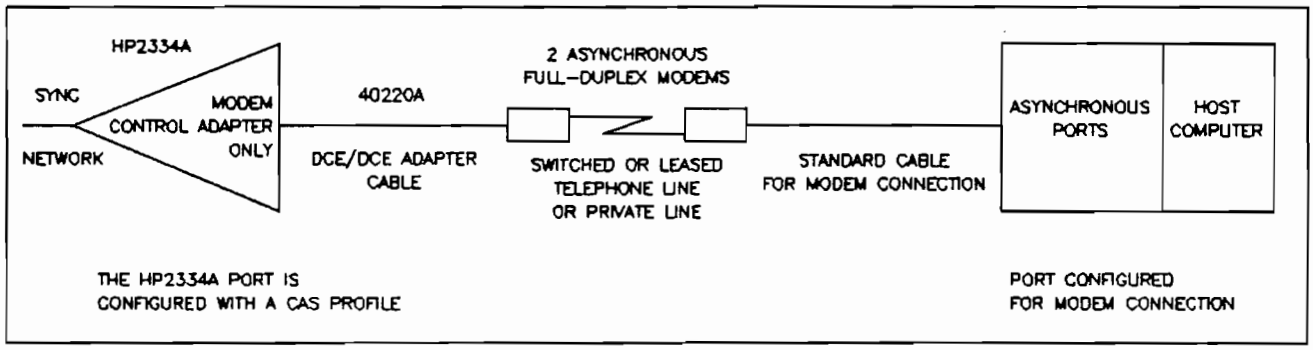



**Figure 2-9 Modem Connection of Asynchronous Computer Ports**

**PBX CONNECTION**

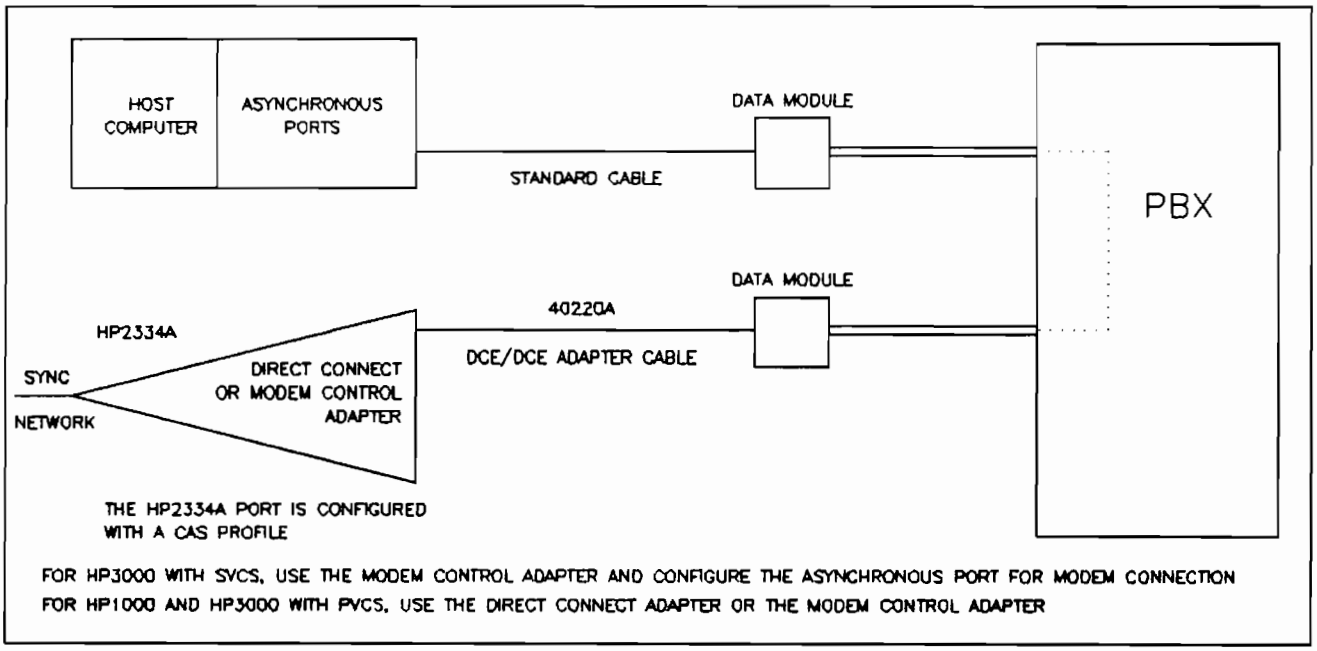



**Figure 2-10 PBX Connection of Asynchronous Computer Ports**

## 2.3 CONNECTION TO THE SYNCHRONOUS NETWORK

**NOTE**

IF A PSN IS TO BE USED, CARE MUST BE TAKEN IN CHOOSING THE CORRECT CATEGORY AND NUMBER OF VIRTUAL CIRCUITS AND/OR FACILITIES REQUIRED.

**PSN CONNECTION**

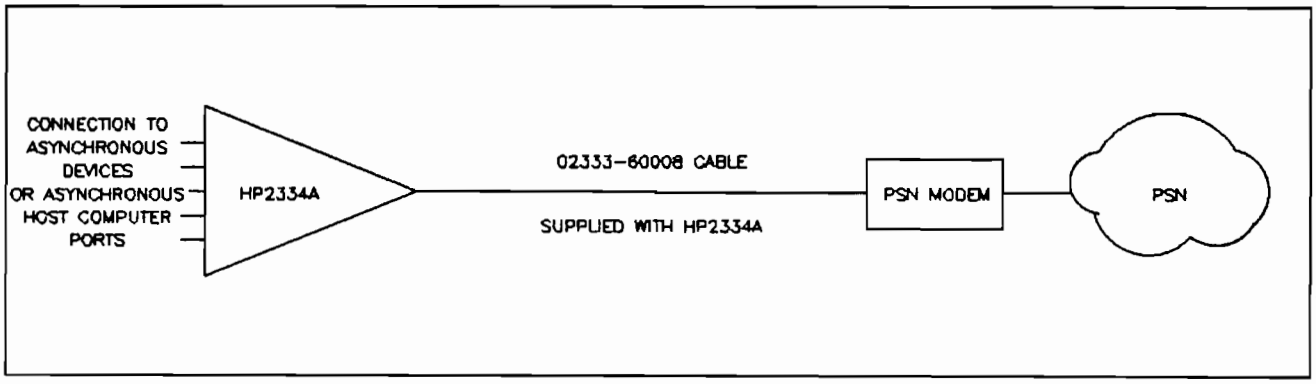



**Figure 2-11 HP2334A to PSN Connection**

## SYNCHRONOUS MODEM LINK CONNECTION

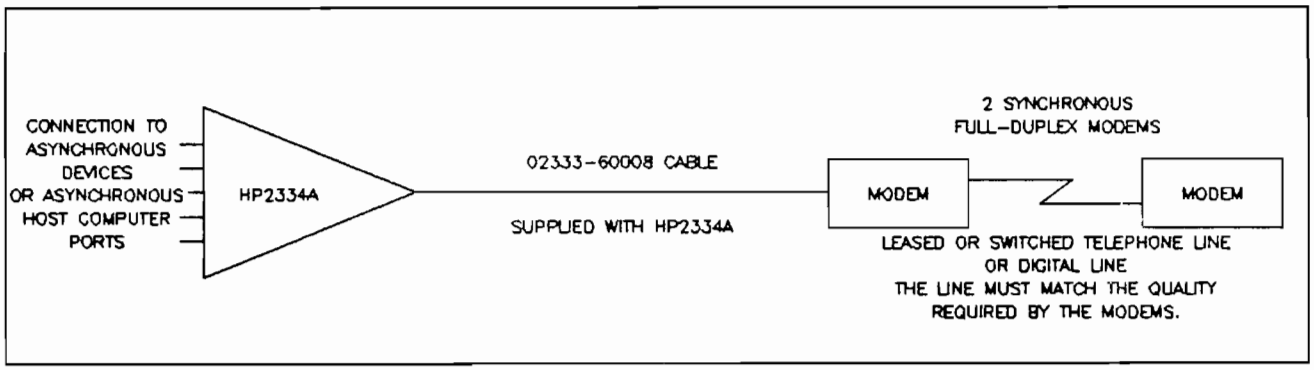



**Figure 2-12 HP2334A to Synchronous Modem Link Connection**

# SITE PREPARATION

CHAPTER 3

## 3.1 INTRODUCTION

This chapter provides information on preparing the site prior to installing the HP2334A Multimux(s). The HP2334A may be mounted either on a table or in a standard 19 inch (48 cm) computer rack (HP system II cabinet), where the rack height is 5.25 inches (13.5 cm = 3 Us).

The site must conform with the environmental conditions detailed in Section 3.3 and be equipped with:

1) A clean, flat, dry, horizontal table of adequate size and strength to support each table mounted HP2334A. Alternatively a clean, dry rack of adequate size and strength to support each rack mounted HP2334A. Section 3.2 details the weight and physical dimensions of the HP2334A.

2) The electrical power cabling plus the site line connectors (i.e. electric power sockets). Section 3.4 details the HP2334A power requirements.

3) All the data cabling for communications with:

   a) The device(s) - device cables are NOT supplied with the HP2334A; refer to Section 3-5 for cable information.

   b) The synchronous network - an HP2334A-to-synchronous network modem cable is supplied with the HP2334A; refer to Section 3-5 for cable information.

It is recommended that the site is prepared before receiving the HP2334A Multimux(s).

**NOTE**

THE HP2334A MUST BE CONNECTED TO THE SYNCHRONOUS NETWORK THROUGH A FULL DUPLEX SYNCHRONOUS MODEM. IF THE SYNCHRONOUS NETWORK IS A PUBLIC PSN, THIS MODEM IS NORMALLY INSTALLED AND SUPPORTED BY THE PSN AUTHORITY. THE TYPE OF SYNCHRONOUS NETWORK (OR PSN) CONNECTION SHOULD BE DETERMINED BEFORE COMMENCING SITE PREPARATION (SEE CHAPTERS 2 AND 5).

## 3.2 PHYSICAL SPECIFICATIONS

The weight and physical dimensions of the HP2334A are as follows:

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Weight | Minimum (cabinet plus CPU Card & PSN Adapter Card) | 11 kg (24 lbs) |
| | Maximum (cabinet plus all cards) | 13 kg (29 lbs) |
| Size | Cabinet | 54.0 L x 42.5 W x 13.5 H (14 with feet) cms |
| | | 21.25 L x 16.75 W x 5.25 H (5.45 w/feet) ins |

**Table 3-1 HP2334A Main Physical Specifications**

**NOTE:** For detailed HP2334A physical specifications refer to Section 9.5.

## 3.3 ENVIRONMENTAL CONDITIONS

The HP2334A Multimux is designed to operate in working environments normally maintained for human comfort. It provides a high degree of resistance to extraneous interference and a high level of user safety.

The HP2334A complies with HP (Hewlett Packard) Class B environmental specifications. It is resistant to electrostatic discharge (onto the casing) and electromagnetic interference.

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Dust | Operating and non-operating | Environment free from conductive and corrosive dust/vapour |
| Humidity | Operating | 5% to 95% (non condensing) at +40'C (104'F) |
| Static Discharge | Both operating and non-operating | Maximum onto casing: 15 kV - no errors, 20kV - no loss of data, 25 kV - no damage |
| Temperature (free ambient) | Operating | 0'C to +55'C (+32'F to +131'F) |

**Table 3-2 HP2334A Main Environmental Specifications**

**NOTE:** For detailed HP2334A environmental specifications refer to Section 9.4.

## 3.4 POWER REQUIREMENTS

The HP2334A power requirements are as follows:

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Power Consumption | Typical | 115 VA |
| Line Frequency | Range | 47 Hz to 63 Hz |
| Line Voltage (a.c.) | Single phase,<br>115V - standard<br>230V - Option 015 | <br>86 to 127 Volts<br>195 to 253 Volts |

**Table 3-3 HP2334A Main Power Requirements**

NOTE: For detailed HP2334A electrical specifications refer to Section 9.6.

### 3.4.1 Site Power Cabling

A 3-wire power cord approximately 2 m (80 ins.) long is supplied with each HP2334A for connection the site power outlet. The available power cords are detailed in Section 4.6.

The installation procedure detailed in Chapter 4 MUST be followed for connecting the HP2334A to the site power outlet.

**NOTE**

ALL SITE POWER CABLING MUST BE OF ADEQUATE CURRENT RATING AND BE PROTECTED SO AS TO CONFORM TO LOCAL SAFETY REGULATIONS.

### 3.4.2 Site Voltage Checking

Ensure that the voltage of the site power outlet matches that of the ordered HP2334A(s) (the standard unit is set for 115V a.c.; option 015 for 230V a.c. operation), and is within the tolerances detailed in Table 3-3.

The procedure for checking the HP2334A line (mains) voltage setting is detailed in Section 4.4.

# 3.5 CABLING INFORMATION

## 3.5.1 HP2334A to Synchronous Network Cabling

**NOTE**

THE HP2334A WILL ONLY OPERATE WHEN CONNECTED TO A PSN THROUGH AN INTERFACE COMPLYING WITH THE X.25 RECOMMENDATION.

The HP2334A should be connected to the synchronous network modem using an RS-232-C modem cable. A suitable cable (part number: 02333-60008) is supplied with the HP2334A. The HP2334A-to-synchronous network modem signals are detailed in Section 4.10.

When connecting to a PSN, the PSN modem and modem-to-PSN cabling are normally the responsibility of the PSN, which should be consulted for modem connection information.

## 3.5.2 HP2334A to Asynchronous Device Cabling

Up to 16 RS-232-C asynchronous point-to-point devices (four per Device Adapter Card) may be connected to the HP2334A with each device using a discrete cable. The cables should be the same as those used to connect the device to a modem, as the HP2334A interprets the signals in a similar manner to a modem (see Table 3-4).

The cables listed in Table 3-4 are suitable for use with the Direct Connect Adapter Card and the Modem Control Adapter Card, both of which are equipped with 25 pin FEMALE RS-232-C connectors (ports). The HP2334A-to-device signals for each adapter card are detailed in Section 4.10.

For details of the uses and applications of the Direct Connect Adapter and Modem Control Adapter cards refer to Section 1.7.

## 3.5.3 HP2334A to Asynchronous Modem Cabling

When fitted with the Modem Control Adapter Card(s) (HP40261A or Option 123), the HP2334A may be connected to the devices or asynchronous computer ports via two asynchronous modems. Discrete cables and modem pairs must be used for each device or port connection.

The two modems must be configured in full-duplex mode and strapped for constant transmission. The Modem Control Adapter Card signals are detailed in Section 4.10.

Use the **HP40220A** cable (part number: 40220-60001) to connect between the HP2334A and the first modem and a standard modem cable (see Table 1-3) to connect the second modem to the device (terminal or printer).

Where the HP2334A is to be connected to asynchronous computer ports via a pair of modems, the **HP40220A** cable should be used between the HP2334A and the first modem. The recommended cable (according to the type of computer asynchronous terminal controller) should be used to connect the second modem to the asynchronous computer port. e.g. For an HP3000 ADCC port, use a type 30062B modem cable.

| ACCESSORY | PART NUMBER | DESCRIPTION |
|---|---|---|
| Device Adapter Card to device cables; 1)for PAD Function: | 5061-2409 | To connect an HP264X terminal, use: HP13232M European modem cable (length 4.5m) |
| | 02640-60131 | HP13232N US modem cable (length 4.5m) |
| | 02640-60218 | HP13232Y EMP protect cable (length 4.5m) (for lightning induced transient protection) |
| | | To connect an HP262X terminal, use: |
| | 13222-60002 | HP13222M European modem cable (length 5m) |
| | 13222-60001 | HP13222N US modem cable (length 5m) |
| | 13222-60005 | HP13222Y EMP protect cable (length 5m) (for lightning induced transient protection) |
| | | To connect an HP2621B or HP2392A terminal: |
| | 40242-60004 | HP40242M modem(RFI filter) cable (length 5m) |
| | | To connect an HP2382A terminal, use: |
| | 13242-60002 | HP13242M European modem cable (length 5m) |
| | 13242-60001 | HP13242N US modem cable (length 5m) |
| | 13242-60005 | HP13242Y EMP protect cable (length 5m) (for lightning induced transient protection) |
| | | To connect HP260X, HP263X, HP268X or HP293X printers use: |
| | 13242-60002 | HP13242M European modem cable (length 5m) |
| | 13242-60001 | HP13242N US modem cable (length 5m) |
| | 13242-60005 | HP13242Y EMP protect cable (length 5m) |
| | 02631-60065 | Standard HP263X cable (length 3.8m) |
| 2)for CAS Function: (or asynchronous modem connection) | 40220-60001 | Use HP40220A cable to connect the HP2334A to a point-to-point computer port or an asynchronous modem (25 pin, length 5m). |
| | 30152-60001 | HP30152A RS-232-C Extension/Adapter cable 3 pin/M to 25 pin/F connects an ATP Direct Connect port to HP40220A cable (length 5m). |

**Table 3-4 HP2334A Device Cables**

## 3.5.4 HP2334A to Asynchronous Computer Port Cabling

The Modem Control Card allows direct connection between the HP2334A and a computer asynchronous port using the **HP40220A** cable (part number: 40220-60001). Using this cable with the Modem Control Adapter Card ensures that when communication is cleared on a switched virtual circuit by the remote DTE (or the synchronous network) the computer (e.g. HP3000) upper level software can terminate the session. The HP2334A CTS and DCD modem signals fall (OFF) and using the HP40220A cable ensures that the RTS and DTR signals fall (OFF) at the computer port. The Modem Control Adapter Card signals are detailed in Section 4.10. The HP1000 and some other computers do not monitor the CTS signal, but instead use a timeout procedure to terminate sessions. In this case the Direct Connect Adapter Card may be used with the **HP40220A** cable.

# INSTALLATION

CHAPTER 4

## 4.1 INTRODUCTION

**CAUTION**

THE HP2334A MULTIMUX SHOULD BE INSTALLED AND PREPARED FOR USE BY QUALIFIED PERSONNEL ONLY.

The HP2334A Multimux is delivered fully assembled with all the ordered device interface and adapter cards (the ordered Options) in position. However, if device interface/adapter cards (e.g. the HP40260A Direct Connect Processor Module) are subsequently ordered, they may be installed as described in Chapter 13.

This section details all the information necessary to install the HP2334A on a previously prepared site. The site preparations are detailed in Chapter 3.

The HP2334A should be installed and verified in the following order:

1) Unpack and inspect the HP2334A as described in Section 4.2.

2) Check the product and options/accessories identification as described in Section 4.3.

3) Check that the line voltage and line fuse are correct for the site power supply as described in Section 4.4.

4) Mount the HP2334A as described in Section 4.5.

5) Connect the HP2334A to the site line (mains) power supply as described in Section 4.6.

6) Following the connection and test procedure detailed in Section 4.7, ensure that the HP2334A is operating correctly by performing:

   a) The Power On Test as described in Section 4.8.

   b) The CPU Card Switches Test as described in Section 4.9.

7) Then connect it to the devices (or computer asynchronous ports) and the synchronous network as described in Section 4.10.

8) Configure the HP2334A-to-device and HP2334A-to-synchronous network communication parameters as described in Chapter 6.

9) Initialize and operate (on-line) the HP2334A as described in Chapter 7. Should an error condition occur or if on-line communication cannot be established, then refer to Section 7.10, "User Troubleshooting" and Chapter 14, TROUBLESHOOTING.

## 4.2 STORAGE & PACKING

### STORAGE

The HP2334A must be stored or shipped in an environment which does not exceed the following limits:

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Altitude | Non-operating | Up to 15,300 m (50,000 ft.) max. |
| Temperature | Non-operating | -40°C to +75°C (-40°F to +167°F) |
| Transportation Handling | In shipping carton | Maximum vertical drop: 76 cm (30 in). |

**Table 4-1 HP2334A Storage and Shipping Conditions**

**NOTE**: The HP2334A must be protected from extreme temperature changes that could cause condensation within the cabinet.

### UNPACKING AND INSPECTION

**NOTE**

IF UPON RECEIPT THE HP2334A MULTIMUX IS DAMAGED, NOTIFY YOUR NEAREST HEWLETT PACKARD OFFICE IMMEDIATELY AND DO NOT CONNECT IT TO AN ELECTRIC POWER SUPPLY.

If upon receipt the shipping carton is undamaged; with the carton standing upright on a solid flat surface, its contents should be removed and placed on a solid flat surface free from dirt and liquids. If possible retain the shipping carton for future use.

Ensure that the HP2334A has been delivered with the correct options and accessories (see Section 4.3) before commencing the installation procedures described in Sections 4.4 to 4.10.

If upon receipt the shipping carton is damaged, remove the contents and inspect the HP2334A for damage (scratches, dents, broken parts, etc.).

If the HP2334A is damaged, do **NOT** connect it to an electric power supply.

Notify the carrier and the nearest Hewlett-Packard office immediately (sales and service offices are listed at the rear of this manual) and retain the shipping carton and packing material for inspection by the carrier. The HP office will arrange for the repair or replacement of the HP2334A without waiting for the settlement of any claims against the carrier.

In any correspondence, refer to the HP2334A Multimux by its model number (i.e. HP2334A) and quote the full serial number (e.g. 2446F00835) as detailed on the identification label (see Section 4.3).

**CAUTION**

THE HP2334A WEIGHS UP TO 13 KG (29 LBS) AND SHOULD BE HANDLED WITH CARE.

## PACKING

If the HP2334A is being returned to a Hewlett-Packard office or service center, it must be securely packaged before being shipped.

**Original packing.** If available, the original shipping carton should be used; with a tag attached indicating the type of service required, the model number, full serial number and return address. The carton should be marked FRAGILE to encourage careful handling.

**Other packing.** The following general instructions should be followed for re-packing with commercially available material:

- Wrap the HP2334A in heavy paper or plastic. Then attach a tag indicating the type of service required, model number, full serial number and return address.
- Use a strong shipping container. Double-walled carton made of 160 kg (350 lb) test material is recommended.
- Use a layer of shock absorbing material 70 to 100 mm (3 to 4 inches) thick around all the sides of the HP2334A to provide firm cushioning and prevent movement inside the container.
- Securely seal the shipping carton.
- Mark the shipping carton FRAGILE to encourage careful handling.

# 4.3 PRODUCT IDENTIFICATION

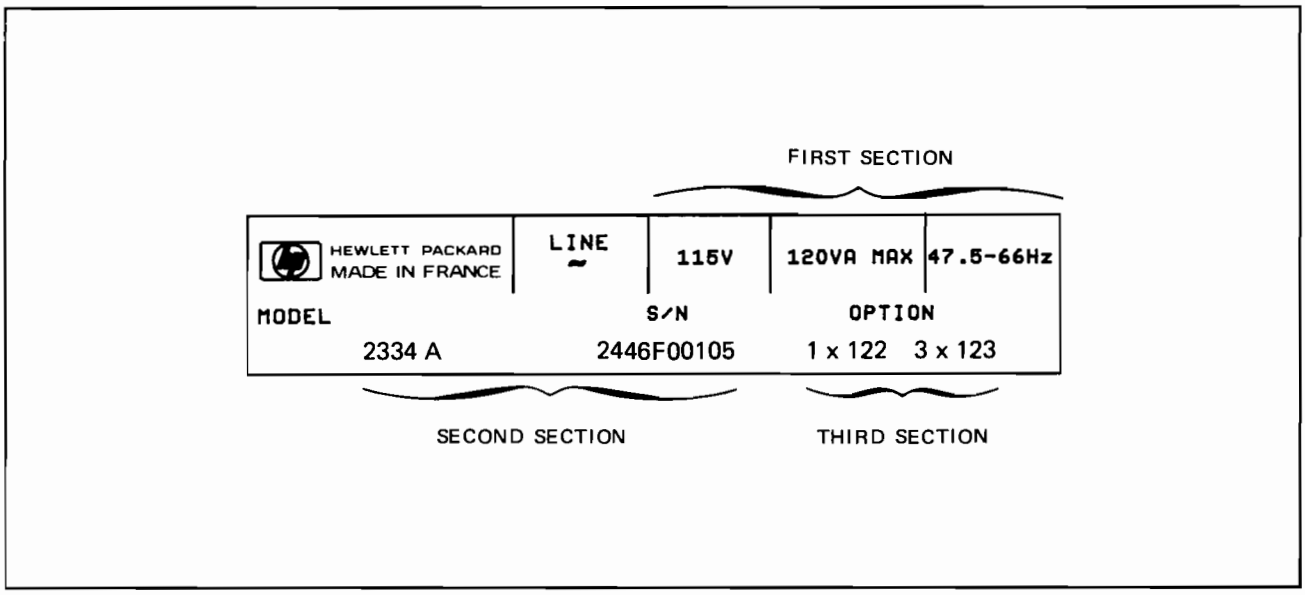



**Figure 4-1 HP2334A Identification Label**

An identification label is located at the front of the HP2334A, on the protective metal plate covering the CPU Card and power supply PCA. To check the product identification, simply remove the front panel (held in place magnetically) in order to view the label.

The product identification label is in three sections:

- The FIRST section stating the power requirement.
- The SECOND section stating the model number and serial number.
- The THIRD section listing any options included with the HP2334A..

**Device Identification.** The device is identified by a ten character serial number in the second section of the identification label (see Fig. 4-1). The serial number is in two parts as follows:

- A five character prefix (e.g. 2446F) where the letter indicates the country of manufacture (A = USA, F = France, G = Germany, J = Japan and U = United Kingdom). Identical devices share the same prefix.
- A five character suffix (e.g. 00835) which is assigned sequentially and is unique to each device.

**Options & Accessories Identification.** Any options (such as Option 122, the Direct Connect Processor Module) are delivered installed in the HP2334A. The options included in the HP2334A are listed in the third section of the identification label (see Fig. 4-1). All ordered accessories (such as rack mounting equipment or add-on cards) are delivered in a separate carton.

Upon delivery, verify that the ordered options and/or accessories are included in the received shipment. If the shipment has been incorrectly packed, contact the nearest HP Sales and Service Office.

## 4.4 LINE VOLTAGE & FUSE CHECKING

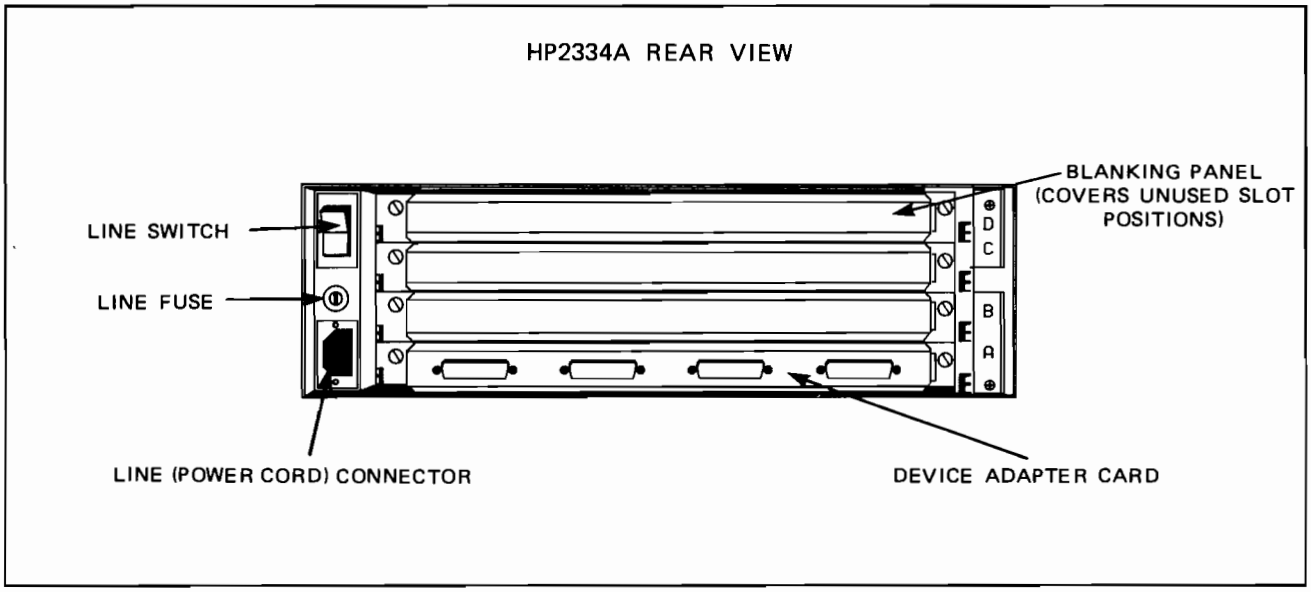



**Figure 4-2 HP2334A Line Connector, Switch and Fuse**

Before mounting and connecting the HP2334A to the line (mains) power supply the product identification must be checked to ensure that the HP2334A voltage setting conforms with the site power supply.

Similarly, it is recommended that the Line (mains power) Fuse is checked before connecting the HP2334A to the site power outlet.

**Voltage Checking.** The HP2334A's power requirement is detailed in the first section of the product identification label located on the protective metal plate covering the CPU card and the power supply PCA at the front of the unit (see Section 4.3).

Remove the front panel and check that the power requirement shown on the label conforms with the site power supply.

If the power requirement shown on the identification label does not conform with the site power supply, do NOT connect the HP2334A to the site power outlet but contact the nearest HP Sales and Service Office.

If the power requirement is correct for the site power supply then proceed with the line fuse checking BEFORE mounting the HP2334A and connecting it to the site power outlet.

**WARNING**

IF THE HP2334A IS CONNECTED TO THE SITE (MAINS) POWER SUPPLY THEN IT MUST BE DISCONNECTED **BEFORE** CHECKING THE LINE FUSE.

**Line Fuse Checking.** The rear panel line (mains) power fuse of the HP2334A should be checked as follows:

1) Using a flat blade screwdriver, unscrew the rear panel circular plastic fuse holder located below the LINE switch (see Figure 4-2).

2) Withdraw both the cover and the fuse. Examine the fuse and ensure that it is correctly rated for the operating voltage. The fuse ratings are as follows:

   a) 1.5 AT 250 V (i.e. 1.5 Amps timelag = slow blow) for a **230** Volt line supply.

   b) 3.0 AT 250 V (i.e. 3 Amps timelag) for a **115** Volt line supply.

3) Fit a fuse of the correct rating as necessary.

When the power requirement and line fuse rating have been verified the HP2334A may be mounted and connected to the site power supply as detailed in the following sections.

**NOTE:** The fuse value is normally marked at one end of the fuse. The correct fuse ratings are printed on a label adjacent to the fuse holder.

## 4.5 MOUNTING INSTRUCTIONS

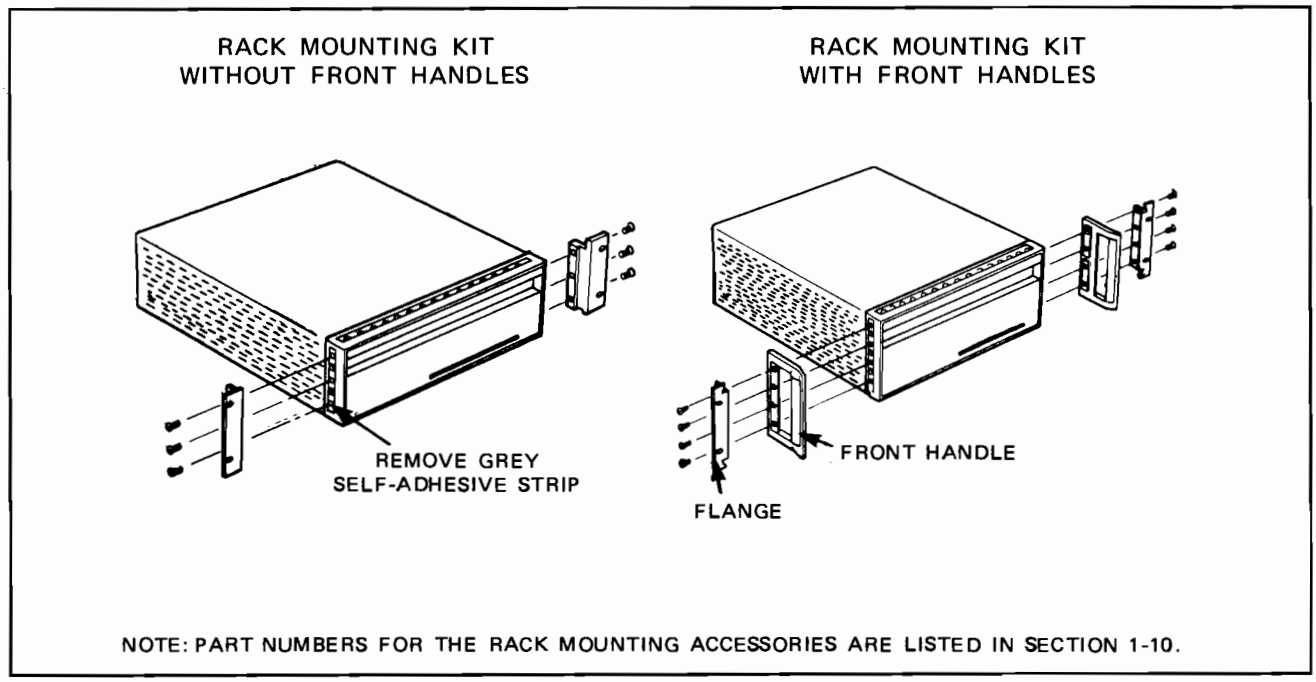



**Figure 4-3 HP2334A Rack Mounting Accessories**

**CAUTION**

TO PREVENT THE HP2334A OVERHEATING AN AIR GAP MUST BE LEFT ON EITHER SIDE OF THE CABINET. FOR A DESK MOUNTED HP2334A THIS GAP MUST BE AT LEAST 10 CM (4 IN).

The HP2334A may be mounted on a table or in a computer rack in an environment conforming to the specifications detailed in Chapter 3. It should NOT be mounted anywhere subject to heat, dust, moisture, or environmental hazards (such as accidental damage).

**Table Mounting.** Simply mount the HP2334A on the site table (see CAUTION note above).

**Rack Mounting.** In order to mount the HP2334A in a rack, the mounting accessories listed in Table 1-3 are required. The mounting accessories comprise two side flanges and two handles (optional) and they enable the HP2334A to be mounted in a standard 19 inch wide computer rack. It is 5.25 inches (i.e. three Us) high.

Before the HP2334A can be mounted in the rack, the four plastic feet on its base must be removed. This may be achieved for each foot by gently lifting the rear of the foot marked "tab" and at the same time sliding the foot in the direction of the embossed arrow.

The HP2334A may then be mounted in the rack as follows:

1) At the front right-hand and left-hand sides of the HP2334A are vertical strips of gray colored self-adhesive plastic, see Figure 4-3. Use a blunt edged instrument (e.g. flat-blade screwdriver) to carefully lift off and remove the two plastic strips, thereby exposing the screw holes.

2) If handles are required, place the handle over the screw holes and then mount the side flange over the handle (ensuring that the screw holes in the HP2334A, handle and flange align), before securing them in position with the supplied screws.

3) If handles are not required, mount each side flange directly over the screw holes and secure them in position with the supplied screws (see Figure 4-3).

4) Slide the rear of the HP2334A into the computer rack. Then secure the HP2334A in position by screwing the side flanges to the rack.

## 4.6 POWER SUPPLY CONNECTION

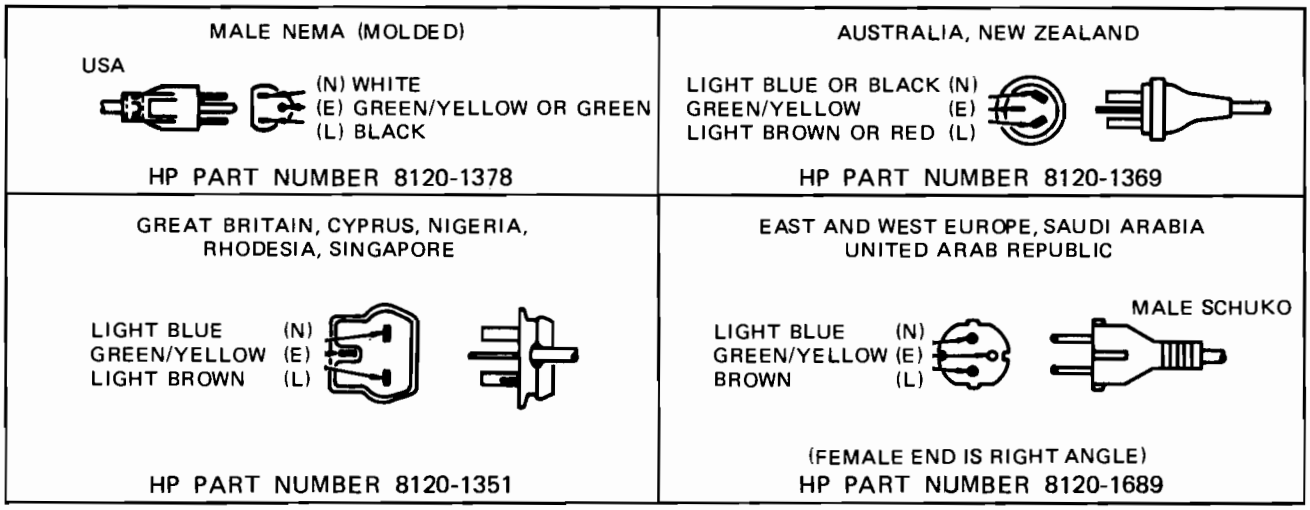



**Figure 4-4 HP2334A Power Cords**

**WARNING**

THE HP2334A CONTAINS HAZARDOUS VOLTAGES. DO NOT ATTEMPT TO REMOVE THE REAR ADAPTER CARDS OR BLANKING PANELS WHEN THE UNIT IS CONNECTED TO THE LINE (MAINS POWER) SUPPLY.

The HP2334A is equipped with a 3 wire power cord (one of those shown in Figure 4-4) which grounds the unit when connected to the appropriate site power outlet. To preserve this safety feature when operating the HP2334A from an outlet without a ground connection, use an appropriate adapter to connect the power cord ground lead (green/yellow) to an external ground.

**Connection Procedure.** Connect the HP2334A to the site power supply as follows:

1) Ensure that the HP2334A's rear panel LINE switch is set to OFF (0).

2) Connect the power cord to the HP2334A's rear panel line connector (see Figure 4-2), then plug it into the site power outlet.

3) Switch ON the HP2334A's LINE switch as required.

**Plug Replacement.** If the plug on the cable does not fit the site power outlet then a replacement plug must be fitted. First REMOVE the power cord, then cut the cable at the plug end and connect a suitable replacement plug. The replacement plug must meet local safety standards and include the following features:

- Minimum current rating 2 amperes.
- Ground connection.
- Cable clamp.

The color coding used depends on the cable supplied (see Figure 4-4).

## 4.7 HP2334A CONNECTION & TEST PROCEDURE

The HP2334A should be checked and then connected to the device(s) and the synchronous network in the order depicted in Figure 4-5.

The HP2334A has five built-in diagnostic tests which enable its operation and data communication to be verified. Two of these tests must be performed during the connection and test procedure.

The tests are as follows:

- An internal Power-On Self Test which is automatically performed whenever the HP2334A is switched ON, or initialized using the Reset push-button. This test is performed irrespective of whether the HP2334A is off-line or on-line, see Section 4.8 for details.

- An off-line CPU Card Switches Test that checks the operation of the CPU Card's DIP switches, see Section 4.9 for details.

These tests are configured using the DIP switches mounted on the CPU Card, and correct operation is confirmed by the corresponding CPU Card LED display (see Figure 4-6).

The Connection and Test Procedure shown in Figure 4-5 is described in Sections 4.8 to 4.10 and Chapters 6 and 7.

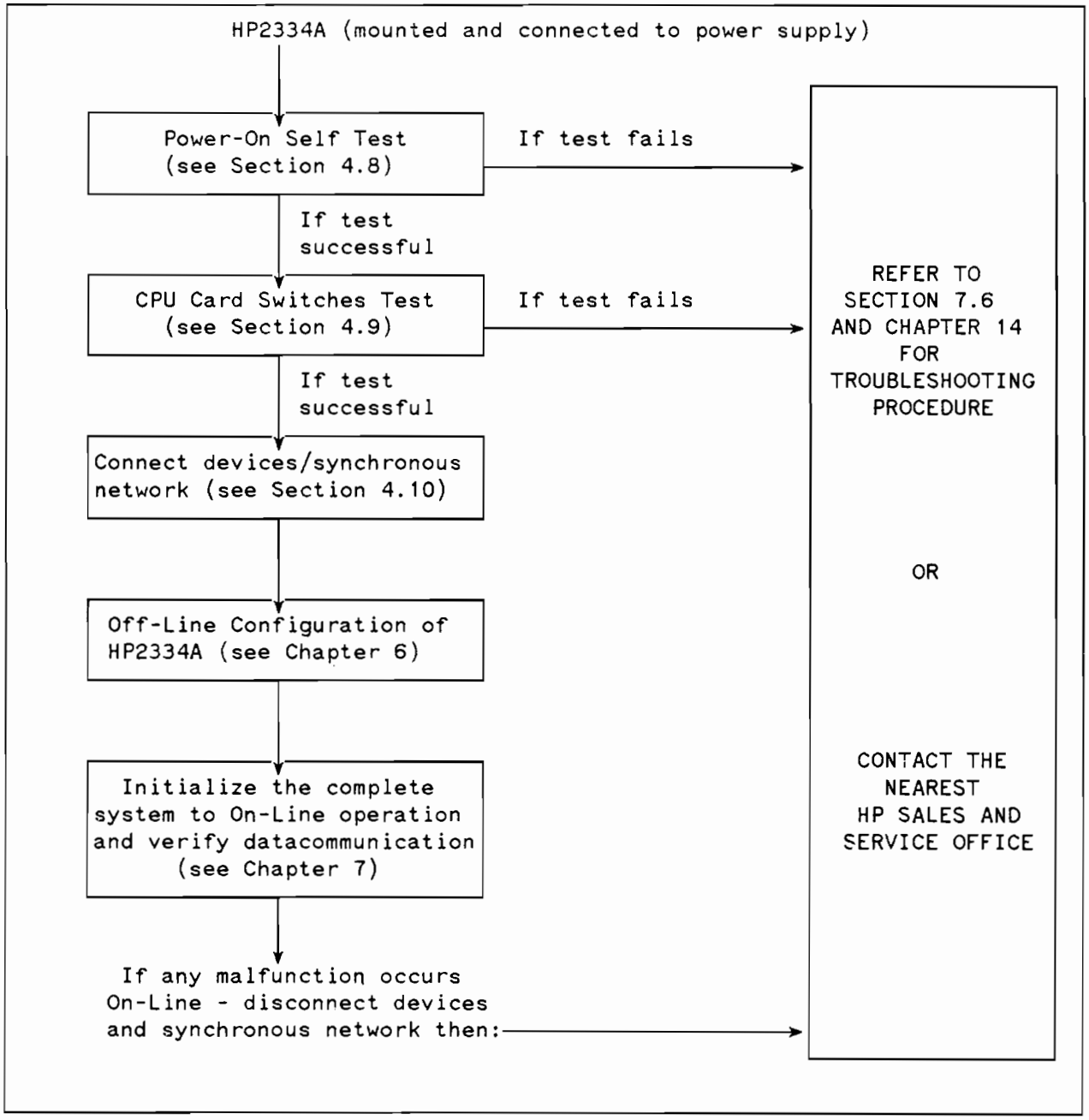



**Figure 4-5 HP2334A Connection and Test Procedure**

## 4.8 POWER-ON SELF TEST

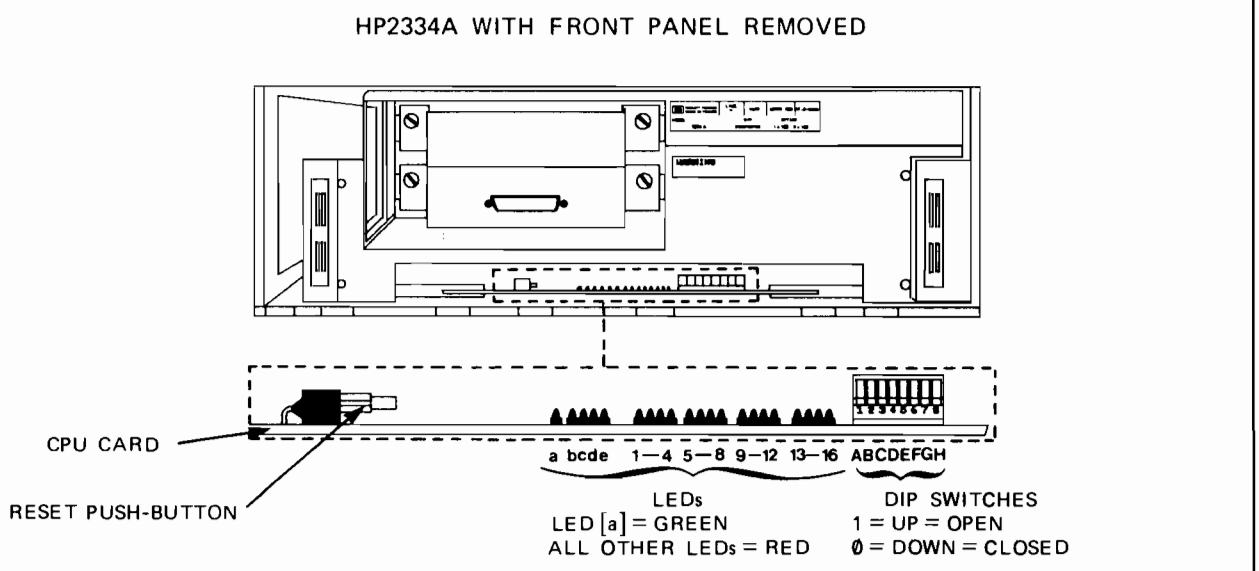



**Figure 4-6 CPU Card LEDs and DIP Switches**

**WARNING**

WHEN THE FRONT PANEL IS REMOVED, DO NOT TOUCH OR REMOVE THE METAL PLATE PROTECTING THE CPU CARD AND POWER SUPPLY AS HIGH VOLTAGES ARE PRESENT BEHIND IT.

At each power-on (or when the CPU Card's reset push-button is pressed) the HP2334A automatically performs a self test that checks the operation of the CPU Card's microprocessor, RAMs, ROMs, DMA, the internal bus circuitry and the Device Interface Cards. If an error is detected, an error indication is displayed on the CPU Card LEDs (see Figure 4-6).

**Preparation.** The HP2334A does not require any preparation in order to perform the power-on test. However, as the CPU card DIP switches may be in any position during the test, it is recommended that they are configured for the CPU Card Switches Test which follows a successful power-on test.

If the power-on test is successful, the HP2334A will then automatically commence the selected test procedure. To select the CPU Card Switches Test, remove the front panel and set the DIP switches (s Figure 4-6) as follows:

| DIP Switch: | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Setting: | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

**Procedure.** To perform the power-on test, simply switch ON the HP2334A (or if it is already ON, press the Reset push-button shown in Figure 4-6).

The Power-On Self Test lasts approximately twenty seconds and causes:

1) All of the 21 LEDs to be ON (illuminated) for one second, then OFF (extinguished) for one second.

2) Then each LED to individually illuminate, starting at LED [a] going through to LED [16] (i.e. one lit LED is propagated from left to right).

3) The self diagnostic tests are then performed with LEDs [d] or [e] ON (illuminated) to indicate which test routine is active (LEDs [a] and [1] to [16] are OFF).

| LED DISPLAY | | | | | TEST |
|---|---|---|---|---|---|
| [a] | [b] | [c] | [d] | [e] | |
| 0 | 0 | 0 | 0 | 1 | - CPU Card Test (10 sec. approx.) |
| 0 | 0 | 0 | 1 | 0 | - Internal Bus and Device Interface Cards Test (3 sec. approx.) |

Where 0 = LED OFF
1 = LED ON

The CPU Card testing is performed first and, if successful, the Internal Bus and Device Interface Cards are then tested.

**Interpretation.** If the tests are SUCCESSFUL, the HP2334A commences the next selected procedure (the CPU Card Switches Test).

If the Power-On Test FAILS due to an error being detected, the HP2334A will halt and provide a failure indication as follows:

- LED [a] remains OFF (extinguished).
- LED [d] or [e] will remain ON (illuminated) indicating the failed test routine.
- LEDs [1] to [16] will provide a display indicating the type of failure (refer to Chapter 14, TROUBLESHOOTING).
- LED [b] ON indicates an invalid DIP switch setting.

If the HP2334A halts due to a failure refer to Section 7.6 "User Troubleshooting" and Chapter 14, TROUBLESHOOTING. If the failure cannot be corrected then contact the nearest HP Sales & Service Office.

## 4.9 CPU CARD SWITCHES TEST

**Preparation.** To select this test, remove the HP2334A's front panel and set the CPU card DIP switches (see Figure 4-6) as follows:

| DIP Switch: | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Setting: | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

If the DIP switches are already set to this configuration, as recommended in the Power On Test preparation (Section 4.8), no further preparation is necessary.

**Procedure.** To perform the CPU Card Switches Test, simply press the Reset push-button (or if the HP2334A is switched OFF, switch it ON). The test causes:

1) The power-on test to be performed as described in Section 4.8.

2) If the power on test is successful, the switches test will commence immediately after the power on test has completed. Note that if the DIP switches are set as shown above, then the CPU Card Switches Test always follows a successful Power-On Self Test (see Section 4.8). The switches test is performed with LED [a] OFF (extinguished) and with LEDs [b] to [e] providing the following display:

| LED DISPLAY | | | | | TEST |
|---|---|---|---|---|---|
| [a] | [b] | [c] | [d] | [e] | |
| 0 | b | b | 1 | 1 | - CPU Card Switches Test |

Where 0 = LED OFF
1 = LED ON
b = LED BLINKING ON/OFF

3) If the test is successful, LEDs [1] to [8] are OFF (extinguished) while LEDs [9] to [16] provide a display which images the position of switches A to H (i.e. an LED is ON (illuminated) when the corresponding DIP switch is set Open (1)). Therefore as the switches ABCDEFGH are set to 00000011, LEDs [9] to [16] should also display 00000011 (i.e. LEDs [15] and [16] ON). To verify the test, toggle Open (1) and Closed (0) switches A to H and check that the corresponding LEDs from [9] to [16] go ON and OFF accordingly.

**Interpretation.** If the test is successful, the HP2334A remains in the switches test mode; i.e. LEDs [b] and [c] blink, LEDs [d] and [e] remain ON (continuously lit) and LEDs [9] to [16] provide a display imaging the position of DIP switches A to H. If the test is successful, the HP2334A may then be connected to the synchronous network and devices as described in Section 4.10. If LEDs [9] to [16] do NOT illuminate in the image of switches A to H, then the switches test has failed. If the test fails due to an error being detected, the HP2334A stops and provides the following display:

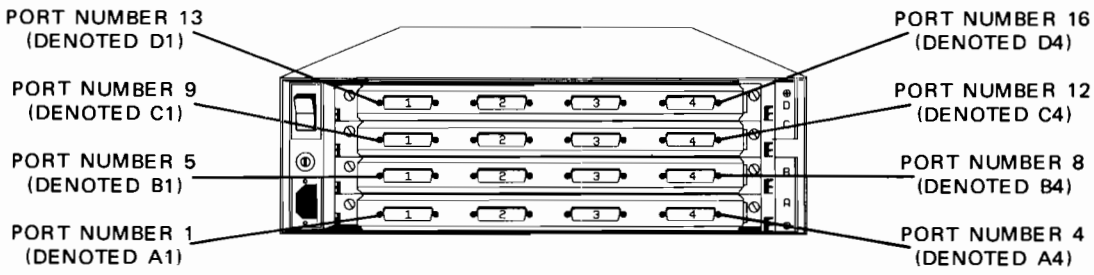
- LED [a] remains OFF (extinguished).
- LEDs [b] and [c] are OFF, and [d] and [e] remain ON (constantly lit).
- LEDs [1] to [16] indicate the reason for the failure (see Table 14-2 for a list of LED error indications).

If the HP2334A stops due to a failure refer to Section 7.6 "User Troubleshooting" and Chapter 14, TROUBLESHOOTING. If the failure cannot be corrected then contact an HP Sales & Service Office.

# 4.10 HP2334 CONNECTION

## 4.10.1 HP2334 to Device Connection

REAR VIEW OF HP2334A SHOWING DEVICE ADAPTER CARD PORTS WHERE 'D', 'C', 'B', AND 'A' ARE THE FOUR CARD SLOT POSITIONS




| PORT NUMBER | 1 2 3 4 | 5 6 7 8 | 9 10 11 12 | 13 14 15 16 | TEST PORT |
|---|---|---|---|---|---|
| DENOTED | A1 A2 A3 A4 | B1 B2 B3 B4 | C1 C2 C3 C4 | D1 D2 D3 D4 | |
| RELATIVE PORT SUB ADDRESS* | 01 02 03 04 | 05 06 07 08 | 09 10 11 12 | 13 14 15 16 | 17 |

*NOTE: THE SUB-ADDRESS (PROVIDED FOR THE SYNCHRONOUS COMMUNICATIONS PROTOCOL) IS AUTOMATICALLY ASSIGNED FOR EACH PORT. THE SUB-ADDRESS BASE IS USER DEFINED AND IS 00 IN THIS EXAMPLE.
THE HP2334A MAIN (LOCAL CLUSTER) ADDRESS MUST BE ASSIGNED BY THE USER WHEN THE HP2334A IS CONFIGURED.

**Figure 4-7 HP2334A Device Adapter Card Port Sub-addresses**

The HP2334A has two types of Device Adapter Card each of which is equipped with four 25-pin FEMALE connectors or ports (see Section 1-7). The applications and uses of the Direct Connect Adapter and Modem Control Adapter cards are detailed in Section 1-7 and cable information is provided in Section 3.5. The available signals for each card are detailed in Tables 4-2 and 4-3.

If asynchronous devices or computer ports are to be connected to the HP2334A via modems then the Modem Control Adapter Card MUST be used. Similarly, if the HP2334A is to be connected to the asynchronous ports of a computer that requires modem control signals to terminate a session (e.g. the HP3000 when SVCs are used), then the Modem Control Adapter Card MUST be used (see subsection 3.5.4).

Using the Modem Control Adapter Card (with modem control signals enabled) ensures that if an accidental line disconnection or any type of SVC clear (user or network generated) occurs then the computer session is correctly terminated. Terminating the session in this way ensures that another user cannot access the computer through an existing session without the required security.

Once the HP2334A has successfully passed the power-on and CPU Card DIP switch tests it may be connected to the device(s). To do this, simply plug the device cable connectors into the relevant rear panel

Device Adapter Card ports (see Figures 4-7 and 4-8), ensuring that all locking screws are tightened. This may be done with the HP2334A switched ON or OFF as required.

- When configuring the HP2334A, a character mode terminal must be connected to device port A1 (see Chapter 6).

- Each device port is automatically assigned a unique device sub-address, required by the HP2334A-to-synchronous network communications protocol (see Figure 4-7). Each device should therefore be plugged into it's correct port in order that the port sub-address matches that assigned to the device by the host computer.

- It is recommended that each device cable connector is labeled with its associated HP2334A device port identity. Then, if the cables are subsequently removed they can easily be replaced in the correct HP2334A device port.

Once the asynchronous devices have been connected, the HP2334A should then be connected to the synchronous network as described in subsection 4.10.2.

**DEVICE ADAPTER CARD PORT SIGNALS**

| CONNECTOR PIN # | CCITT V.24 | FUNCTION | | CONNECTOR PIN FUNCTION |
|---|---|---|---|---|
| 1 | 101 | Protective Ground | | SHIELD GROUND |
| 2 | 103 | Transmit Data | TX | INPUT |
| 3 | 104 | Receive Data | RX | OUTPUT |
| 7 | 102 | Signal Ground | | SIGNAL GROUND |

**Table 4-2 Direct Connect Adapter Card (Device Port) Signals**

| CONNECTOR PIN # | CCITT V.24 | FUNCTION | | CONNECTOR PIN FUNCTION |
|---|---|---|---|---|
| 1 | 101 | Protective Ground | | SHIELD GROUND |
| 2 | 103 | Transmit Data | TX | INPUT |
| 3 | 104 | Receive Data | RX | OUTPUT |
| 4 | 105 | Request to Send | RTS | INPUT |
| 5 | 106 | Clear to Send | CTS | OUTPUT |
| 6 | 107 | Data Set Ready | DSR | OUTPUT |
| 7 | 102 | Signal Ground | | SIGNAL GROUND |
| 8 | 109 | Data Carrier Detect | DCD | OUTPUT |
| 9-19 | - | Not Connected | | - |
| 20 | 108.2 | Data Terminal Ready | DTR | INPUT |
| 21-25 | - | | | - |

**Table 4-3 Modem Control Adapter Card (Device Port) Signals**

**NOTE:** ALL SIGNALS IN TABLES 4-2 AND 4-3 COMPLY WITH CCITT V.24/V.28 RECOMMENDATIONS.

## FUNCTION OF DEVICE ADAPTER CARD PORT SIGNALS

The function of each signal, with reference to Tables 4-2 and 4-3 are as follows:

1) The DTR "ON" indicates to the HP2334A that the DTE (device ) is "ON" and ready for dialogue.

2) The DSR signal indicates to the DTE (device) that the HP2334A is "ON" and ready for dialogue.

3) The RTS "ON" indicates that the DTE (device) wants to transmit data. This signal must remain "ON" as long as the DTE wishes to maintain the communication.

4) The CTS signal indicates to the DTE that transmission may commence.

5) The DCD signal behaves in the same manner as the CTS signal.

6) The RX and TX signals are valid only when RTS and DTR are "ON".

**NOTE: When using the Direct Connect Adapter Card, the HP2334A sets the DSR and CTS signals "ON" automatically when the DTR and RTS signals respectively are "ON" (refer to Fig. 10-5).**

**NOTE: When using the Modem Control Adapter Card (refer to Fig. 10-6), the DCD and CTS state (OFF/ON) depends primarily on two factors (see also Behaviors 1, 2 and 3 below).**

**The two factors are:**

- **The selected Port Profile.**
- **The setting of Local Parameter #14. (See Chapter 6)**

The HP2334A asynchronous port signals exhibit one of the three following types of behavior according to the Device Adapter Card used and the type of configuration and connection:

**Behavior 1:** The DCD and CTS stay continuously "ON".

**Behavior 2:** The DCD and CTS stay continuously "ON" unless the communication is terminated (switched virtual circuit cleared) by either the synchronous network (PSN) or the remote DTE. If this occurs, the HP2334A will drop these signals (OFF) for a period of 5 seconds to enable computer upper level software to terminate the session when the HP2334A is used in a CAS configuration.

**Behavior 3:** The DCD and CTS are set (ON) only if there is a virtual circuit established and will be reset (OFF) if an SVC is cleared.

- A **PAD** configuration may have **Behavior 1 or 2** (default **Behavior 1**).
- A **CAS** configuration may have **Behavior 2 or 3** (default **Behavior 2**).

**NOTE:** When using the Modem Control Card, the modem behavior can be suppressed on a port by setting Local Parameter #14 in the port profile accordingly (refer to subsection 6.7.2).

## 4.10.2 HP2334 to Synchronous Network Connection

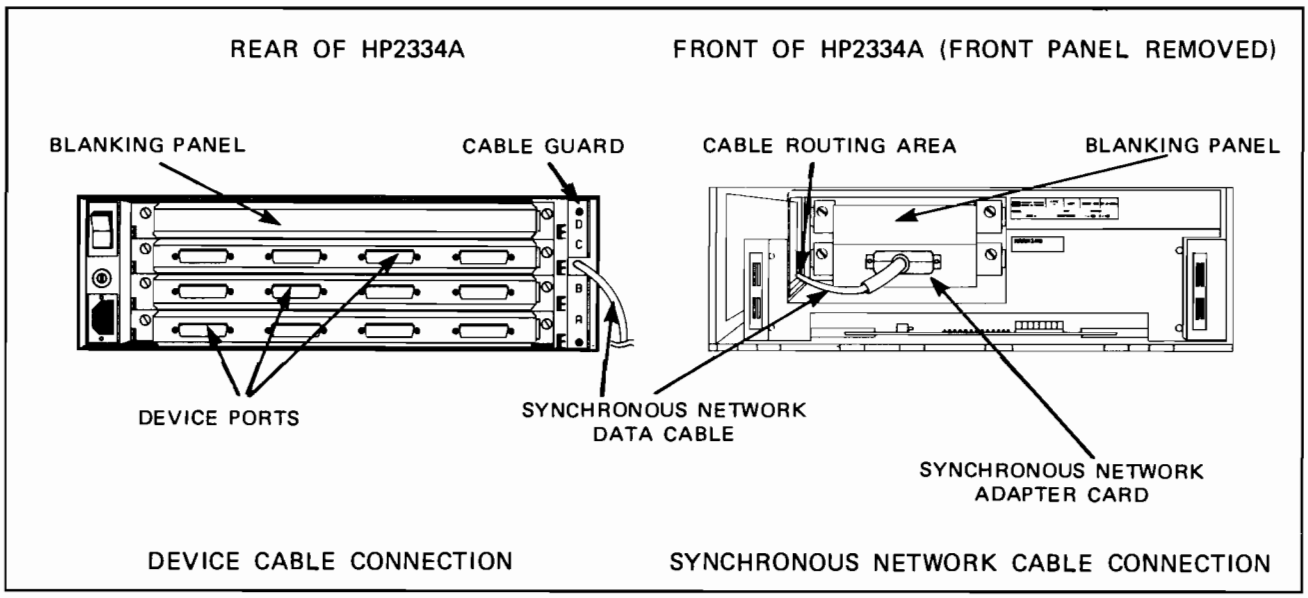



**Figure 4-8 HP2334A to Device and Synchronous Network Connection**

The HP2334A Synchronous Network Adapter Card is equipped with a 25-pin MALE connector or port (type ISO 2110), as it is always the DTE at X.25 Level 1 (electrical level) with reference to the synchronous network. The available signals are detailed in Table 4-4 on the next page.

When the HP2334A has passed its power-on and switches tests, it may be connected to the synchronous network. This is achieved by connecting the supplied HP2334A-to-synchronous network modem cable to the Synchronous Network Adapter Card (as shown in Figure 4-8) and the synchronous network (or PSN) modem.

The connection procedure is as follows:

1) Ensure that the HP2334A is switched OFF, then disconnect the power cord.

2) Remove the HP2334A's front panel.

3) At the rear right-hand of the HP2334A, remove the cable guard (marked D, C, B, A and containing a slot) that is attached to the HP2334A cabinet by two cross-head screws, see Figure 4-8.

**NOTE:** Do NOT remove any of the Device Adapter Cards or blanking panels.

4) Pass the connector of the HP2334A-to-synchronous network modem cable into the data cable routing area (behind the cable guard), as shown in Figure 4-8. This cable (part number: 02333-60008) is supplied with the HP2334A.

5) From the front of the HP2334A, carefully pull the cable through the data cable routing area and then plug the data cable connector into the Synchronous Network Adapter Card connector (see Figure 4-8) and secure it in position by tightening the two locking screws.

6) Ensure that the cable is a loose fit in the routing area. Then replace the front panel.

7) At the rear of the HP2334A, fit the slot in the cable guard over the data cable. Then fit a plastic cable tie (i.e. tie-wrap) through the two holes in the cable guard slot and secure the cable guard (this acts as cable clamp). Re-fit the cable guard at the rear right-hand side of the HP2334A and tighten the two cross- head screws to secure it in position.

8) Replace the power cord and switch ON the HP2334A as required.

The synchronous network (or PSN) modem should be connected and configured according to the manufacturer's instructions. The HP2334A-to-synchronous network communications may then be configured as described in Chapter 6.

| CONNECTOR PIN # | CCITT V.24 | EIA RS-232-C | FUNCTION | | CONNECTOR PIN FUNCTION |
|---|---|---|---|---|---|
| 1 | 101 | AA | Protective Ground | | SHIELD GROUND |
| 2 | 103 | BA | Transmitted Data | Tx | OUTPUT |
| 3 | 104 | BB | Received Data | Rx | INPUT |
| 4 | 105 | CA | Request to Send | RTS | OUTPUT |
| 5 | 106 | CB | Clear To Send | CTS | INPUT |
| 6 | 107 | CC | Data Set Ready | DSR | INPUT |
| 7 | 102 | AB | Signal Ground | | SIGNAL GROUND |
| 8 | 109 | CF | Data Carrier Detect | DCD | INPUT |
| 9-14 | - | - | Not Connected | | - |
| 15 | 114 | DB | Tx Clock Input | TCI | INPUT |
| 16 | - | - | Not Connected | | - |
| 17 | 115 | DD | Rx Clock Input | RCI | INPUT |
| 18-19 | - | - | Not Connected | | - |
| 20 | 108.2 | CD | Data Terminal Ready | DTR | OUTPUT |
| 21 | - | - | Not Connected | | - |
| 22 | - | - | No internal action | | - |
| 23 | 111 | CH | Data Rate Select | DRS | OUTPUT |
| 24 | 113 | DA | Tx Clock Output | TCO | OUTPUT |
| 25 | - | - | No internal action | | - |

**Table 4-4 Synchronous Network Adapter Card (Connector) Signals**

**NOTE**: ALL SIGNALS COMPLY WITH THE CCITT V.24/V.28 RECOMMENDATIONS (X.21BIS AND RS-232-C COMPATIBLE). IN ORDER TO BE COMPATIBLE WITH DIGITAL MODEMS, THE MODEM CONTROL SIGNALS MAY FALL (OFF) FOR A PERIOD OF UP TO ONE SECOND WITHOUT AFFECTING OPERATION OF THE HP2334A AT X.25 LEVEL 2.

# PSN SUBSCRIPTION

CHAPTER 5

## 5.1 INTRODUCTION

This chapter is intended as a brief guide to help the user choose parameter values and facilities when subscribing to a Packet Switching Network (PSN). The required subscription parameters vary from one PSN administration to another, so if a parameter which is shown as "user choice" does not appear on a subscription form it signifies that the PSN uses a defined value.

The parameter values supplied and facilities requested at subscription time must be carefully selected in order that the subsequent PSN connection is cost-effective for the user's applications. Refer to the PSN authority for further information.

The supplied subscription parameters must be recorded (or keep a copy of the subscription form) as this information is essential when initially configuring the HP2334A and for any modifications to the configuration that may be required in the future.

The X.25 Level 1 to 3 parameters and supported PSN facilities are detailed in Section 6.4 with reference to configuration of the HP2334A. For more detailed information refer to the HP publication: *X.25: THE PSN CONNECTION*, part number 5958-3402.

**WARNING:** THE HP2334A MUST BE CONFIGURED WITH ALL THE REQUIRED X.25 PARAMETERS AND FACILITIES IN ACCORDANCE WITH THE VALUES SUBSCRIBED FOR WITH THE PSN AUTHORITY. FACILITIES THAT ARE SUBSCRIBED FOR MUST BE CONFIGURED IN THE HP2334A.

## 5.2 SUBSCRIPTION CHECKLIST

Tables 5-1 and 5-2 provide a quick reference to establish which parameters and facilities must be subscribed for with a PSN. Note that the HP2334A proprietary facilities are also listed in Table 5-2 and that these should not be subscribed for with the PSN. Some of the parameters and facilities shown in the tables have supporting information which may be found in the following subsections.

| PARAMETERS | USER CHOICE (RECOMMENDED VALUE) | USE THE PSN DEFINED VALUE | USE HP2334A DEFAULT VALUE |
|---|---|---|---|
| X.25 LEVEL 1 | | | |
| Line Speed: | X | | |
| Physical Link | Not subscribed | | X (X.21bis) |
| X.25 LEVEL 2 | | | |
| Network Type: | Not subscribed | | |
| Frame Window: | X (7) | | |
| Timer T1: | X (refer to line speed) | X | |
| Retry Counter N2: | Not subscribed | | |
| Equipment Type: | | | X (LAP-B DTE) |
| I Frame: | Not subscribed | | X (131 bytes) |
| X.25 LEVEL 3 | | | |
| Local Address: | | X | |
| Window Size IN : | X (2) | X | |
| OUT: | X (2) | | |
| Throughput IN/OUT: | X (refer to line speed) | | |
| Max. Packet Size IN: | | | X (128) |
| OUT: | | | X (128) |
| Number of PVCs: | X | | |
| First PVC: | X | | |
| Last PVC: | X | | |
| Number of SVCs IN: | X | | |
| First SVC: | X | | |
| Last SVC: | X | | |
| | SEE 5.2.3 | | |
| Number of SVCs 2 WAY: | X | | |
| First SVC: | X | | |
| Last SVC: | X | | |
| Number of SVCs OUT: | X | | |
| First SVC: | X | | |
| Last SVC: | X | | |

**Table 5-1 PSN Levels 1 to 3 Subscription Checklist**

| FACILITIES | PSN SUBSCRIBED | HP2334A SUPPORTED |
|---|---|---|
| Packet/Window Size Neg.: | User Choice | Supported |
| Throughput Negotiation: | User Choice | Supported |
| Reverse Charging Acceptance: | User Choice | Supported |
| D-Bit: | User Choice | Supported |
| Incoming Calls Barred: | User Choice | Supported |
| Outgoing Calls Barred: | User Choice | Supported |
| Automatic D-Bit Modification: | - | Not Supported |
| Fast Select: | - | Not Supported |
| Packet Retransmission: | - | Not Supported |
| Ext. Packet Seq. Numbering: | - | Not Supported |
| RPOA Selection: | - | Not Supported |
| Datagrams: | - | Not Supported |
| PVC Associated Ports: | Not Subscribed | Supported |
| Callable Port Pool: | Not Subscribed | Supported |
| Local User Group: | Not Subscribed | Supported |
| Symbolic Remote Address: | Not Subscribed | Supported |
| Messages: | Not Subscribed | Supported |
| Automatic Dial: | Not Subscribed | Supported |

**Table 5-2 PSN Subscribed and HP2334A Supported Facilities**

## 5.2.1 Level 1 Parameters

**Line Speed.** The only subscription parameter that is normally required is the user choice of the transmission line speed. Some networks may offer a choice of physical link and in this case the X.21bis interface MUST be selected.

The HP2334A supported line speeds are listed in subsection 6.4.1 and the highest PSN supported line speed should normally be selected.

## 5.2.2 Level 2 Parameters

The three parameters which must be subscribed at this level are as follows:

**Frame Window.** The recommended value for this parameter is 7.

**Timer T1.** It is recommended that the value for this parameter be in the range of 1500 to 30000 milliseconds according to the selected line speed (see Timer T1 in subsection 6.4.2).

**Equipment Type.** The equipment type is always "LAP-B DTE" for an HP2334A connected to a PSN.

For further information on Level 2 parameters refer to 6.4.2.

## 5.2.3 Level 3 Parameters

NOTE: Local Address - When subscribing with certain PSNs the user MUST request the use of sub-addressing at subscription time.

The parameters which must be subscribed at this level are as follows:

**Window Size In/Out.** The "window size in" and "window size out" parameters are subscribed parameters with most PSNs. Some PSNs use a default value of 2 for these parameters and the user cannot subscribe for a different value.

The recommended "window size in" parameter and "window size out" parameter value is 2.

**Throughput In/Out.** The parameter values selected must be less than or equal to the line speed selected (see 6.4.3).

**Maximum Packet Size In/Out.** The HP2334A default value (128) must be selected for both the "in" and "out" parameter values.

**PVCs AND SVCs.** The user must first determine the number of PVCs that are required, if any. A PVC is a permanent "association" between a local DTE and a remote DTE.

The number of SVCs that are required and whether they will be used for initiating calls, receiving calls or both initiating and receiving calls must then be determined. The simplest solution is to subscribe for the required number of 2-way SVCs. Alternatively the SVCs can be split into the required number of each category according to the Logical Channel Number assignment rules detailed in subsection 6.4.3.

NOTE: In order to have full access to the HP2334A Test Port at least one incoming SVC plus one outgoing SVC or two 2-way SVCs are required.

For further information on Level 3 parameters refer to subsection 6.4.3.

NOTE: When the HP2334A is to be used in X.25 Stat Mux Configuration, it is recommended that any printer-connected device ports are either assigned PVCs or (if the Modem Control Adapter Card is used) are configured with the ADL facility (see Section 6.8) if SVCs are to be used.

## 5.3 FACILITIES

The optional user facilities which may be provided by the various PSNs are shown in the first section of Table 5-2. The facilities which are supported by the HP2334A may be requested by the user at PSN subscription time. Some of these facilities will be in effect on all virtual circuits (VCs) at all times, others may be requested on a per-call basis.

The facilities listed in Table 5-2 which are not supported by the HP2334A should NOT be subscribed for with the PSN authority.

The supported facilities which when subscribed for are effective on all VCs are as follows:

- Packet Size Negotiation
- Window Size Negotiation
- Throughput (class) Negotiation
- Reverse Charging Acceptance
- D-Bit (end-to-end acknowledgement)

The only supported facilities which need to be requested on a per-call basis are as follows:

- Reverse Charging Request
- PSN Closed User Group (CUG) Access

To summarize, if a facility is NOT required do NOT subscribe for it. Except when negotiation facilities are required (to negotiate a defined PSN parameter value to the HP2334A default parameter value) the only recommended facility to subscribe for is the Reverse Charging Acceptance facility when this is required.

# CONFIGURATION

CHAPTER 6


## 6.1 INTRODUCTION

The HP2334A must be configured with the synchronous network (or PSN) X.25 parameters to enable communication across the synchronous network and the asynchronous protocol (by assigning PAD parameter values) for communication with connected asynchronous devices (or computer ports).

These communication parameters must initially be defined off-line (i.e. when not communicating with the synchronous network or devices). They are saved automatically in non-volatile (permanent) memory so that the HP2334A does not require the configuration process each time it is powered-on.

The off-line configuration (or reconfiguration) of the HP2334A is normally performed using a terminal which is directly connected to the HP2334A device port A1 (refer to 6.2.1, "Preparation"). Alternatively the off-line configuration (or reconfiguration) may be performed from a remote location by connecting the remote terminal to the HP2334A device port A1 via a pair of asynchronous modems and a telephone line (see 6.1.1, "Remote Off-Line Configuration").

The HP2334A may be physically connected to the synchronous network and the asynchronous devices as required during the off-line configuration (or reconfiguration) procedure except for the port A1.

For a description of how to enter CONFIGURE mode refer to Section 6.2. The synchronous network configuration is described in Section 6.3 and for details of the configuration levels refer to Sections 6.4 and 6.5. The asynchronous ports profile configuration is described in Section 6.6 together with details of the PAD profiles and the procedure for creating user defined profiles (UDPs). For information on the PAD profile parameters refer to Section 6.7. The automatic dial (auto call) and port disable facilities are described in Section 6.8 and the LIST command in Section 6.9. Some configuration examples are given in Section 6.10.

For information on how to perform on-line modification of the HP2334A configuration refer to Chapter 8, "Using the Test Port".

## 6.1.1 Remote Off-Line Configuration

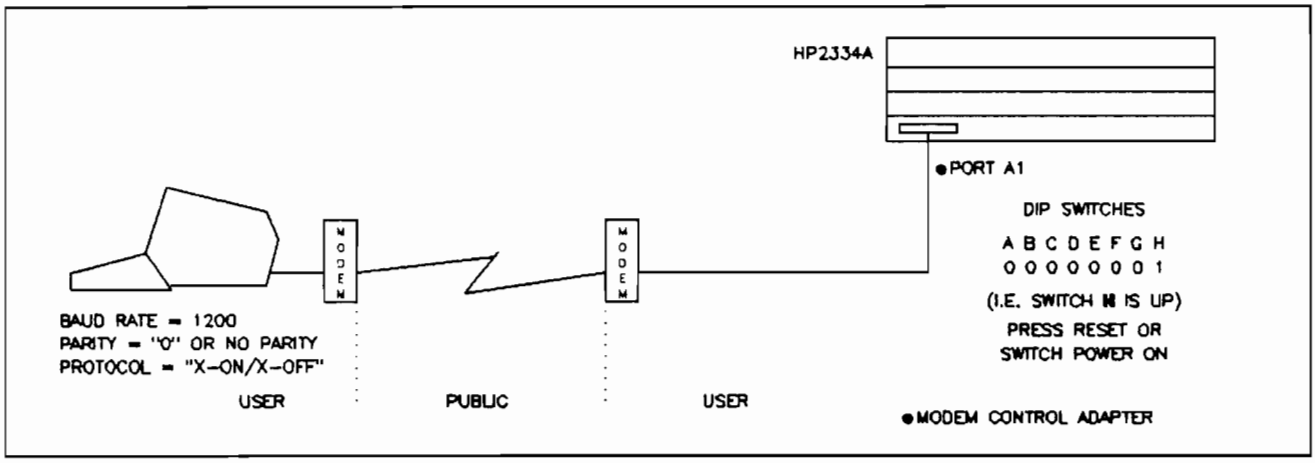



**Figure 6-1 HP2334A Remote Off-Line Configuration**

The off-line configuration may be performed remotely by connecting a terminal to port A1 of the HP2334A via a telephone line and two full duplex, asynchronous modems (at 1200 baud) as shown in Figure 6-1. An operator is required at the HP2334A location to perform certain simple actions (DIP switch setting, power-on/reset and reading the LEDs) and a second telephone line is necessary for conveying verbal instructions.

This is an important feature as it enables, for example, an experienced operator to perform off-line configuration of HP2334As located at multiple remote sites (branch offices) without leaving the company headquarters.

The Modem Control Adapter Card must be used to provide ports A1 to A4 as remote configuration requires the use of asynchronous modems between the terminal and device port A1. Once communication is established between the terminal and the HP2334A, the preparation and configuration procedure is the same as when configuring the HP2334A locally (see 6.2.1).

## 6.2 ENTERING CONFIGURATION MODE

### 6.2.1 Preparation

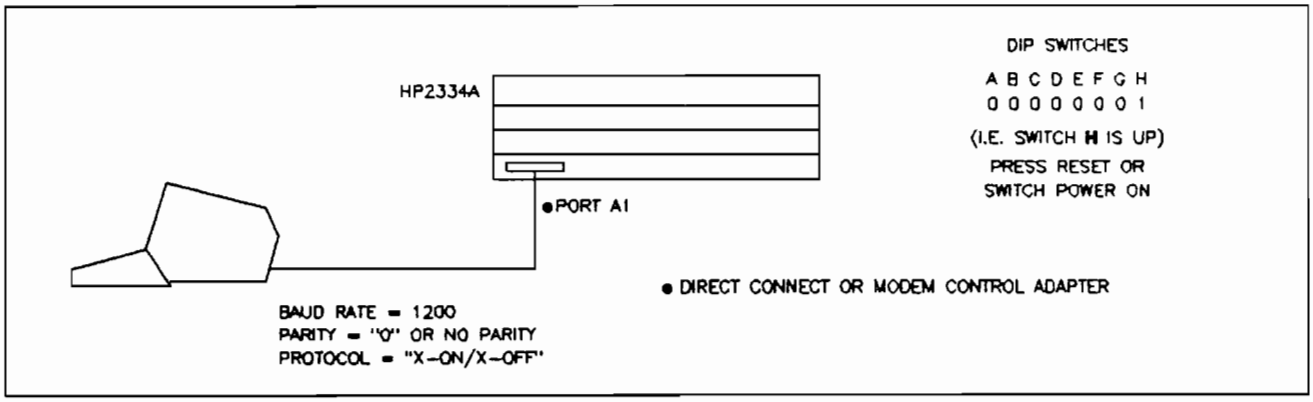



**Figure 6-2 HP2334A Local Off-Line Configuration**

The HP2334A should be prepared for off-line configuration as follows:

1) Connect an HP character mode interactive terminal to device port A1. All other asynchronous devices may remain connected as required. The synchronous network may remain connected as required.

2) Set the terminal as follows:

   a) BAUD RATE - 1200 baud.
   b) DATA BITS - 7.
   c) PARITY - set for "0" or no parity.
   d) X-ON/X-OFF Handshake - ENABLED.
   e) FULL DUPLEX.
   f) REMOTE mode.
   g) Automatic Line Feed - DISABLED.
   h) CHARACTER mode (BLOCK mode OFF).

3) Set the HP2334A to CONFIGURE mode by setting the CPU Card DIP switches as follows:

```
DIP Switch: A  B  C  D  E  F  G  H
   Setting: X  X  X  X  0  0  0  1    Where: 0 = DOWN / OFF
                                             1 = UP / ON
                                             X = ON or OFF
```

Switches ABCD may be set as required; refer to Table 14-2.

**NOTE**

WHEN THE HP2334A IS IN CONFIGURE MODE ONLY PORT A1 IS ENABLED AND IT IS PRECONFIGURED AT 1200 BAUD.

## 6.2.2 Procedure

To enter CONFIGURE mode, simply press the CPU Card's reset push-button (or if the HP2334A is switched OFF, switch it ON).

This causes:

1) The power-on test to be performed as described in Section 4.8.

2) If the power-on test is successful, the HP2334A enters the CONFIGURE mode and the LEDs illuminate as follows:

```
          LED DISPLAY                    MODE
[a]   [b]   [c]   [d]   [e]
 1     b     b     0     0     - CONFIGURE

                                Where 0 = LED OFF
                                      1 = LED ON
                                      b = LED BLINKING ON/OFF (AFTER
                                          CONFIGURATION LISTING)
```

In addition, while the HP2334A is being configured LED [1] will be ON (illuminated) as only port A1 is recognized while the HP2334A is in CONFIGURE mode.

If the LEDs do not illuminate in this manner then refer to Chapter 14, TROUBLESHOOTING.

3) The HP2334A automatically provides the initial off-line configuration listing as shown in 6.2.3, Example 1. If the HP2334A has previously been configured, then the off-line configuration listing appears like Example 2 (but with different parameter values) and provides the HP2334A's current configuration.

The off-line configuration message lists the configuration in the following order:

- The HP2334A-to-Synchronous Network (X.25) configuration (see HSA).
- The HP2334A-to-Device (X.3 parameters) configuration (see ASG). This shows the "profile" assigned to each port.
- The hardware installed in the HP2334A. This details the ROMs fitted on the CPU Card and is followed by Device Interface and Adapter Card information. Note that no data will be displayed if a Device Adapter Card is not fitted in the associated position (e.g. slot D). The Device Adapter Cards fitted to the HP2334A may be identified as follows:

  The Direct Connect Adapter Card is shown as: RS232C 4 ports.

  The Modem Control Adapter Card is shown as: RS232MOD 4 ports.

4) The HP2334A then provides an asterisk (*) prompt and waits for the user's configuration command. For a list of the configuration commands see 6.2.4, "Off-Line Configuration Commands".

## 6.2.3 Configuration Listings

**HP2334A INITIAL CONFIGURATION LISTING - EXAMPLE 1**

```
                                HP2334A Multimux
                               ------------------

Configuration Mode:

HSA    02334-80320    02334-80330
 HP2334   CONFIGURATION X.25 LEVEL I
       ------------------------------------------------------------
       -
       ------------------------------------------------------------

 HP2334   CONFIGURATION X.25 LEVEL II
       ------------------------------------------------------------
       -
       ------------------------------------------------------------

 HP2334   CONFIGURATION X.25 LEVEL III
       ------------------------------------------------------------
       -
       ------------------------------------------------------------

 HP2334   CONFIGURATION X.25 LUG
       ------------------------------------------------------------
       -REMOTE ADDRESS
       ------------------------------------------------------------

 HP2334   CONFIGURATION X.25 SRA
       ------------------------------------------------------------
       -REMOTE ADDRESS
       ------------------------------------------------------------
ASG
    Assignment for each port

          1    2    3    4

    D     1    1    1    1
    C     1    1    1    1
    B     1    1    1    1
    A     1    1    1    1

       ------------------------------------------------------------
CPU    02334-80300 . 02334-80310 .
SC-D               .             .
SC-C               .             .
SC-B               .             .
SC-A   05180-2039  . 05180-2040  . RS232MOD4 ports
```

## HP2334A CONFIGURATION LISTING - EXAMPLE 2

```
                              HP2334 Multimux
                             -----------------

Configuration Mode:

HSA    02334-80320 . 02334-80330
 HP2334  CONFIGURATION  X.25  LEVEL  I

       ------------------------------------------------------------
       -PHYS. LINK  : X.21bis DTE          -LINE SPEED  : 9600
       ------------------------------------------------------------

 HP2334  CONFIGURATION  X.25  LEVEL  II

       ------------------------------------------------------------
       -NETWORK TYPE: NET,0                -EQUIP. TYPE : LAP-B DTE
       -WINDOW SIZE : 7                    -TIMER T1    : 1600 ms
       -RET. CNT N2 : 20                   -I-FRAME     : 131 bytes
       ------------------------------------------------------------

 HP2334  CONFIGURATION X.25  LEVEL III

       ------------------------------------------------------------
       -LOCAL ADDRESS : 12345678900
       -WIND. SIZE IN : 2                  -WIND. SIZE OUT: 2
       -THROUGHPUT IN : 9600               -THROUGHPUT OUT: 9600
       -PACK. SIZE IN : 128                -PACK. SIZE OUT: 128
       -FIRST PVC     : 1                  -LAST  PVC     : 1
       -FIRST  SVC IN :                    -LAST  SVC IN  :
       -FIRST  2W SVC : 2                  -LAST   2W SVC : 6
       -FIRST  SVC OUT:                    -LAST  SVC OUT :
       -FIRST POOL PRT: A2                 -LAST POOL PRT : A4
       -D-BIT         : NO
       -PKT. NUMBERING: 8
       -FAC. SUPPORTED:                  RV.CGA
       -PVC ASSOC. PRT: 1:A1
       ------------------------------------------------------------

HP2334 CONFIGURATION  X.25  LUG

       ------------------------------------------------------------
       -REMOTE ADDRESS
       -06XXXXXXXXXXX
       -38XXX324677653
       -3456664XX234
       ------------------------------------------------------------
```

**continued overpage...**

...continued

```
HP2334 CONFIGURATION  X.25  SRA
       ------------------------------------------------------------
       -REMOTE ADDRESS
       -138012345<---PARIS
       -0311031234567<---SAN-FRAN
       ------------------------------------------------------------

ASG
    Assignment for HSA

    D   1   1   1   1
    C   1   1   1   1
    B   1   1   1   1
    A   1   1   1   1

        1   2   3   4

       ------------------------------------------------------------

CPU    02334-80300 . 02334-80310 .
SC-D               .             .
SC-C               .             .
SC-B               .             .
SC-A   05180-2039  . 05180-2040  . RS232C  4 ports
```

In Configuration Listing Examples 1 and 2 one Synchronous Network Adapter Card, one Device Interface Card (4 Channel Processor Card) and one Device Adapter Card have been fitted. In these examples:

1) HSA refers to the Synchronous Network Adapter Card fitted in slot "A" of the Network Adapter Backplane. The two part numbers listed adjacent to HSA refer to two ROMs fitted to the CPU Card (i.e. the current firmware revision).

2) Certain parameters in X.25 Level 1 to Level 3 (shown in Example 2) are pre-selected and cannot be changed by the user. These parameters (together with user defined parameters) are only listed once the HP2334A has been configured (see Section 6.3).

3) The two part numbers listed adjacent to CPU refer to the two more ROMs fitted to the CPU Card (i.e. the current firmware revision).

4) The parameters SC-D, SC-C, SC-B and SC-A refer to the Device Interface Cards (4 Channel Processor Cards) fitted in slots D, C, B and A respectively on the Main Backplane. They list:

   - The part numbers of the ROMs fitted on the Device Interface Card(s) (i.e. each card's current firmware revision).

   - The associated Device Adapter Cards fitted to the HP2334A. These may be identified as follows:

     The Direct Connect Adapter Card is shown as: RS232C 4 ports.

     The Modem Control Adapter Card is shown as: RS232MOD 4 ports.

## 6.2.4 Off-Line Configuration Commands

In CONFIGURE mode the HP2334A provides a current (or an initial) configuration listing, followed by an asterisk (*) prompt which allows the user to enter one of the following primary commands:

| PROMPT | COMMAND | ACTION |
|---|---|---|
| * | HSA [RETURN] | Configure Synchronous Network parameters. |
| * | ASG [RETURN] | Assign a profile for each port. |
| * | LIST [RETURN] | Lists the Synchronous Network configuration, the device port profile assignments and the hardware/firmware installed in the HP2334A. |
| * | ADL [RETURN] | Assign automatic dial for each port. |
| * | UDP [RETURN] | Create a user defined profile. |

Note that [RETURN] represents the character Carriage Return (Cr) generated by pressing the terminal's [RETURN] key and that the HSA, ASG, ADL and UDP commands each have a subset of secondary user commands (see 6.3.2, 6.6.2 and 6.8.1 respectively).

The Configuration Listing (Example 1 or 2 in 6.2.3) which is displayed on entering CONFIGURE mode is identical to that displayed in response to the command * LIST. Similarly, the main configuration levels (e.g. X.25 Level 3) are listed in the same way by using the corresponding HSA: LIST command (e.g. HSA: LIST3) as detailed in 6.3.2.

**NOTE**: Editing is allowed during off-line configuration; the character delete and line delete characters are "Backspace" and "Control-X" respectively.

# 6.3 SYNCHRONOUS NETWORK CONFIGURATION

## 6.3.1 Introduction

In order to configure the HP2334A-to-synchronous network data communication parameters, the HP2334A must be prepared as described in 6.2.1 and must be in CONFIGURE mode as described in 6.2.2.

Using an interactive terminal connected to device port A1, the HP2334A-to-synchronous network configuration may then be defined using the HSA primary command. This command allows the user to configure all the X.25 parameters (Levels 1, 2 and 3) and is also used for configuring the Messages (including a Test port password), Symbolic Remote Address (SRA) and Local User Group (LUG) facilities.

Once the configuration has been listed and the user asterisk (*) prompt is obtained, the command should be entered as follows:

```
* HSA (RETURN)
```

The HSA command refers to the Synchronous Network Adapter Card mounted in slot "A" of the Network Adapter Backplane (the only card fitted) and (RETURN) is the carriage return (Cr) character generated by pressing the terminal's (RETURN) key.

The HP2334A then enters the synchronous network configuration definition mode and displays on the terminal the user prompt:

```
HSA:
```

The HSA secondary user commands detailed in 6.3.2 are then available for use.

## 6.3.2 HSA User Commands

The following HSA secondary user commands are available for use once the HSA: prompt has been obtained:

| PROMPT | COMMAND | ACTION |
|---|---|---|
| HSA: | LEVEL1 [RETURN] | Configure X.25 Level 1 parameters |
| HSA: | LEVEL2 [RETURN] | Configure X.25 Level 2 parameters |
| HSA: | LEVEL3 [RETURN] | Configure X.25 Level 3 parameters |
| HSA: | MSG [RETURN] | Configure internal messages |
| HSA: | LUG [RETURN] | Define Local User Group |
| HSA: | SRA [RETURN] | Define Symbolic Remote Address |
| HSA: | LIST1 [RETURN] | List X.25 Level 1 parameter values |
| HSA: | LIST2 [RETURN] | List X.25 Level 2 parameter values |
| HSA: | LIST3 [RETURN] | List X.25 Level 3 parameter values |
| HSA: | LISTMSG [RETURN] | List internal messages |
| HSA: | LISTLUG [RETURN] | List Local User Group |
| HSA: | LISTSRA [RETURN] | List Symbolic Remote Address definition |
| HSA: | [RETURN] | Exit (returns the CONFIGURE asterisk (*) prompt) |

Note that the first six of the above HSA secondary commands are used for parameter configuration/definition and the following six are used to list the corresponding configured parameters. Simply pressing the terminal's [RETURN] key enables the user to exit from the synchronous network configuration definition mode and the HP2334A then returns the CONFIGURE asterisk (*) prompt.

## 6.3.3 Configuration Procedure

Once the HSA: prompt has been obtained as described in 6.3.1 the appropriate HSA secondary commands must be entered to configure the X.25 levels and facilities in the order shown in 6.3.4, "Configuration Dialogue Example". Certain configuration parameters (e.g. Packet Size) are preconfigured in the HP2334A. The HP2334A does not provide a prompt for these parameters and they cannot be changed by the user.

The HP2334A responds to each secondary command by displaying a series of configuration parameter prompts (questions), providing a new prompt each time the user inputs a valid response (value) until the configuration cycle is complete. Note that the configuration can only be set in the sequence shown and that all responses must be terminated and correctly assigned values validated by pressing the terminal's [RETURN] key. Thus if a parameter value has to be changed then the complete sequence (e.g. Level III) must be repeated.

When entering a value to a parameter question, the Backspace key (or Cancel) may be used to correct an error. If a configuration parameter is entered with a syntax error then the HP2334A responds with an "ERR" error message and repeats the prompt in order that the parameter can be correctly re-entered.

If the HP2334A is being configured for the first time, ALL the X.25 Level 1, 2 and 3 parameter questions MUST be answered. In subsequent changes to the configuration, if any parameter (except virtual circuits) does not need to be changed then simply pressing the terminal's [RETURN] key validates the existing parameter value. When assigning virtual circuits, a carriage return (Cr) (generated by pressing [RETURN]) in response to a prompt (question) means that there are no virtual circuits of the defined type.

X.25 Levels 1 to 3 are implemented according to the X.25 Recommendation. Details of the X.25 Level 1 to 3 parameters and user facilities (e.g. Reverse Charge acceptance) are detailed in Section 6.4. For details of the HP2334A Messages (MSG), Local User Group (LUG) and Symbolic Remote Address (SRA) facilities refer to Section 6.5.

The values and responses selected when configuring the HP2334A synchronous network communication parameters MUST match those defined at the remote location (e.g. the other HP2334A in a Stat Mux configured non-PSN network) or subscribed for with the PSN authority.

When all the levels and facilities have been configured, it is recommended to check that all parameter values have been correctly assigned by using the relevant LIST secondary command detailed in 6.3.2.

## 6.3.4 Configuration Dialogue Example

| CONFIGURATION PARAMETERS | COMMENTS |
|---|---|
| DIALOGUE FOR LEVEL 1 CONFIGURATION: | |
| **HSA:** LEVEL1 RETURN | |
| **Line_Speed?** | |
| 1200, 2400, 4800, 9600, 19200. RETURN | *Specify the data transmission rate on the synchronous network connection (in bps).* |
| **HSA:** | |
| DIALOGUE FOR LEVEL 2 CONFIGURATION: | |
| **HSA:** LEVEL2 RETURN | |
| **NTK_type?** | |
| | *Specify the type of network:* |
| TEL | - *(for TELENET)* |
| DTX | - *(for DATEX-P)* |
| NTS,XX | - *(for PSNs without subaddress)* |
| NET,XX | - *(ALL other PSNs; HP2334A is a DTE)* |
| DCE,XX RETURN | - *(no PSN; HP2334A is a DCE)* |
| | *NOTE: XX represents the number of digits of the called address in an incoming call (excluding sub-address).* |
| **Frame_window?** | |
| 1,2,3,4,5,6,7 RETURN | *Specify the window size at frame level (parameter **k**).* |
| **Timer_T1?** | |
| 1000 - 30000 RETURN | *Specify the frame timeout in milliseconds (ms).* |
| **HSA:** | |

CONFIGURATION PARAMETERS | COMMENTS

DIALOGUE FOR LEVEL 3 CONFIGURATION:

HSA: LEVEL3
RETURN

Local_Address?

(nnnnnnnnnnnnnnn)
RETURN

*Specify the local network address of the HP2334A + relative sub-address base (up to 15 digits).*

Throughput_In?

75, 150, 300, 600,
1200, 2400, 4800,
9600, 19200.
RETURN

*Specify the throughput class in (03 to 11). Must be <= line speed.*

Throughput_Out?

75, 150, 300, 600,
1200, 2400, 4800,
9600, 19200.
RETURN

*Specify the throughput class out (03 to 11). Must be <= line speed.*

Window_Size_In?

1,2,3,4,5,6,7
RETURN

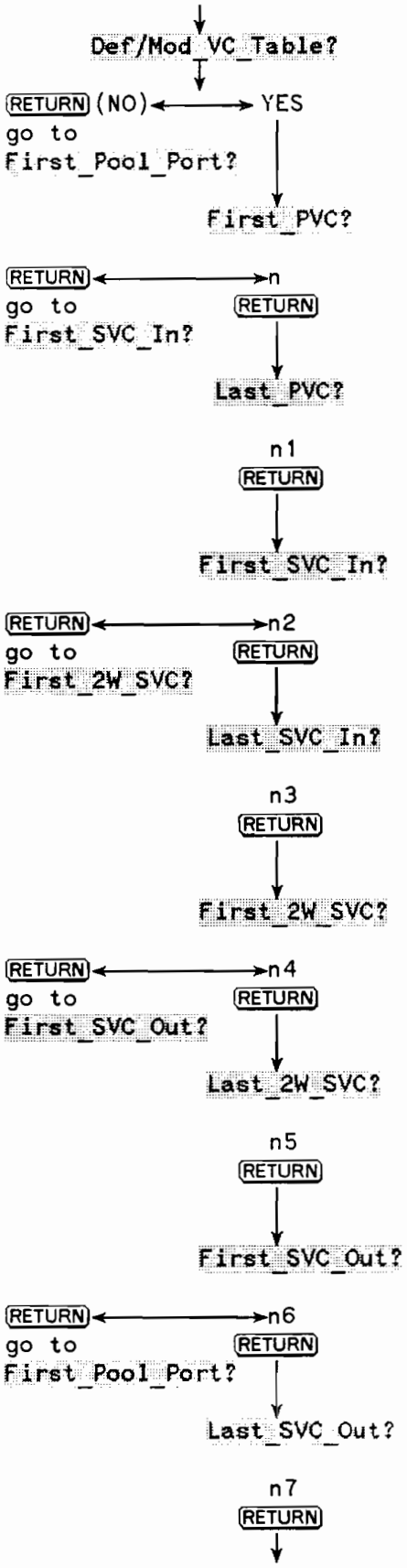
*Specify the window size from the network to the HP2334A.*

Window_Size_Out?

1,2,3,4,5,6,7
RETURN

*Specify the window size from the HP2334A to the network.*

continued on next page:




*Specify if user wants to define or modify the Virtual Circuit Table.*

*Specify the first PVC to start at LCN = n; n is PSN assigned or is user defined in a private link. If 16 PVCs defined, next prompt is:* First_SVC_In?

*Specify the last PVC to be at LCN = n1 (up to 16 PVCs)*

*Specify the first SVC IN to start at LIC = n2 (LCN < n2 < 4096)*

*Specify the last SVC IN to be at HIC = n3 (LIC < n3 < 4096)*

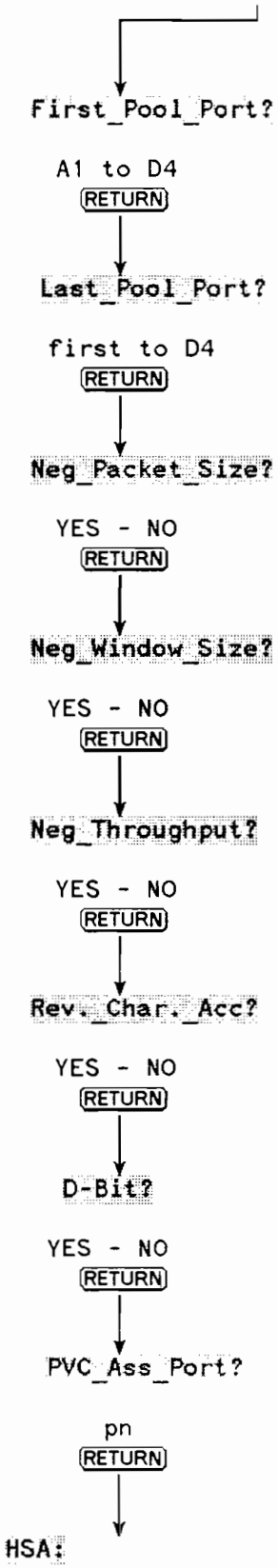
*Specify the first 2W SVC to start at LTC = n4 (HIC < n4 < 4096)*

*Specify the last 2W SVC to be at HTC = n5 (LTC < n5 < 4096)*

*Specify the first SVC Out to start at LOC = n6 (HTC < n6 < 4096)*

*Specify the last SVC Out to be at HOC = n7 (HTC < n7 < 4096)*

continued from previous page:




*Specify the first port of the callable port pool.*

*Specify the last port of the callable port pool.*

*Specify if HP2334A is to negotiate packet size on each call.*

*Specify if HP2334A is to negotiate window size on each call.*

*Specify if HP2334A is to negotiate throughput class on each call.*

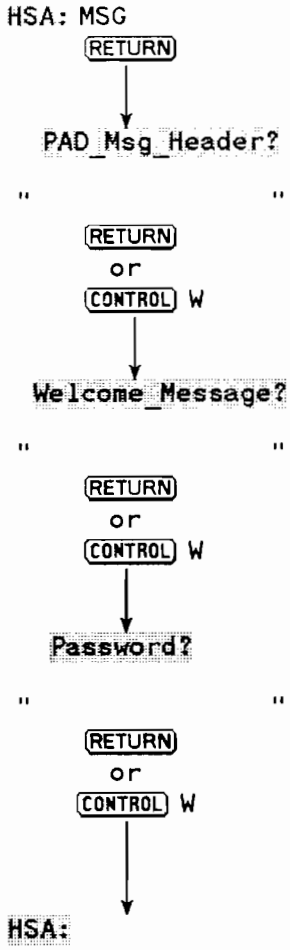
*Specify if HP2334A is to accept reverse charge calls.*

*Specify if HP2334A is to use end-to-end acknowledgement on each call*

*Asked only if PVCs are defined and repeated for each PVC (up to 16). Specify the port associated with each PVC; where p=A|B|C|D, n=1|2|3|4*

CONFIGURATION PARAMETERS | COMMENTS

DIALOGUE FOR MSG CONFIGURATION:




*Specify the PAD Message Header (up to 10 characters) displayed before a PAD message(CLR or RESET). Press Cntrl-W if no message. Press* RETURN *to keep the existing message.*

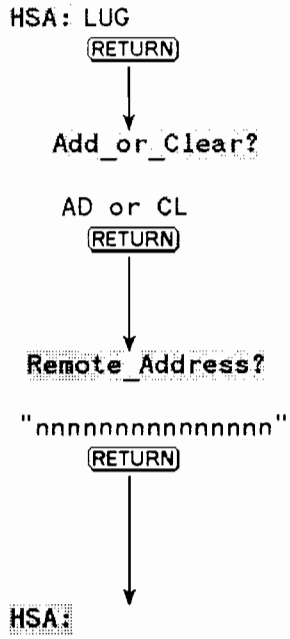
*Specify the PAD Identification Service Signal (up to 20 characters) displayed on power-on or reset in RUN mode. Press Cntrl-W if no message. Press* RETURN *to keep the existing message.*

*Specify the password for the Test Port (up to 10 characters). Press Cntrl-W if no password. Press* RETURN *to keep the existing password.*

CONFIGURATION PARAMETERS | COMMENTS

DIALOGUE FOR LOCAL USER GROUP CONFIGURATION:

---



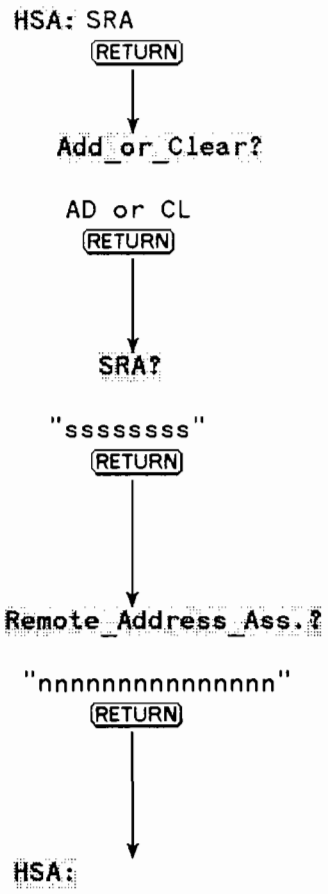

*Specify if user wants to add to or redefine the LUG list. AD = Adds, CL = Clears ALL and prompts for new inputs.*

*Specify the remote DTE address to be added to the list (up to 15 digits); n = 0 to 9 or X (X = don't care value). The prompt is repeated (up to 16 filters can be defined), n = RETURN to exit.*

CONFIGURATION PARAMETERS | COMMENTS

DIALOGUE FOR SYMBOLIC REMOTE ADDRESS CONFIGURATION:

---




*Specify if user wants to add to or redefine the SRA list. AD = Add, CL = Clears ALL and prompts for new inputs.*

*Specify the symbolic name of remote DTE to be added to the list (up to 8 chars); s = any character in IA5 cols 2 to 7 (not "," "+" or "Cr") or RETURN to exit. The prompt is repeated (up to 16) after the Remote Address Ass? is defined.*

*Specify the remote DTE address which is associated to the symbolic name (up to 15 digits); n = 0 to 9. The SRA prompt is then repeated (up to 16 SRAs can be defined).*

# 6.4 X.25 CONFIGURATION LEVELS

## 6.4.1 X.25 Level 1

X.25 Level 1 defines the physical, electrical and handshake characteristics between the HP2334A and the synchronous network. At Level 1 there is one user selectable parameter and one pre-selected parameter as follows:

**User Selectable Parameter (HSA: LEVEL1).**

- LINE SPEED. The only user selectable parameter value is for the line speed which determines the data transmission rate between the HP2334A and the synchronous network in bits per second (bps). Note that the configured line speed must always be greater than or equal to the highest asynchronous line speed for the connected asynchronous devices.

  The following line speeds are available:

  | | |
  |---|---|
  | 1200 bps | 9600 bps |
  | 2400 bps | 19200 bps |
  | 4800 bps | |

  When connected to a PSN or any synchronous modem, the HP2334A will support any line speed up to 19200 bps when the timing signals are provided by the modem. The HP2334A should then be configured with the line speed closest to the modem speed (e.g. modem speed = 12000 bps; configure the line speed at 9600 bps).

  Where the HP2334A is required to provide a timing signal (e.g. on a private X.25 network using direct (modem suppresser) cable connections), the internal clock (on pin 24) offers the following speeds according to the configured line speed value:

  4800 bps
  9600 bps
  19200 bps

**Pre-selected Parameter.**

- PHYSICAL LINK. The pre-selected parameter value for the physical link is always X.21bis DTE for the HP2334A.

## 6.4.2 X.25 Level 2

The HP2334A implements LAP-B (Link Access Protocol - Balanced) at Level 2 as described in the CCITT X.25 Recommendation. The Level 2 parameters define the link level protocol between the HP2334A and the synchronous network.

**User Selectable Parameters (HSA: LEVEL2).** Three parameters are user selectable as follows:

- NETWORK TYPE. This parameter identifies the type of synchronous network that the HP2334A is connected to. The synchronous network may be a PSN (see Section 1.8 for a list of PSNs that the HP2334A is certified for use with) or a private X.25 network. When configuring the HP2334A, the network types fall into five categories; these are as follows:

```
1)  TEL      - TELENET (U.S.A.) only.
2)  DTX      - DATEX-P (Germany) only.
3)  NTS,XX   - For all PSNs which do not support sub-address.
4)  NET,XX   - For ALL other networks (PSNs or modem-link networks)
               where the HP2334A is a DTE (see NOTE below).
5)  DCE,XX   - For non-PSN networks only; when the HP2334A is a DCE
               (see NOTE below and STAT MUX configuration, Chapter 2).

               Where XX represents the number of digits of the called
               address in an incoming call.
```

The HP2334A supports two digits of sub-address (sub-address of the called or calling port) and if it is to be used with a PSN which does not support sub-addressing then network type 3) must be specified.

The number of digits in the HP2334A main (local cluster) address must be specified when configuring network types 3), 4) and 5). For types 3) and 4) this may be determined from the number of digits in the called address in an incoming call packet (or see Appendix C).

**NOTE:** When a Stat Mux Configuration (without PSN) is used, one HP2334A (can be either) must be configured as NET,XX and the other as DCE,XX; where XX is the number of digits (without sub-address) that must be entered to call the HP2334A. Thus if XX = 0 (recommended for Stat Mux Configurations) then only a sub-address needs to be entered to be connected to a specific port of the called HP2334A.

For further information on the HP2334A main and sub-addresses refer to the X.25 Level 3 parameter "Local Address" and Appendix C.

**NOTE:** Certain PSNs (e.g. TRANSPAC) do not include the called address in an incoming call packet. In this case XX must be configured with a value of "0".

FRAME WINDOW (parameter K). The frame window parameter allows the user to select the number of outstanding, sequentially numbered, unacknowledged information frames (I-Frames) that can occur between the HP2334A and the synchronous network (the DTE and the DCE).

All the frames are sequentially numbered from 0 to 7 (modulo 8); thus the maximum value for this parameter is 7 and the minimum is 1.

Recommended Choice: Specify a value of 7.

- TIMER T1. This parameter specifies the maximum amount of time that the HP2334A should wait for a frame to be acknowledged before initiating the recovery procedure. The time that may be specified for timer T1 must be in the range of 1,000 to 30,000 milliseconds (smallest change = 10ms). It should not be set too short in relation to the line speed as the throughput may be degraded due to unnecessary retransmissions when the line is heavily loaded. Use the following minimum values, according to the line speed, as a guide when defining the timer T1 parameter:

| LINE SPEED | TIMER T1 |
|---|---|
| 1200 bps | 10000 ms |
| 2400 bps | 5000 ms |
| 4800 bps | 3000 ms |
| 9600 bps | 1600 ms |
| 19200 bps | 1000 ms |

**Pre-Selected Parameters.** There are three pre-selected parameters as follows:

- RET. CNT N2 (Retry Count N2). The value of N2 specifies the maximum number of transmissions and retransmissions of a frame that will be attempted following the running out of timer T1 (N2 includes the initial transmission). The HP2334A automatically sets the value of N2 to 20.

- EQUIPMENT TYPE. When the HP2334A (or a host computer system) is connected to a public PSN it is always acting as a LAP-B DTE and a physical DTE (Data Terminal Equipment) as the LAP-B DCEs and physical DCEs (Data Circuit Terminating Equipment) are components of the PSN itself. Thus the HP2334A equipment type is always LAP-B DTE (Link Access Protocol - Balanced, Data Terminal Equipment) when the HP2334A is connected to a public PSN.

  The only exception is when one HP2334A is acting as a LAP-B DCE (the other HP2334A is the LAP-B DTE) in a Stat Mux configured (see Chapter 2) non-PSN network. In this case the Network Type must be defined as DCE,XX enabling the HP2334A to recognize that it is acting as a LAP-B DCE.

  The HP2334A automatically sets the equipment type to LAP-B DTE unless the Network Type is defined as DCE,XX in which case it is automatically set to LAP-B DCE.

- I-FRAME (N1). The maximum number of bits in a frame is specified by N1 which depends directly upon the maximum length of the information fields transmitted across the link. Thus N1 is directly related to (and specified by) the maximum packet size parameter at Level 3.

  As the HP2334A maximum packet size is fixed at 128 bytes, plus a packet overhead of 3 bytes, the N1 parameter value is automatically set to 1048 bits (or 131 bytes). Incoming call packets are within this size as the HP2334A does not support the Fast Select facility.

  **NOTE:** The configuration listing displays the N1 value in bytes, not in bits.

## 6.4.3 X.25 Level 3

X.25 Level 3 defines the packet level protocol and specifies procedures for establishing a call, transferring data and structuring data into packets.

**User Selectable Parameters. (HSA: LEVEL3)** The user selectable parameters are as follows:

- LOCAL ADDRESS. When the HP2334A is connected to a PSN it is assigned a main (local) address on the network. The local address of the HP2334A may be up to 13 digits in length plus two digits for defining the relative sub-address of the HP2334A device ports. The configured Local Address parameter may thus be up to 15 digits long. Refer to Appendix C for details of local addresses assigned by the various PSNs.

  The HP2334A sub-addressing feature enables a remote DTE calling the HP2334A local address to establish a virtual circuit with a device connected to a specific device port. If the call is made without a sub-address, than a virtual circuit will be established with the first available free port (i.e. a port not engaged on an SVC) in the Callable Port Pool. The device ports start at A1 to A4, then B1 to B4, C1 to C4 and D1 to D4 in this order.

  The format of the sub-address is two digits following the called HP2334A local address. When configuring the Local Address parameter, the relative sub-address for the device ports MUST be defined by adding a two digit number (in the range 00 to 82) to the PSN assigned local address.

  **WARNING:** If the sub-address is not specified then the HP2334A will take the last two digits of the PSN assigned local address as the device port relative sub-address. The relative sub-address can be 00 in most cases.

  Example:

```
00   01 02 03 04    05 06 07 08    09 10 11 12    13 14 15 16    17
RS   A1 A2 A3 A4    B1 B2 B3 B4    C1 C2 C3 C4    D1 D2 D3 D4    TEST PORT

RS = The relative sub-address which is defined as 00 in this example.
```

  For example, if the Local Address parameter is defined as: 13809754340 (a TRANSPAC address), then the relative sub-address is **40**. To call the first port (A1), the caller must enter the following address: 13809754341 (40 + 1). To call the pool port the address is: 13809754340 or 138097543 and to call the Test Port the address is: 13809754357 (40 + 17).

  **NOTE:** Sub-address "00" is supported as a "don't care" value when the relative sub-address base is 00 and the HP2334A will respond as if no sub-address is provided.

  The Test Port (relative sub-address + 17 ) may be accessed by a remote host computer to obtain HP2334A statistical information (e.g. line quality).

  By defining a Callable Port Pool (see First Pool Port) it is possible to restrict the available ports when a call is received without a sub-address. By defining a Local User Group (LUG) it is possible to restrict access to the HP2334A (local address) to only those remote DTEs defined in the LUG. The HP2334A device ports may be disabled for outgoing and incoming calls by using the disable feature of the ADL facility.

  **NOTE:** In a non-PSN network only the relative sub-address base needs to be entered as the Local Address parameter (see Network Type, Level 2).

- THROUGHPUT CLASS (Throughput In and Out). The throughput is the total data transferred per second and is a characteristic associated with a virtual circuit. The throughput class is a fixed data transfer rate in bps (bits per second) and is dependant on the transmission line speeds, packet and window sizes and the PSN's internal operation.

  The throughput must always be less than or equal to the line speed (in and out) and in most cases the maximum value compatible with the line speed should be used. The throughput in and out must be specified at configuration time. The available rates and associated throughput classes are as follows:

| THROUGHPUT (bps) | CLASS |
|---|---|
| 75 | 03 |
| 150 | 04 |
| 300 | 05 |
| 600 | 06 |
| 1200 | 07 |
| 2400 | 08 |
| 4800 | 09 |
| 9600 | 10 |
| 19200 | 11 |

  The HP2334A configured value is defined in bits per second and not as a throughput class reference.

  **NOTE**: On some PSN international gateways it is sometimes necessary to reduce the throughput class in order to establish a virtual circuit but this is normally done automatically by the PSN.

- WINDOW SIZE (W) IN/OUT. The window size in and window size out parameters allow the user to select the maximum number of unacknowledged sequential packets that may be outstanding at any given time and the necessary amount of packet buffering. The window size in (from the remote host computer to HP2334A) and the window size out (from the HP2334A to remote host computer) must be specified; the available sizes are 1 to 7.

  When connected to a public PSN, a value of 2 is recommended for the window size in and the window size out parameters.

  When using the HP2334A in a private (modem or modem eliminator link) network, a window size in and out of between 2 and 4 is recommended.

- DEFINE/MODIFY VIRTUAL CIRCUIT TABLE (Def/Mod VC Table). A virtual circuit (VC) is a bi-directional logical data path between two DTEs (e.g. between an HP2334A and a remote host computer). The HP2334A may be connected to up to 16 VCs at any time (one per device port); 17 if the Test Port of the HP2334A also is being accessed. Up to 95 virtual circuits can be allocated, consisting of a maximum of 16 permanent virtual circuits (PVCs) and the required number of switched virtual circuits (SVCs).

  A permanent virtual circuit (PVC) is a fixed "association" between two DTEs that does not require call establishing or clearing procedures. When connected to a PSN, the HP2334A must be configured with the PVCs that have been subscribed for with the PSN authority. For private (modem or modem eliminator link) networks the required number of PVCs (up to 16) have simply to be configured in the HP2334A.

  **NOTE:** For full Test Port access at least one 2-way or one incoming and one outgoing SVC must be subscribed for (if used with a PSN) and configured in the HP2334A.

  A switched virtual circuit (SVC) is a temporary "association" between two DTEs that is initiated when a call is established and maintained until a Clear Request is sent by either DTE. PSNs normally subdivide SVCs into three categories; SVCs defined as "IN" can only receive incoming calls, SVCs defined as "OUT" can only make (originate) outgoing calls and SVCs defined as "2W" (2 way) can both originate and receive calls. Note that once a call is established it is full-duplex in all cases.

  A virtual circuit is identified by a Logical Channel Number (LCN) which starts at 1 (0 with some PSNs) and can go up to 4095. The X.25 Recommendation specifies that LCNs must be assigned to virtual circuits as shown in Figure 6-3.

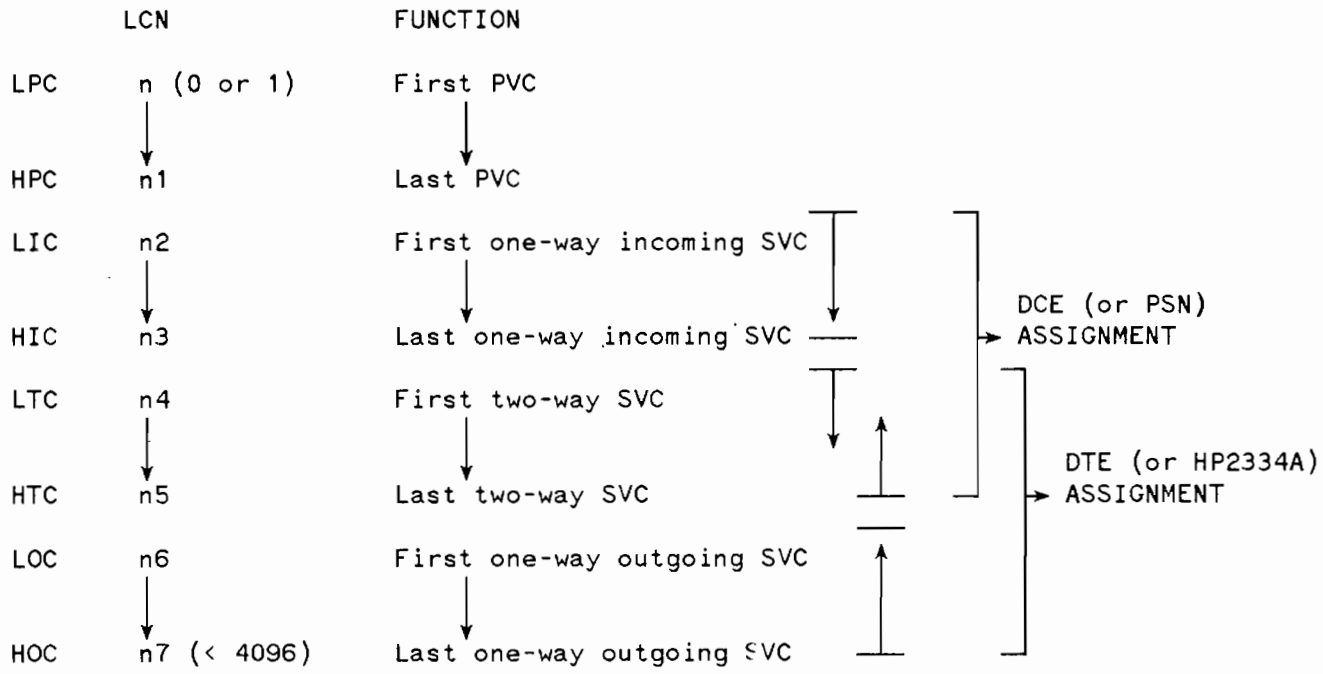



**Figure 6-3 Virtual Circuit Assignment**

With a Stat Mux (non-PSN) configured network any number of VCs (up to 95) may be configured according to the user's requirements. When the HP2334A is to be used with a PSN only the VCs subscribed for must be configured in the HP2334A. Note that if no VCs are configured then the user is unable to exit the VC table definition of the configuration dialogue.

The LCNs are assigned to virtual circuits (VCs) as shown in Fig 6-3. No "gaps" may exist within a VC category. However, gaps may exist between PVCs and SVCs or between SVC categories to allow for future expansion. The virtual circuits must be assigned LCNs as shown in Figure 6-3, where the first circuit in any category corresponds to the "lowest" numbered (e.g. n4) and the last circuit corresponds to the "highest" numbered (e.g. n5) virtual circuit in that category.

**NOTE:** In a Stat Mux configured (non-PSN) network the PVCs must have the same LCN at both ends and be associated with the correct port at each end (see "PVC associated port").

When connected to a PSN, the HP2334A is the DTE and the PSN is the DCE. With reference to Figure 6-3 note that the DTE virtual circuit assignment shown means that when a device connected to the HP2334A wants to make a call (i.e. establish a one-way outgoing VC or a two-way VC) the virtual circuit will be established on the first free VC in the required category from the highest to the lowest numbered. Similarly when a virtual circuit is to be established for an incoming call to the HP2334A, the DCE (or PSN) virtual circuit assignment shown means that the VC established (i.e. one-way incoming or two-way VC) will be the first free VC from the lowest to the highest numbered in the required category.

When the HP2334A is connected to a remote host computer via a direct modem (or modem eliminator) link, the remote host computer must be configured as the DCE and the DTE/DCE virtual circuit assignment behavior will be as described above.

For a Stat Mux configured (non-PSN) network, one HP2334A is configured as the DCE and the other as the DTE. The virtual circuit assignment behavior is again identical to that described above and corresponds to whether the HP2334A is the DTE or the DCE.

**NOTE:** When the HP2334A is to be used in a Stat Mux Configuration, it is recommended that any printer-connected device ports are either assigned PVCs or (if the Modem Control Adapter Card is used) are configured with the ADL facility (see Section 6.8) if SVCs are to be used.

- CALLABLE PORT POOL (First/Last Pool Port). The First Pool Port and Last Pool Port parameters allow the user to specify a group of HP2334A device ports which can be used (called) when a call is received without a sub-address (or with the relative sub-address base value). This feature is particularly important when output devices (e.g. printers) are connected to the HP2334A and when the HP2334A is used for Computer Access Support (CAS). If a call is received without sub-address then a virtual circuit is established with the first free device port in the port pool. Thus it prevents a simple terminal being called inadvertently when no sub-addressing is provided.

  A call may be established according to the following rules:

  - If an incoming call is received without any sub-address (or with the relative sub-address base value), then the call will be directed to the first free port of the Callable Port Pool. If all of those ports are engaged then the incoming call is cleared.

  - If the incoming call is received with a valid sub-address then the call is established with the corresponding device port if it is free or else the incoming call is cleared.

  **NOTE:** Calls that are received with an invalid (non-existent) sub-address are cleared.

  Device ports that are assigned to PVCs cannot be accessed through the Callable Port Pool and if included in the range of pool ports they are listed but are not considered part of the port pool. Thus the device port(s) which are specified by the user to be included in the port pool must not be assigned to PVCs.

  **NOTE:** The HP2334A does not include non-existent ports or ports assigned to PVCs in the port pool. A Callable Port Pool must be defined by the user during configuration.

- NEGOTIATE PACKET SIZE, WINDOW SIZE & THROUGHPUT CLASS. These facilities enable the HP2334A to negotiate the packet size, window size and throughput class with a PSN. In cases where the PSN default values for these parameters differ from those of the HP2334A the negotiate facility for the relevant parameter(s) should be subscribed for with the PSN and configured in the HP2334A.

  While the HP2334A only supports a maximum packet size of 128 bytes (pre-selected parameter), the throughput class and the window size are user selectable within the range specified in the X.25 Recommendation and may simply be configured in the HP2334A accordingly. If window or packet size negotiation is requested, a call is established after the incoming and outgoing window/packet sizes are negotiated. Throughput class negotiation follows the same negotiation procedure unless a Selection PAD command signal requests it, in which case the negotiated value will override the HP2334A configured value.

  The capability of the HP2334A to negotiate these parameters enables conflicting default parameter values (between the HP2334A and the PSN) to be resolved. For example, a PSN with a default maximum packet size of 256 bytes can be negotiated down to the HP2334A maximum packet size of 128 bytes.

  **NOTE:** Negotiation facilities are not required and should not be configured for private (non-PSN) networks.

- REVERSE CHARGING ACCEPTANCE (Rev. Char. Acc?). This facility must be subscribed for with the PSN authority and configured in the HP2334A if reverse charge calls are to be accepted. It is identical to telephone "collect" calls in that the user at the HP2334A local address is billed for received calls requesting reverse charge. This facility is only available when the HP2334A is to be used with a PSN.

  **NOTE:** A reverse charge request may be placed on a call from an HP2334A connected device. For further details refer to Chapter 7.

- D-BIT. This refers to a particular bit (the Delivery Confirmation bit) in the packet header. It is a procedure, available on some PSNs, for end-to-end acknowledgement of data packets. If required, this facility must be subscribed for with the PSN and configured in the HP2334A; it is then effective on all calls (SVCs and PVCs).

  With local acknowledgement (D-bit disabled), the PSN acknowledges the received packet before transferring it to its destination; i.e. D-bit set to "0".

  With end-to-end acknowledgement (D-bit enabled), the PSN transfers a packet to its destination and the receiving device returns an acknowledgement (via the PSN) to the caller; i.e. D-bit set to "1".

  **NOTE:** The D-bit must be supported (and subscribed for) by any called remote DTE. The D-bit should be set to "0" for Stat Mux (non-PSN) configured networks.

- PVC ASSOCIATED PORTS (PVC Ass. Port?). This parameter is only selectable when PVCs have been defined as it enables the user to specify the HP2334A device port assigned to each PVC. Note that the "PVC Ass. Port?" prompt is repeated until all the PVCs have device ports assigned to them.

  **NOTE:** PVCs are assigned to the device ports starting at the lowest numbered LCN.

**Pre-Selected Parameters.** The fixed value parameters are as follows:

- PACKET SIZE. This parameter specifies the maximum number of bytes in a packet. The HP2334A uses a fixed value (in and out) of 128 bytes which is recommended and used by most PSNs.

  **NOTE:** The "M-bit" (more data bit) in the packet control field is automatically set if the user data is contained in more than one packet.

- PACKET NUMBERING. Sequential packet numbering is used to ensure the correct transmission of all packets. The control field of each packet contains the packet's identification number (i.e. the packet's sequential number, P(S)) and also contains the "next packet expected to be received" number P(R), which is used to authorize/acknowledge data packets.

  All the packets in a call are sequentially numbered 0, 1, 2, 3,..., n; which is then repeated 0, 1, 2, .., *n* etc. The standard value of n is 7 (modulo 8).

## 6.5 MSG, LUG & SRA CONFIGURATION

**Message Configuration (HSA: MSG).** The HP2334A can have three types of message defined as follows:

- PAD MESSAGE HEADER (PAD Msg Header?). The PAD message header prompt allows the user to specify a message which is displayed before any PAD message defined in the X.28 Recommendation (e.g. the CLR or RESET characters). The configured message can be from 1 to 10 characters long, or press CONTROL W if no message is required. An existing message is kept by pressing RETURN.

  NOTE: Experienced users may wish to enter (or list) an escape sequence or command as the PAD message header (applicable to all PAD messages). If this is required the terminal must be in display function mode to prevent the command or escape sequence being executed.

- WELCOME MESSAGE. The welcome message prompt allows the user to specify a message for the PAD Identification Service Signal. The message can be from 1 to 20 characters long and is displayed before the prompt at power-on or reset when the HP2334A is in RUN mode. If no message is required simply press CONTROL W. An existing message is kept by pressing RETURN.

- PASSWORD. The password prompt allows the user to specify a password to restrict access to the HP2334A Test Port. The password is displayed only while being defined and listed only in response to the HSA secondary command LISTMSG. The password may be from 1 to 10 characters long; if no password is required simply press CONTROL W. An existing password is kept by pressing RETURN.

  To gain access to the Test Port the password must be entered correctly once the COM message provided by the HP2334A PAD has been obtained on the terminal screen (see the X.25 Level 3 Local Address parameter for the Test Port address). If the password is entered incorrectly then the call is cleared.

**Local User Group Configuration (HSA: LUG).** This is an optional HP2334A facility that enables the HP2334A to only accept calls from addresses which match one of up to 16 defined filters, all other calls being cleared; this is equivalent to an input filter. It is set up by the user specifying the address of the remote device (the address being included in the call from the device). The address may include up to 15 numeric characters, with "X" as a "don't care" value and a maximum of 16 filters may be defined. If the maximum number of filters is exceeded then an "ERR" error message is displayed on the terminal screen and only 16 filters are kept.

Once the LUG is defined the access is restricted as follows:

1) The number of digits of the calling address (including sub-address) must equal the number of digits of the filter.

2) The digits defined as "X" (don't care) in the filter provide a place holder for the equivalent digit of the calling address.

3) The format of the received calling address must be the format of the defined LUG.

4) The HP2334A will try to match the calling address with all the defined filters and if no match is found the call is cleared.

**NOTE**: When the calling address contains a sub-address the LUG filter must be carefully defined and it is recommended that the "X" (don't care) place holder is used for the last two digits.

- ADD OR CLEAR (AD - CL?). The Add or Clear prompt enables the user to specify whether the LUG list is to be defined/added to or completely redefined. Clear will clear ALL the LUG filters and then prompt for new inputs.

- REMOTE ADDRESS. The remote address prompt enables the user to specify the remote calling address of the LUG member. It may be up to 15 digits long ("X" = don't care) and must be entered by pressing the terminal's RETURN key; the HP2334A then prompts again for the next remote address (up to 16 can be defined). To exit LUG definition simply press the terminal's RETURN key in response to the prompt.

**WARNING**: The LISTLUG secondary command should be used to ensure that less than 16 LUG filters are defined before attempting to add another filter to the LUG list. When 16 LUG filters are defined and the ADD command is used and "ERR" error message is displayed on the terminal screen and the user must then clear and redefine the LUG list.

**Symbolic Remote Address Configuration (HSA: SRA).** This is an optional HP2334A facility which is provided in order to prevent numbering errors in called addresses. Up to 16 symbolic addresses may be defined as follows:

- ADD OR CLEAR (AD - CL). The Add or Clear prompt enables the user to specify whether the SRA list is to be defined/added to or completely redefined. Clear will clear ALL the SRAs and then prompt for new inputs.

- SYMBOLIC REMOTE ADDRESS (SRA?) The symbolic remote address prompt allows the user to define the symbolic name associated to the remote DTE address. It can be up to 8 characters long and must be entered by pressing the terminal's RETURN key; the HP2334A then prompts for the remote address associated to the defined symbolic name.

  **NOTE**: A symbolic name can contain any character in the International Alphabet #5 or ASCII character set (see Appendix D) except "," "+" and "Cr" (see configuration dialogue in 6.3.4.). The space and backspace characters are treated but are not significant in an SRA definition.

- ASSOCIATED REMOTE ADDRESS (Remote Address Ass.?) This prompt is obtained once a symbolic name has been entered and allows the user to specify the remote DTE address associated to the symbolic name. The address (including optional sub-address) can be up to 15 digits long and must be entered by pressing the terminal's RETURN key; the HP2334A will then prompt the user for the next SRA. To exit SRA definition simply press RETURN in response to the SRA prompt.

  **NOTE**: The HP2334A does not check for identical symbolic names.

**WARNING**: The LISTSRA secondary command should be used to ensure that less than 16 SRAs are defined before attempting to add another SRA to the list. When 16 SRAs are defined and the ADD command is used, and "ERR" error message is displayed on the terminal screen and the user must clear and redefine the SRA list.

**NOTE**: It is recommended that the LISTLUG and LISTSRA secondary commands are used before any modification to the LUG or SRA lists.

# 6.6 ASYNCHRONOUS PORTS PROFILE CONFIGURATION

## 6.6.1 Introduction

The HP2334A functions as a Packet Assembler/Disassembler (PAD) providing an Interactive Terminal Interface (ITI) in accordance with the 1980 CCITT X.3 Recommendation. The 18 PAD parameters defined in the recommendation are referred to as "Standard X.3 Parameters". The HP2334A also supports 25 additional "local parameters" which provide greater control and more capabilities for the PAD and PAD Support functions. Note that 10 of the 25 local parameters are reserved and cannot be modified. The PAD parameters are detailed in Section 6.7.

The parameters define specific characteristics of the asynchronous devices or actions that the PAD must take on receipt of a particular input (e.g. a BREAK) from a terminal.

A PAD "Profile" is a defined set of values for the 43 standard X.3 and local parameters. A total of 10 pre-defined profiles (Basic Defined Profiles or BDPs) are available in the HP2334A in order to meet the requirements standard device interfacing and for use as an initial standard profile set for creating UDPs. Each device must be assigned a PAD profile in the HP2334A by using the ASG user command (see 6.6.2 and 6.6.3). Note that when the asynchronous, point-to-point port(s) of a non-X.25 host computer are connected to the HP2334A, the HP2334A is viewed as a terminal by the host computer. This is referred to as a "CAS/PAD" or simply "CAS" and a "CAS/PAD" profile must be assigned to the corresponding HP2334A device ports.

For non-standard applications/device interfacing the user may create a "User Defined Profile" (UDP) using the UDP command (see 6.6.5 and 6.6.6).

The HP2334A features an automatic dial (or auto-call) facility which performs the call (SVC) establishment procedure to the remote address defined for each device. Up to 16 devices can be assigned automatic dial by using the ADL user command (see Section 6.8) and each device may have one remote address (a Symbolic Remote Address) assigned to it.

The LIST command is detailed in Section 6.9 and typical configuration examples are given in Section 6.10.

**NOTE:** The word "terminal" when used in this section refers generally to any asynchronous device (display terminal, printer, plotter, etc.).

## 6.6.2 ASG User Command

The ASG primary user command is used to assign PAD or CAS/PAD profiles to the HP2334A asynchronous ports. Note that an Remote PAD (associated to CAS/PAD) profile is automatically downloaded by a CAS/PAD profile and is not user assigned. The procedure requires the HP2334A to be prepared as described in 6.2.1 and to be in CONFIGURE mode as described in 6.2.2.

Using an interactive terminal connected to device port A1 the port profile assignments may then be set using the ASG command. Once the CONFIGURE asterisk (*) user prompt is obtained the command should be entered as follows:

```
* ASG [RETURN]
```

The HP2334A then enters the port profile assignment mode and displays on the terminal the following user prompt:

```
ASG:
```

Once the ASG prompt is obtained, PAD or CAS/PAD profiles may be assigned to device ports as detailed in 6.6.3. The following secondary user commands are then also available for use:

| PROMPT | COMMAND | ACTION |
|---|---|---|
| ASG: | LIST [RETURN] | List assignment values. |
| ASG: | [RETURN] | Exit assignment mode. |

Note that if any secondary command not shown above is entered at the ASG level then it is rejected with an "ERR" error message. Entering a [RETURN] (or CR) in response to the ASG: prompt enables the user to exit the profile assignment mode and returns the CONFIGURE asterisk (*) prompt.

For a description of the profile assignment procedure and use of the secondary user commands refer to 6.6.3.

## 6.6.3 Profile Assignment Procedure

Once the ASG: prompt has been obtained as described in 6.6.2, the user may assign a PAD (or CAS/PAD) profile to each of the HP2334A asynchronous ports. A profile must be selected for each port and each port must then be assigned its correct profile. This is to configure the PAD according to its function and the specific asynchronous device (or computer port) characteristics.

Several Basic Defined Profiles (BDPs) are available in the HP2334A as an initial standard profile set (see 6.6.4). These pre-defined profiles may be assigned to a port or may be modified by the user in order to define a User Defined Profile (UDP) in the HP2334A. Refer to 6.6.5 for details of the UDP command and 6.6.6 for the UDP definition procedure.

Note that any profile which is assigned to a port must be defined in the HP2334A. If a profile is specified which has not been defined then it is rejected with an "ERR" error message. The HP2334A default PAD profile is the BDP #1.

The selected profiles are assigned to the ports as follows:

| SYNTAX | ACTION |
|---|---|
| ASG: pn[,pn[,...]..]]:<m> RETURN | Assign profile <m> to port number pn, where pn may have the following format: pn = p[n] with p = {A\|B\|C\|D} and the optional n = {1\|2\|3\|4}.<br><br>Example: ASG:A,B1:21 RETURN<br>assigns profile #21 to ports A1, A2, A3, A4 & B1 and returns the ASG: prompt. |

It is recommended that once profile assignment is complete it is verified by using the following secondary user command:

ASG:LIST RETURN

Entering a RETURN (Cr character) in response to the ASG: prompt enables the user to exit the profile assignment mode and returns the CONFIGURE asterisk (*) prompt.

## 6.6.4 PAD Profiles

Several Basic Defined Profiles (BDPs) are available in the HP2334A as an initial standard profile set. These pre-defined profiles may be assigned to a port or may be modified by the user in order to define a User Defined Profile (UDP) in the HP2334A. Refer to Table 6-6 for details of the parameter values of the profiles described in this section.

Some UDPs are described in this section because of their utility but they are NOT defined in the HP2334A. They have been tested and can be defined by using the UDP commands. Refer to 6.6.5 for details of the UDP command and 6.6.6 for the UDP definition procedure.

**NOTE:** All BDPs are defined for an asynchronous device/computer port speed of 9600 bps.

There are three basic types of profile according to the way the HP2334A is to be used:

- **HP2334A as a standard PAD**

  Non-HP devices normally use the standard X.3 PAD profile (profile #1). The local parameters are defined to provide additional capabilities for HP devices and host computers.

| PROF. NUMBER | COMMENTS | BDP (defined) or UDP |
|---|---|---|
| Profile # 1 | Std. PAD (CCITT 1980 X.3) | BDP |
| Profile #21 | Std. PRINTER | BDP |
| Profile #31 | HP CRTs PAD | BDP |

**Table 6-1 PAD Profiles**

| BASIC PROFILE | UTILISATION |
|---|---|
| Profile # 1 | All the character mode and HP block mode applications supported by the HP2334A working with terminals using X-ON/X-OFF flow control. |
| Profile #21 | Used to connect the HP2334A in Cluster Controller Configuration to supported printers. |
| Profile #31 | All character and HP block mode applications for the HP2334A working with HP terminals using X-ON/X-OFF flow control. |

**Table 6-2 PAD Profile Utilization**

- **HP2334A as CAS/PAD (Computer Access Support)**

The CAS/PAD profiles and their utilization are detailed in tables 6-3 and 6-4 respectively. In order to provide CAS the HP2334A must be as transparent as possible. When a PAD calls a remote host computer through a CAS/PAD, the CAS/PAD sends a specific set of X.3 and local parameters to configure the calling PAD. Thus every CAS/PAD profile has an associated profile for the remote PAD.

| PROFILE NUMBER # | COMMENTS | ASSOCIATED REMOTE PROF# | BDP or UDP |
|---|---|---|---|
| Profile #51 | CAS/PAD (CCITT 1976) | Prof. #101 | BDP |
| Profile #61 | CAS/PAD (CCITT 1980) | Prof. #121 | BDP |
| Profile #71 | HP3000 CAS/PAD | Prof. #141 | BDP |
| Profile #72 | HP1000 CAS/PAD | Prof. #142 | UDP |
| Profile #73 | CAS/PAD (Transparent) | Prof. #143 | UDP |
| Profile #74 | HP3000 CAS/PAD (PSN) | Prof. #144 | UDP |

**Table 6-3 CAS/PAD Profiles**

**NOTE:** Only profiles #51, #61 and #71 are defined in the HP2334A. Profiles #72, #73 and #74 are shown because of their utility (e.g. profile #72 is required to support EDIT/1000 on the HP1000) and if required they must be created together with their associated remote PAD profiles ( #142, #143 and #144) by using the UDP command.

**WARNING:** A Remote PAD (associated to CAS/PAD) profile must be defined in the HP2334A before its associated CAS/PAD profile.

| BASIC PROFILE | UTILISATION |
|---|---|
| Profile #51 | Supports full duplex transmission between a CAS/PAD and a PAD supporting only the first 11 X.3 parameters (CCITT 1976). |
| Profile #61 | Supports full duplex transmission between a CAS/PAD and a PAD supporting only the first 12 X.3 parameters (CCITT 1980). |
| Profile #71 | Supports full duplex transmission (including block-mode) between an HP2334A PAD and CAS/PAD for the HP3000. Supports HP terminals and printers. |
| Profile #72 | Supports full duplex transmission and EDIT/1000 between an HP2334A PAD and CAS/PAD for the HP1000. |
| Profile #73 | Supports full duplex transparent transmission (binary transfers) between an HP2334A PAD and CAS/PAD. |
| Profile #74 | HP3000 CAS/PAD profile for use with PSNs. Supports full duplex transmission (excluding block mode) with local echo controlled by the HP2334A PAD (see local par #14), for HP terminals only. Note: Passwords are displayed. For block mode applications use prof #71. |

**Table 6-4 CAS/PAD Profile Utilization**

**NOTE**: When using profiles #72 or #73 the "escape from data transfer" character is the "break" character. When the "break" function is required the "break" character must be entered twice.

- Remote PAD (associated to CAS/PAD) Profiles

| PROF. NUMBER | COMMENTS | BDP or UDP |
|---|---|---|
| Profile #101 | Remote PAD is a standard PAD (CCITT 1976) | BDP |
| Profile #121 | Remote PAD is a standard PAD (CCITT 1980) | BDP |
| Profile #141 | Remote PAD is HP2334A (X.3 and local parms) | BDP |
| Profile #142 | Remote PAD to support EDIT/1000 (HP1000) | UDP |
| Profile #143 | Remote PAD supports full duplex transparent | UDP |
| Profile #144 | Remote PAD is an HP2334A (X.3 & local parms) | UDP |

**Table 6-5 Remote PAD (Associated to CAS/PAD) Profiles**

**NOTE:** Only profiles #101, #121 and #141 are defined in the HP2334A; profiles #142 #143 and #144 must be created using the UDP command. A user defined CAS/PAD profile (e.g. profile #72) will follow the same behavior as the BDP (e.g. profile #71) from the initial standard profile set that it was created from (e.g. profile #72 will send 20 parameters to its associated remote PAD profile #142).

These profiles are used only in Stat Mux and X.25 Stat Mux configured networks where the CAS/PAD sends a SET & READ control packet (X.29) containing a specific set of parameters as follows:

- CAS/PAD profile #51 sets 7 parameters of profile #101 (parameters 1, 2, 3, 4, 5, 7 and 8).
- CAS/PAD profile #61 sets 8 parameters of profile #121 (parameters 1, 2, 3, 4, 5, 7, 8 and 12).
- CAS/PAD profile #71 sets 20 parameters of profile #141 (X.3 parameters 1, 2, 3, 4, 5, 7, 8, 12 and 15. Local parameters 2, 3, 4, 5, 8, 9, 13, 14, 18, 19 and 22).

**NOTE:** A Remote PAD (associated to CAS/PAD) profile is not assigned to a port by the user. It is automatically downloaded by a remote called port having a CAS/PAD profile thus reconfiguring the standard PAD profile assigned to the port.

**NOTE:** When using profile #143 the "break" character is used for escape from data transfer.

| | BASIC DEFINED PROFILES (BDP) | | | | | | | | | USER DEFINED PROFILES (UDP) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROFILE: | 1 | 21 | 31 | 51 | 61 | 71 | 101 | 121 | 141 | 72 | 73 | 74 | 142 | 143 | 144 |
| X.3 PARAMETERS: | | | | | | | | | | | | | | | |
| 01 Esc Data Transfer | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 02 Echo | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 03 Data Forwarding | 2 | 0 | 2 | 0 | 0 | 127 | 0 | 0 | 127 | 127 | 127 | 127 | 127 | 127 | 2 |
| 04 Idle Timer | 0 | 10 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05 HP2334A Flow Cntrl | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 06 PAD messages | 5 | 0 | 5 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 07 Break processing | 21 | 0 | 21 | 0 | 0 | 0 | 21 | 21 | 21 | 0 | 0 | 0 | 8 | 8 | 21 |
| 08 Discard output | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09 Cr padding | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 10 Line folding | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 11 Baud Rate | 14 | 14 | 14 | 14 | 14 | 14 | - | - | - | 14 | 14 | 14 | - | - | - |
| 12 Device Flow ctrl | 1 | 1 | 1 | 1 | 1 | 0 | - | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13 Lf insertion | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 14 Lf padding | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 15 Editing | 1 | 0 | 1 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 16 Backspace char. | 8 | 8 | 8 | 8 | 8 | 8 | - | - | - | 8 | 8 | 8 | - | - | - |
| 17 Cancel char. | 24 | 24 | 24 | 24 | 24 | 24 | - | - | - | 24 | 24 | 24 | - | - | - |
| 18 Line display | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| LOCAL PARAMETERS: (accessed with parameter 0: value 13) | | | | | | | | | | | | | | | |
| 01 Parity | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 02 Read mode | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 96 | 0 | 1 | 0 | 64 | 0 | 96 |
| 03 Device trigger | 0 | 0 | 17 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04 EOR | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 05 Alternate EOR | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| 06 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 07 Reserved | 128 | 128 | 128 | 128 | 128 | 128 | - | - | - | 128 | 128 | 128 | - | - | - |
| 08 Subsys break char. | 0 | 0 | 25 | 0 | 0 | 0 | - | - | 25 | 0 | 0 | 0 | 25 | 0 | 25 |
| 09 Subsys break proc. | 0 | 0 | 64 | 0 | 0 | 0 | - | - | 64 | 0 | 0 | 0 | 64 | 0 | 64 |
| 10/11/12 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 13 Line Delete Msg | 3 | 3 | 1 | 3 | 3 | 3 | - | - | 1 | 0 | 0 | 3 | 1 | 1 | 1 |
| 14 Echo & modem sign. | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 15 Auto speed | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 16/17 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 18 Read count MSB | 63 | 63 | 63 | 0 | 0 | 0 | - | - | 12 | 0 | 0 | 0 | 12 | 12 | 12 |
| 19 Read count LSB | 255 | 255 | 255 | 128 | 128 | 128 | - | - | 255 | 128 | 128 | 128 | 255 | 255 | 255 |
| 20 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 21 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |
| 22 Write mode Enq Ack | 64 | 64 | 84 | 64 | 64 | 96 | - | - | 92 | 96 | 69 | 96 | 92 | 69 | 92 |
| 23 Line size | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | - | - | - |
| 24 Std PAD or CAS/PAD | 0 | 0 | 0 | 101 | 121 | 141 | - | - | - | 142 | 143 | 144 | - | - | - |
| 25 Reserved | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | 0 | 0 | 0 | - | - | - |

"-" = original profile parameter not modified

**Table 6-6 Profile Parameter Definition**

## 6.6.5 UDP User Command

The UDP primary user command is used to create or modify User Defined Profiles (UDPs). The HP2334A has several pre-defined Basic Defined Profiles which can be used for many standard applications, but certain configurations require a special sets of parameters to be defined (e.g. auto-speed, auto-parity or different flow control mechanisms). A good knowledge of the standard X.3 and local parameters is required to avoid creating erroneous UDPs.

To enter UDP level the HP2334A must initially be prepared as described in 6.2.1 and be in CONFIGURE mode as described in 6.2.2. Once the CONFIGURE asterisk (*) prompt is obtained the UDP command may be entered and the HP2334A will then provide a prompt for the profile number as follows:

```
* UDP (RETURN)

Prof. number?
```

The profile number that should be entered in response to the prompt is the number of the UDP to be created or modified (the HP2334A can determine the associated BDP number, if any, which is the reference for modifications). If a BDP number (or profile #100) is entered then the HP2334A will reject it with an "ERR" error message (profile #100 is reserved for off-line configuration and terminal loop back testing).

As described in 6.6.4, there are three types of profile available:

**PAD PROFILES:** 1 < UDP number < 51

**Note:** The UDP number must not be one of the 3 Basic Defined Profiles (i.e. BDPs #1, #21 and #31).

```
 1 < UDP number < 21  (using BDP # 1).
21 < UDP number < 31  (using BDP #21).
31 < UDP number < 51  (using BDP #31).
```

**CAS/PAD PROFILES:** 51 < UDP number < 100

**Note:** The UDP number must not be one of the 3 Basic Defined Profiles (i.e. BDPs #51, #61 and #71).

```
51 < UDP number < 61  (using BDP #51).
61 < UDP number < 71  (using BDP #61).
71 < UDP number < 100 (using BDP #71).
```

**REMOTE PAD (associated to CAS/PAD) PROFILES:** 101 < UDP number < 161

**Note:** The UDP number must not be one of the 3 Basic Defined Profiles (i.e. BDPs #101, #121 and #141).

```
101 < UDP number < 121 (using BDP #101).
121 < UDP number < 141 (using BDP #121).
141 < UDP number < 161 (using BDP #141).
```

The UDP definition capability of the HP2334A means that a wide range of PAD (and CAS/PAD) functions and device (computer port) interfacing can be accommodated.

A simple situation where a UDP should be defined is where the HP2334A as a standard PAD is to interface a supported printer which operates at 2400 bps. The PAD profile for a printer is BDP #21, but in this profile the baud rate (X.3 parameter #11) has a value of 14 or 9600 bps (see Table 6-6 Profile Parameter Definition and parameter #11 in 6.7.1). A UDP can be created from BDP #21 by modifying this parameter to a value of 12 or 2400 bps (refer to 6.6.6 for the UDP definition procedure). In this case the UDP number that should be entered must be greater than 21 and less than 31.

**NOTE**: In order to define a CAS/PAD profile its Remote PAD (associated to CAS/PAD) profile must be defined first (with reference to local parameter #24).

Once the UDP number is entered (enter the number and press RETURN), the HP2334A enters UDP level and displays the "free space" for parameter definition, the defined profiles and the UDP: prompt. The user may then use the secondary commands available at UDP level as described in 6.6.6.

**NOTE**: If an existing UDP number is entered then the HP2334A assumes that it is to be modified. Once the UDP level is entered, all of the defined UDPs are listed.

## 6.6.6 UDP Definition Procedure

Once the UDP number has been entered the HP2334A enters UDP level and displays the "free space" indicating the number of parameters that can be modified, the defined profiles in the HP2334A memory and the UDP: prompt. The user may then modify, list the profile parameters, list the profiles or delete any UDP by using the following UDP secondary user commands:

| PROMPT | COMMAND | ACTION |
|---|---|---|
| UDP: | LIST RETURN | List all the defined profiles and number of modifiable parameters. |
| UDP: | DEL X RETURN | Delete Profile number "X". |
| UDP: | SET p:v[,p:v[,..]] RETURN | Modify the profile where "p" is the parameter and "v" is the value. |
| UDP: | SET? p:v[,p:v[,..]] RETURN | Modify profile and display the parameters(p= parameter, v= value). |
| UDP: | PAR? RETURN | Display the profile before or after modification. |
| UDP: | RETURN | Saves the created/modified UDP. |
| Prof. number? | RETURN | Exit UDP level (returns CONFIGURE asterisk (*) prompt). |

**NOTE**: The UDP is not defined in the HP2334A until the UDP level is exited (UDP: RETURN). Up to 30 UDPs may be defined in the HP2334A according to the available memory "free space" (see LIST command).

**WARNING**: A UDP must not be modified back to its base values if it is assigned to a device port. If this occurs an "ERR" error message is displayed and one parameter must then be modified in order to exit UDP level and de-assign (using the ASG command) the UDP.

**DEL Command.**

This command is used to delete a defined UDP. It cannot be used to delete a BDP and if this is attempted the HP2334A will display an "ERR" error message. The "DEL X" command ("X" is the profile number) updates the "free space" indication obtained on entering UDP level or listed with the LIST command at UDP level.

**NOTE**: When any profile (including remote profiles) is assigned to a port it cannot be deleted. Thus the profile to be deleted must be de-assigned from the device port (using the ASG command) before it can be deleted.

**SET Command.**

The SET command permits the user to modify a BDP or a defined UDP in order to create a new UDP or re-define an existing one. One or several profile parameters may be changed by using the SET command and including the parameter numbers and the values to be modified. The BDP or UDP from which the new UDP is being created remains unchanged unless the same UDP number is used (it is then being modified) or it is deleted using the DELete command. The format of SET command is: "SET" followed by the parameter number, a colon and then the new value to be set. If more than one "parameter:value" is to be modified then the "parameter:value" couples must be separated by a comma.

- If a parameter number is not given then the parameter value remains the same value as the BDP or the defined UDP being modified.
- If one parameter number or one value is invalid then parameters up to but excluding the erroneous one will set.
- The SET command size is limited to 128 characters.
- The local parameters are accessed through parameter number 0 and parameter value 13 decimal.

```
Example:
          SET 2:0, 4:1, 5:0, 0:13, 2:0      (The space character is optional.)

This sets parameter #2 to value 0, parameter #4 to value 1,
parameter #5 to value 0 and local parameter #2 to value 0.
```

**NOTE**: This command does not update the "free space" indication obtained on entering UDP level or listed with the LIST command at UDP level. If the SET command is entered without parameters/values then all previous modifications to the UDP are canceled (UDP parameter values are reset to the original values at the time UDP level was entered).

**SET? Command.**

The SET? command is identical to the SET command but also lists the new values of the modified parameters.

**NOTE**: This command does not update the "free space" indication obtained on entering UDP level or listed with the LIST command at UDP level. If the SET? command is entered without parameters/values then all previous modifications to the UDP are canceled (UDP parameter values are reset to the original values at the time UDP level was entered).

**PAR? Command.**

This command enables the user to list one, several or all of the parameters of a defined profile. To list all of the profile parameters simply enter PAR? (then press RETURN). Alternatively enter the command PAR? followed by the parameter number. If more than one parameter value is required the parameter numbers must be separated by comma. Note that the PAR? command size is limited to 128 characters.

Example:

```
PAR? 2,4,54,0,22 RETURN          (The space character is optional.)
```

The HP2334A PAD then responds by providing a listing, the format of which is: "PAR" followed by a list of parameter numbers and corresponding values requested. Note that parameter number 0 with a value of 13 is a separator indicating that the parameters which follow are local parameters.

Example:

```
PAR 2:1, 4:0, 54:INV, 0:13, 22:64
```

Note that in this example the value of a non-existent standard X.3 parameter number 54 has been requested and the INValid response is listed.

**LIST Command.**

This command lists all of the profiles (BDPs & UDPs) defined in the HP2334A and the amount of "free space" available for defining additional profiles. On entering the LIST command the message format which is displayed is as follows:

Example:

```
PROFILE NUMBER: XXX                    FREE SPACE: 43 parameters

EXISTING PROFILES:  1,21,31,51,61,71,100,101,121,141
UDP:                                          (The prompt is returned.)
```

The "free space" displayed corresponds to the number of parameters that can be modified and profiles that can be saved. One parameter "space" is required to define each modified parameter and one is required to save the UDP itself. Thus if a UDP is to be defined by the modification of only one parameter then two parameter "spaces" are required (one for the modified parameter and one to save the profile).

If the "free space" is exceeded when defining (UDP: RETURN) a profile then an error message is displayed. If this occurs, one existing profile must be deleted to provide more "free space" in order to save the profile being created. Alternatively, the profile being created can be restored to its original values (the BDP base) by using the SET or SET? commands without parameters. If the UDP level is exited at this time then the profile being created is deleted automatically to prevent duplication of BDPs.

**NOTE**: If a UDP is modified back to its BDP base then the UDP is automatically deleted (if not assigned) when UDP level is exited. A LIST command will show this. If the profile is assigned to a port then a different profile must be assigned (using the ASG command) in order that the original profile can be deleted.

### Carriage Return Command

The RETURN (or Carriage Return command) is used to exit the UDP level. If an "ERR" error message is displayed after entering this command, then look at the "free space" to see if there is enough space in the memory to define the profile. If this occurs then a profile must be deleted by using the "DEL" command to provide space for the new profile.

## 6.7 PAD PARAMETERS

Using the provision stated in the X.3, X.28 and X.29 Recommendations, in addition to the 18 standard X.3 parameters the HP2334A features proprietary parameters referred to as "local parameters" which provide increased capabilities. These parameters are accessed using a separation mechanism (parameter reference= 0, parameter value = 13) for SET, READ and SET & READ commands.

There are 25 "local parameters" of which the following 11 are reserved and cannot be modified: #6, #7, #10, #11, #12, #16, #17, #20, #21, #23 and #25.

### 6.7.1 Standard X.3 PAD Parameters

**Parameter #1: Escape from data transfer.**

This function allows the terminal to initiate an escape from the data transfer state in order to send PAD commands.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | Not possible. |
| 1 | Escape with DLE (Ctrl.P). |
| 32 to 126 | Escape with the defined character. |

**NOTE:** Whenever possible, the defined character is the Data Forwarding Signal for any data just entered and is sent with the data as the Data Forwarding Signal.

Entering the "escape from data transfer" character twice will add it once in the data buffer (it is echoed to the terminal) and the PAD stays in the "data transfer" state. Any line delete character following the "escape from data transfer" character will return the PAD to the data transfer state.

When the "escape from data transfer" state is entered the following parameters are forced to the values shown below:

```
Parameter # 2 = 1    -    Echo is ON.
Parameter # 3 = 2    -    "Cr" and "+" are the
                          data forwarding signals.
Parameter # 4 = 0    -    Idle timer is OFF.
Parameter #15 = 1         Editing is ON.
                          (if Par. # 16 is not 0,
                          backspacing is enabled).
                          (if Par. # 17 is not 0,
                          line deleting is enabled).
```

In all cases the ENQ/ACK flow control mechanism for data transfer is maintained (when defined).

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #2: Echo.**

The Echo parameter enables all the characters received from the terminal to be transmitted back to the terminal as well as being processed by the HP2334A.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No echo. |
| 1 | Echo. |

**NOTE:** The DC2/ACK/X-ON/X-OFF characters if enabled as flow control characters are not echoed. A defined escape from data transfer character, if enabled, is not echoed.

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #3: Selection of data forwarding signals.**

This parameter allows the selection of a defined set of character(s) received from the terminal to be recognized by the HP2334A as an indication to terminate the input sequence and forward the block of data to the host.

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | No data forwarding character. |
| 1 | 0 | A-Z, a-z, 0-9. |
| 2 | 1 | CR (carriage return). |
| 4 | 2 | ESC or BEL or ENQ or ACK. |
| 8 | 3 | DEL or CAN or DC2. |
| 16 | 4 | ETX or EOT. |
| 32 | 5 | HT or LF or VT or FF. |
| 64 | 6 | All characters from IA #5 columns 0 and 1 not included in above and the DEL character. |
| 127 | | All the characters are data forwarding. |

Possible values: All possible combinations in the range 0 to 127.

The data forwarding character defined here is sent to the host as the last byte of the buffer.

**NOTE:** Values 0 or 1 are accepted for Bit #0 but they have no action. When parameters #16 and #17 are defined, the defined DEL and CAN characters cannot be considered as the data forwarding signal. If Local Parameter #22 has a value of 32 then it has priority over this parameter including value 4 (Bit #2 set).

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #4: Selection of idle timer delay.**

This parameter enables the HP2334A PAD to terminate the assembly of a packet and forward it when the time interval between successive characters received from the terminal exceeds a selected value.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No time-out is required. |
| 1 to 255 | Indicate the value of the delay in twentieths (1/20) of a second. |

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #5: Flow control of the terminal by the HP2334A.**

This parameter enables the HP2334A to control the flow of data from the terminal to the PAD. The HP2334A indicates whether it is ready to accept characters from the terminal by transmitting special characters. These characters are used to switch the terminal transmission on and off.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | X-ON/X-OFF not used. |
| 1 | Use of X-ON (DC1) and X-OFF (DC3). |

**NOTE**: If X-OFF is not recognized by the device, the HP2334A will keep on sending it until its memory overflows.

This parameter is modifiable using X.28 and X.29 commands.

**Parameter #6: Suppression of PAD messages.**

This parameter allows all PAD output messages to the terminal to be suppressed.

| VALUE (decimal) | BIT | ACTION |
|---|---|---|
| 0 | | No PAD messages. |
| 1 | 0 | PAD messages are transmitted to the terminal. |
| 4 | 2 | PAD prompt character "@" is used in command state. |
| Possible values: | 0, 1, 5 (1+4). | |

**NOTE**: The standard BDPs for terminal applications have a parameter value of 5.

This parameter is modifiable using X.28 and X.29 commands.

**Parameter #7: Break processing.**

This parameter specifies the kind of processing that should be performed by the PAD upon receipt of a break signal.

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | Nothing. |
| 1 | 0 | Interrupt. |
| 2 | 1 | Reset. |
| 4 | 2 | Indication of a break is forwarded. |
| 8 | 3 | Escape from data transfer state. |
| 16 | 4 | Discard output to the terminal. |

Possible values: 0, 1, 2, 8, 21 (1+4+16).

**NOTE**: When a break is processed and this parameter has a value of 21 an X.29 Indication of Break packet is forwarded to the remote host computer with a parameter #8 Discard Output value of 1.

If a break signal is received while the HP2334A is in an X-OFF received state it will set to the X-ON state (except when parameter #7 = 8).

When parameter #7 = 8 and an "escape from data transfer" character is entered, the data packet (if any) is forwarded with the "escape from data transfer" character as the last byte (except when parameter #1 = 0).

When parameter #7 = 8 and parameter #1 = 0, the data packet (if any) is forwarded with "null" as the last data byte. If "break" is entered twice the HP2334A PAD sends an INTerrupt packet in order that a remote CAS/PAD can output a BREAK signal to the associated host computer asynchronous port connection (the data packet, if any, is not forwarded).

When parameter #7 has a value of 1 and a "break" character is entered, the Call User Data field in the interrupt packet is set to 0 and not 1 as recommended by the CCITT.

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #8: Discard output.**

This parameter is used in break processing and directs the HP2334A PAD to discard user data instead of transmitting it to the terminal.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | Normal delivery. |
| 1 | Discard output to the terminal. |

**NOTE**: All data, including PAD messages, is discarded when this parameter is set to 1.

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #9: Padding after carriage return.**

This parameter provides for automatic insertion of padding characters in the character stream transmitted to the terminal after a Carriage Return character. This is to enable the printing mechanism of the (teletype) terminal to perform the Carriage Return function correctly. The padding character is NUL.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No CR padding. |
| 1 to 7 | Indicate the number of padding characters to be generated by the HP2334A. |

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #10: Line folding.**

This parameter provides for automatic insertion of the appropriate terminator in the character string transmitted to the terminal. The maximum number of characters per line may be defined.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No line folding. |
| 1 to 255 | Indicate the number of characters per line. |

**NOTE:** The parameter value is accepted but no action is taken.

This parameter is modifiable using X.29 PAD commands only.

**Parameter #11: Baud rate.**

This parameter indicates the baud rate at which the terminal (device) is operating.

| VALUE (decimal) | BAUD RATE |
|---|---|
| 0 | 110 bps |
| 2 | 300 bps |
| 3 | 1200 bps |
| 4 | 600 bps |
| 6 | 150 bps |
| 12 | 2400 bps |
| 13 | 4800 bps |
| 14 | 9600 bps |

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #12: Flow control of the HP2334A by the terminal.**

This parameter provides for flow control between the HP2334A and the terminal. The terminal indicates that it is ready to accept characters from the HP2334A by transmitting X-ON and X-OFF characters.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No flow control. |
| 1 | Use X-ON/X-OFF characters. |

**NOTE:** The X-ON and X-OFF characters are not transmitted to the Host during ASCII transfer and are not considered as data forwarding signals even when parameter #2 = 126 or 127. If an X-OFF character happens to be received by the HP2334A after the last character of the output sequence then only either X-ON or a logical break will be considered as a resume output condition (Break has no action on the flow control if parameter #7 = 8).
This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #13: Line feed insertion.**

This parameter provides for automatic insertion of a line feed character after any Carriage return character in the data stream transmitted to/from the terminal or echoed to the terminal.

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | No LF insertion. |
| 1 | 0 | Insert LF after CR in the data-stream to the terminal. |
| 2 | 1 | Insert LF after CR in the data-stream from the terminal. |
| 4 | 2 | Insert LF after CR as echo to the terminal. |

Possible values: 0, 1, 4, 5 (1+4).

**NOTE:** This function applies in both the "data transfer" and "escape from data transfer" states; it is modifiable using X.29 PAD commands only (no action). Values 0 or 1 are accepted for Bit #0 but they have no action.

**Parameter #14: Padding after Line Feed.**

This parameter provides for automatic insertion of padding characters in the character stream transmitted to the terminal after a Line Feed character. This allows for the printer mechanism of the terminal (teletype) to perform the Line Feed operation correctly. The padding character is "NUL".

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No LF padding. |
| 1 to 7 | Indicate the number of padding characters to be generated by the HP2334A. |

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #15: Editing.**

This parameter provides for character delete, line delete and line display editing functions in the HP2334A for the terminal. These functions apply in both the data transfer state and the "escape from data transfer" state (command state).

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No editing. |
| 1 | Editing during ASCII data transfer. |

**NOTE:** When a character input is larger than the line size, the corresponding packets are forwarded to the network. The editing functions are transparent for the host system within the line size. Once the line size is reached, the editing characters are stored and transmitted to the host computer system when the read size is reached or a data forwarding signal is received.

Only one line delete character is forwarded, subsequent ones being processed locally (within the line size). The "line delete character" is forwarded in the packet with the M-bit set to 1. The line size is fixed to 256 bytes.

This is modifiable using either an X.28 or an X.29 PAD command.

**Parameter #16: Character delete (backspace).**

This parameter provides for character deletion. It enables the user to delete the last character entered at the terminal. No special feedback to the user is provided.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No character delete available. |
| 1 to 127 | Define the character. |

**NOTE:** When the DELete character is defined here, it cannot be used as the data forwarding signal (see parameter #3).

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #17: Line delete (CANcel).**

This parameter provides for line deletion. It enables the user to delete the last line entered at the terminal. Upon receipt of the line delete character the HP2334A will output "!!! CR LF" or "\ CR LF" or "XXX CR LF" depending on the value of the local parameter #13 (Line delete PAD service signal).

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No line delete available. |
| 1 to 127 | Define the character. |

**NOTE:** When the CANcel character is defined here, it cannot be used as the data forwarding signal (see parameter #3).

This parameter is modifiable using X.28 and X.29 PAD commands.

**Parameter #18: Line display.**

This parameter provides for the line display function.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No line display available. |
| 1 to 127 | Define the character. |

**NOTE:** A value is accepted for this parameter but no action is taken.

This parameter is modifiable using an X.29 command only in order to prevent a PAD error message.

## 6.7.2 HP2334A Local PAD Parameters

**Local Parameter #1: Parity.**

This parameter allows the user to specify the parity used for transmission between the HP2334A and the terminal/host computer port.

| VALUE (Bit 3 - Bit 0) | ACTION |
|---|---|
| 0 0 0 0 | No parity (8 bits). |
| X 0 1 1 | Even parity (parity + 7 bits). |
| X 0 0 1 | Odd parity (parity + 7 bits). |
| 0 1 1 1 | No parity ( "0" + 7 bits). |
| 0 1 0 1 | No parity ( "1" + 7 bits). |

Possible values: 0, 1, 3, 5, 7, 9, 11.

**NOTE:** If bit X = 1, the parity bit is not checked by the HP2334A upon receipt of characters.

If bit X = 0, the parity bit of the characters transmitted between the terminal (device) and the HP2334A are checked and an error message is sent to the terminal when the parity bit is not set correctly. When Parity is selected, the HP2334A is handling 7-bits data octets and the remote host computer receives characters with the parity bit set to 0.

This parameter is modifiable via X.28 or X.29

**Local Parameter #2: Read mode.**

This parameter allows the user to specify the handshake protocol used between the HP2334A and the terminal.

| VALUE | Bit # | | ACTION |
|---|---|---|---|
| 1 | 0 | 0 | ASCII read character mode. |
| | | 1 | Binary mode. |
| 2 | 1 | 0 | Read with type ahead allowed. |
| | | 1 | Read trigger is required for each read. |
| 4 | 2 | 0 | No action. |
| | | 1 | Read trigger. |
| 32 | 5 | 0 | No action. |
| | | 1 | Line block mode handshake (DC1,DC2-Cr). |
| 64 | 6 | 0 | No action. |
| | | 1 | Page block mode handshake (DC1-DC2-DC1) and disable Cr (as terminator) until completion. |

Possible values: 0, 1, 96(32+64), 98 (2+32+64), 102 (2+4+32+64).

**NOTE:** This parameter is used in conjunction with standard parameter #5 (flow control) and local parameter #22 (write mode) to define the handshake protocol to be used. Providing that the parameter values are compatible, the HP2334A accepts any parameter combinations.

If page block mode handshake is enabled (bit 6 set), then the HP2334A checks for read completion upon receipt of DC2. If the DC2 is an EOR (see Loc. Par. #4 End of Record) or if the idle timer delay expires (see X.3 par. #4) then the DC2 signal is forwarded to the remote host computer.

If Bit 5 is set (may be a line block mode), the HP2334A will start a two character timer (minimum 15 ms) and waits for a read trigger (Loc. Par. #3) if the DC2 signal has been forwarded to the remote host computer. If Bit 5 is reset or the timer expires before receipt of a Cr character, then an internal buffer is allocated for page block mode.

The HP2334A sends a DC1 signal to the terminal if in type ahead mode or waits for a read trigger command from the remote host computer (X.29 SET command with Local par. #2 = 4) before sending the DC1 if the terminal is not in type ahead mode.

The HP2334A receives data until the EOR (Cr is disabled as a terminator) or the byte count is exhausted (see local parameters #18 and #19) and then forwards it to the remote host computer.

Setting the local parameter #2 value to 64 and local parameter #22 to a value of 4 provides for the "PAD - CAS/PAD" configuration where the PAD has control over the selection of block mode or character mode input and handshaking. If Bit 6 is reset then DC2 is processed as a standard character.

If a binary read is selected the HP2334A disables an ENQ/ACK handshake automatically for the duration of the read.

Block-mode inputs are under the "control" of an automatic read timer and must complete within this timer value or else the read will end and data forwarded as it is . The value of the timer depends on the requested block-mode size and the baud rate.

This parameter can be modified using an X.29 command only.

**Local Parameter #3: Device read trigger.**

This parameter allows the user to specify the character that the HP2334A should use to trigger a read on the device.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No trigger character. |
| 1 to 255 | Defines the character to act as a read trigger. (Should be DC1 - decimal 17 for HP devices.) |

**NOTE:** Do not use value 17 in a Remote PAD (associated to CAS/PAD) profile when local parameter #22 has Bit #2 set (HP block mode incompatibility).

This parameter can be modified using either an X.28 or an X.29 command.

**Local Parameter #4: EOR (End Of Record).**

This parameter allows the selection of a character received from the terminal to be recognized by the HP2334A as an indication to terminate the input sequence and forward the block to the host.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No EOR. |
| 1 to 255 | Defines the EOR character. |

**NOTE:** The EOR character is sent to the host as the last byte of the buffer.

This parameter can be modified using an X.29 command only.

**Local Parameter #5: Alternate-EOR.**

This parameter allows the selection of a character received from the terminal to be recognized by the HP2334A as an indication to terminate the input sequence and forward the block to the host.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No Alternate-EOR. |
| 1 to 255 | Defines the Alternate-EOR character. |

**NOTE:** The alternate EOR character is sent to the host as the last byte in the buffer.

This parameter can be modified using an X.29 command only.

**Local Parameter #8: Define subsystem break character.**

This parameter allows the user to select a character to provide subsystem break capability.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | No subsystem break. |
| 1 to 255 | Defines the subsystem break character. |

**NOTE**: If a subsystem break signal is received while the HP2334A is in the X-OFF received state the interface will go to the X-ON state

This parameter is modifiable using an X.29 command only.

**Local Parameter #9: Subsystem break processing.**

This parameter allows the selection of the operation of the HP2334A after the receipt of a subsystem break (normally Ctrl. Y, value = 25 ) from the terminal.

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | Character defined in Loc. Par. #8 is discarded. |
| 64 | 6 | Terminate current input. |

This parameter is modifiable using an X.29 command only.

**Local Parameter #13: Line delete PAD service signal.**

This parameter allows the user to specify which character the HP2334A should echo "!!!" upon receipt of a line delete (CANcel) character. In any case CR and LF are echoed.

| VALUE (decimal) | ACTION |
|---|---|
| 0 | Do not echo. |
| 1 | Echo "!!!" upon receipt of line delete. |
| 2 | Echo "\" upon receipt of line delete. |
| 3 | Echo "XXX" upon receipt of line delete. |

Possible values: 0, 1, 2, 3.

**NOTE**: This PAD service signal is not affected by the value of the standard X.3 parameter #6 (suppression of PAD messages).

This parameter is modifiable using X.28 and X.29 PAD commands.

**Local Parameter #14: Local echo and modem signal control.**

This parameter allows the user to specify if the HP2334A should control local echo upon receipt of "esc :" and "esc ;".

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | Do not control echo. |
| 1 | 0 | Echo may be controlled by "esc:" (on) and "esc;" (off). |
| 2 | 1 | Upon receipt of a Clear an HP2334A PAD will drop its modem signals. |
| 4 | 2 | CTS and DCD are true only if communication is established. |
| 8 | 3 | Disables modem behavior on the Modem Control Adapter Card. |

Possible values: 0, 1, 2, 3, 4, 5, 8, 9 (8+1).

**NOTE**: Bit #2 is only available on a CAS profile and is only applicable to SVCs. If Bit #3 is set then the modem signals are set but no action is taken when the DTE drops the RTS and DTR signals.

This parameter is modifiable using X.28 or X.29 commands.

**Local Parameter #15: Auto speed and Auto parity.**

This parameter allows the user to specify if the HP2334A should set the auto speed function.

| VALUE (decimal) | Bit # | ACTION |
|---|---|---|
| 0 | | No auto speed (speed is defined by Std Par. #11) and no auto parity. |
| 1 | 0 | Auto speed enabled. |
| 4 | 2 | Auto parity enabled. |

Possible values: 0, 1, 5 (1+4).

**NOTE**: If value 1 is selected; when the baud rate is found, Std Par. #11 (baud rate) is updated. When a set and read X.28 PAD command sets this parameter to 1, the PAD service signal is discarded. If value 4 is selected the terminal parity is determined automatically and local parameter #1, bits 0 and 1 are updated. Auto-parity must be used for ODD or EVEN parity only and must be specified with the auto speed.

**NOTE**: On any device port having auto speed or auto parity enabled a RETURN (Cr) character must be entered in order to obtain the PAD prompt (@) or to establish a PVC for the first time. If auto speed/auto parity is enabled in the profile of an ADL assigned device port, then a Carriage Return (Cr) character must be sent to the HP2334A PAD (by pressing the terminal's RETURN key) in order that the speed/parity can be sensed and set in RUN mode. Once the speed/parity is set, the ADL call procedure is performed to establish the virtual circuit and the PAD data transfer state is then entered. Thus values 1 and 5 must not be selected for CAS ports.

This parameter is modifiable using X.28 or X.29 commands.

**Local Parameter #18: Read length - Most Significant Byte.**

This parameter allows the user to specify the maximum number of bytes that the HP2334A should accept for subsequent read requests. When the byte count is reached the HP2334A forwards the data to the host (no special indication is provided in this buffer; the length is the read length specified by the host). This parameter is also used to determine the maximum size of a block mode transfer (the size being limited by local parameters #18 and #19).

| VALUE (decimal) | ACTION |
|---|---|
| 0 <= n < 16 K | Read byte count (defined in 2 bytes). |

Possible values: 0 to 16000.

Example:

| | 16 kbytes | 3 kbytes |
|---|---|---|
| Local parm #18: | 64 | 12 |
| Local parm #19: | 0 | 0 |

**NOTE:** If a memory overflow occurs on a very large block mode transfer then the read length must be increased on the port profile.

This parameter is modifiable using an X.29 command only.

**Local Parameter #19: Read length - Least Significant Byte.**

Refer to Local Parameter #18.

This parameter is modifiable using an X.29 command only.

**Local Parameter #22: Write specification.**

This parameter permits the CAS/PAD in a "PAD - CAS/PAD" configuration to define the write mode. The write mode may be ASCII or binary with hard or soft-preempt. With hard-preempt the HP2334A will output data as soon as it is received: with a soft- preempt the HP2334A waits for a started read (at least one byte received from the device) to complete before commencing data output.

| VALUE | Bit # | | ACTION |
|---|---|---|---|
| 0 | | 0 | ASCII write. |
| | | 1 | Binary write. |
| 2 | 1 | 0 | Hard-preempt. write. |
| | | 1 | Soft-preempt. write. |
| 4 | 2 | 0 | No action. |
| | | 1 | Automatic read/write mode. |
| 8 | 3 | 0 | All the ACKs are discarded. |
| | | 1 | Send all the ACKs (not waiting). |
| 16 | 4 | 0 | No ENQ/ACK handshake. |
| | | 1 | ENQ/ACK handshake is enabled. |
| 32 | 5 | 0 | No ACK response to ENQ handshake. |
| | | 1 | ACK response to ENQ handshake enabled. |
| 64 | 6 | 0 | Half duplex transmission. |
| | | 1 | Full duplex transmission. |

Possible values: 0, 16, 20(4+16), 24(16+8), 32, 64, 69(64+4+1)
84(64+16+4), 88(64+16+8), 92(64+16+8+4), 96(64+32).

**NOTE:** If this parameter is set to value 32, this value will have priority over Std. Par. #3 (including when set to value 4 (bit 2 set)).

When the HP2334A receives an ENQ sent by a host computer on a CAS port, it sends an ACK back and then lets the ENQ in the buffer pass through to the network.

When the HP2334A receives a ENQ coming from the network, it lets the ENQ go to the terminal and resets its own ENQ mechanism (if the ENQ/ACK protocol is enabled).

**NOTE:** In conjunction with standard parameter #12, this parameter defines the protocol that should be used to write on the device. If the device does not provide an ACK response to an ENQ, after 10 seconds the HP2334A will assume a positive answer and resume output.

**WARNING:** Binary write and binary read must be used with caution. A profile must be created and used only for the binary transfer. The **RPROF** command must be used to switch to the profile just before binary transfer and switch back once the transfer is complete.

When the ENQ/ACK handshake is enabled (an ASCII transfer with Bit-4 set) the ACK character received by the HP2334A is processed according to Bit-3.

If the ENQ character happens to be added by the HP2334A after the last character of the output sequence (not monitored by the HP2334A), then either an ACK or a logical break will be considered as an Acknowledgement. (There is no action upon receipt of a break if Std. Par. #7 = 8)

**NOTE**: If value 4 is selected in conjunction with a local parameter #2 value set to 64 then this provides the PAD of a "PAD - CAS/PAD" configuration with control in the selection of block mode or character mode input and handshaking.

If a DC2 (page block-mode) or DC2-Cr (line block-mode) or DC2-Cr-Lf (line block-mode with auto Lf on) sequence is received the necessary buffer space is reserved while the sequence is sent to the remote host computer. Upon block-mode acknowledgement (DC1) or (data DC1) and a buffer space ready condition, the data (if any) is delivered to the terminal with the flow control mechanism (if any) enabled. Then when a DC1 is delivered, the block-mode input is "active" until the data forwarding condition is met (idle timer or RS or Cr, etc.).

If one of the above sequences is not received a standard character mode input is performed.

This parameter is modifiable using an X.29 command only.

**Local Parameter #23: Character mode line size.**

This function allows the HP2334A to return a data buffer to the remote host computer before any completion condition (EOR or byte count exhausted) occurs. When the remote host computer receives a buffer corresponding to the size defined by this parameter it recognizes that more data is to follow (the read is not completed as defined) and the M-bit is set to 1. This is to ensure that the HP2334A does not buffer too many bytes when working in character mode.

| VALUE (decimal) | ACTION |
|---|---|
| n | Indicate the HP2334A line size divided by 256 (in characters) |

**NOTE**: The HP2334A will force this parameter to a value of 1 and will reject any attempt to modify it.

The user data is broken down into a buffer size equal to n times 256 bytes. The first line size buffer is edited (character delete and line delete having been processed properly by the HP2334A) but subsequent buffers may have character delete and line delete characters in them which must be processed by the remote host. The HP2334A still processes the byte count correctly, including processing of all backspaces and deletes encountered and will complete the read when the byte count is finished.

This parameter is not modifiable with X.28 or X.29 commands.

**Local Parameter #24: Standard PAD or CAS/PAD selection.**

This parameter allows the user to define whether the HP2334A is to follow the standard PAD or the CAS/PAD behavior.

| VALUE | ACTION |
|---|---|
| 0 | Standard PAD. |
| n | CAS/PAD ("n" refers to the profile to load in the remote calling PAD). |

**NOTE:** The profile to be downloaded to the remote calling PAD is defined by the parameter value "n" in the profile. This defines the set of modifications to be sent to the remote PAD according to the CAS/PAD profile. A value of "n" (non-zero) is only accepted on CAS profiles (71 < profile < 100).

**NOTE:** The Remote PAD (associated to CAS/PAD) profile that is to be downloaded to the calling PAD is defined at the HP2334A CAS/PAD location.

This parameter is not modifiable using X.28 or X.29 commands.

## 6.7.3 PAD Parameter Processing Sequence

The actions of different parameters on the characters received from a terminal are tested and taken serially. There is an implicit priority in the order of processing the flow of input data which overrides any defined set of parameters. Thus if two parameters should act on a character, only one action is taken.

The parameter processing order is as follows:

- ENQ/ACK - ACK/ENQ of Local parameter #22, value 16-32.
- X-ON then X-OFF of X.3 parameter #12, value 1.
- Subsystem break of Local parameters #8 and #9.
- Escape character of Local parameter #14, value 1.
- Pad recall signal of X.3 parameter #1.
- DC2 character of Local parameter #2, value 64.
- Delete character of X.3 parameters #15 and #16.
- Delete line of X.3 parameters #15 and #17.
- Line display of X.3 parameters #15 and #18.
- Data forwarding condition of X.3 parameter #3.
- Idle timer of X.3 parameter #4.

**NOTE:** The idle timer condition is processed whenever a timeout condition is reached.

# 6.8 AUTOMATIC DIAL ASSIGNMENT

## 6.8.1 ADL User Command

In order to establish a connection (SVC) when making a call to a remote DTE, the address of the remote DTE must be entered. To simplify the calling procedure the HP2334A has a Symbolic Remote Address (SRA) facility (see Section 6.5) which enables the user to enter a simple symbolic name (associated to the required remote DTE address) to establish the connection. The user may select the defined SRAs which are to be provided with the Automatic Dial (ADL) facility. When the ADL facility is selected the HP2334A performs the necessary call procedure to establish an SVC between each device assigned the ADL facility and its corresponding remote SRA when the device port is "ready". A device port is "ready" when the DTR and RTS modem signals are ON and when speed and/or parity are determined.

When asynchronous devices (or computer ports) are connected to the HP2334A through the Direct Connect Adapter Card, the device ports are normally "ready" (i.e. modem signals are ON) as soon as the HP2334A is powered-on.

When asynchronous devices (or computer ports) are connected to the HP2334A through the Modem Control Adapter Card and the modem control signals are monitored, a device port is "ready" (i.e. modem signals are ON) as soon as the device is powered-on (local connection) or as soon as the modem link is established (modem connection). When the HP2334A is to be used in a Stat Mux configured network, it is recommended that any printer-connected device ports are either assigned PVCs or (if the Modem Control Adapter Card is used) are configured with the ADL facility if SVCs are to be used. Note that ports which are assigned a CAS profile cannot establish an SVC.

**NOTE**: If no SRAs are defined an ADL assignment is not possible. An SRA is identified for ADL assignment by its numerical position in the SRA list.

## 6.8.2 ADL Assignment Procedure

Once the required SRAs (see Section 6.5) have been defined and the HP2334A is in CONFIGURE mode (asterisk * prompt), the ADL primary user command may be entered to assign automatic dial to the selected device ports.

The syntax of the ADL command is as follows:

| SYNTAX | ACTION |
|---|---|
| ADL: pn[,pn[,...]..]]:<m> RETURN | Assign SRA number <m> to port number pn where pn may have the following format: pn = p[n] with p = {A\|B\|C\|D} and the optional n ={1\|2\|3\|4}. |
| ADL: pn[,pn[,...]..]]:- RETURN | De-assign ADL from port number pn by entering a "-" character for <m>. |
| ADL: LIST RETURN | List ADL assignment. |
| ADL: RETURN | Exit ADL level (returns CONFIGURE (*) prompt). |

In order to list the ADL assignment to the device ports the secondary user command LIST may be entered in response to the ADL: prompt. To exit the ADL level, entering a RETURN (Carriage Return) returns the CONFIGURE asterisk (*) prompt.

## 6.8.3 Device Port Disabling

The ADL command can be used to disable a specified device port and consequently disable any incoming calls to that port (the calls are cleared). This function is achieved by using the " ! " symbol of the ADL syntax.

For example, to disable/re-enable device port A3:

```
SYNTAX                                  ACTION

 ADL:  A3:! RETURN                      Disables port A3.

 ADL:  A3:- RETURN                      Re-enables port A3.

 ADL:  list RETURN                      Displays the ADL assignment.

                  1   2   3   4

             D    -   -   -   -
             C    -   -   -   -
             B    -   -   -   -
             A    -   -   !   -         The listing shows port A3 disabled.

 ADL:                                   The prompt is returned after listing.
```

**NOTE**: The port disable only becomes effective after resetting the HP2334A or after a disconnection between the device and the HP2334A.

## 6.9 LIST COMMAND

This command permits the user to list the complete HP2334A configuration including the cards and firmware installed in the HP2334A. The command may be entered when the HP2334A is in CONFIGURE mode in response to the asterisk prompt. Note that the ADL assignment and defined Messages are NOT listed at this level.

The messages cannot be displayed at this level as they may contain escape sequences such as terminal reset or clear display and access to the test port password must also be restricted.

## 6.10 CONFIGURATION EXAMPLES

## 6.10.1 X.25 Cluster Controller Configuration Example

CONFIGURATION DIALOGUE EXAMPLE

| TEXT | EXPLANATION |
|---|---|
| *HSA <cr> | Call the protocol parameter configuration dialogue |
| DIALOGUE FOR LEVEL1 CONFIGURATION | |
| HSA: LEVEL1 <cr> | Select configuration of Level 1 |
| Line spd? 9600 <cr> | |
| HSA: | |
| LISTING OF LEVEL1 CONFIGURATION | |
| HSA: LIST1 <cr> | List the stored configuration |

```
 HP2334  CONFIGURATION  X.25  LEVEL  I
       ------------------------------------------------------------
       -PHYS. LINK  : X.21bis DTE          -LINE SPEED  : 9600
       ------------------------------------------------------------
```

HSA:

DIALOGUE FOR LEVEL2 CONFIGURATION

HSA: LEVEL2 <cr> — Select configuration of level 2

NTK type ? NET,0 <cr>
Frame window? 7 <cr>
Timer T1? 1600 <cr>

HSA:

LIST OF LEVEL2 CONFIGURATION

HSA: LIST2 <cr> — List the stored configuration

```
 HP2334  CONFIGURATION  X.25  LEVEL  II

       ------------------------------------------------------------
       -NETWORK TYPE: NET,0                -EQUIP. TYPE : LAP-B DTE
       -FRAME WINDOW: 7                    -TIMER T1    : 1600 ms
       -RET. CNT N2 : 20                   -I-FRAME     : 131 bytes
       ------------------------------------------------------------
```

HSA:

DIALOGUE FOR LEVEL3 CONFIGURATION

HSA: LEVEL3 <cr> — Select the Level 3 configuration

```
Lcl addr.? 13809748200 <cr>
Thrput in? 9600 <cr>
Thrput out? 9600 <cr>
Wind sz in ? 2 <cr>
Wind sz out? 2 <cr>
Def mod vc tbl.? YES <cr>
Fst pvc? 1 <cr>
Lst pvc? 4 <cr>
Fst svc in? 6 <cr>
Lst svc in? 8 <cr>
Fst 2w svc? 10 <cr>
Lst 2w svc? 16 <cr>
Fst svc out? <cr>
First pool port ? A3 <cr>
Last pool port? C2 <cr>
Neg pk sz? YES <cr>
Neg wd sz? NO <cr>
Neg thrput? YES <cr>
D-bit? NO <cr>
Rev. char. acc? YES <cr>
Ass. pvc? A2 <cr>
Ass. pvc? A3 <cr>
Ass. pvc? B1 <cr>
Ass. pvc? C4 <cr>
HSA:
```

LISTING OF LEVEL3 CONFIGURATION

```
HSA: LIST3 <cr>                List the configuration

HP2334  CONFIGURATION X.25  LEVEL III

       ------------------------------------------------------------
       -LOCAL ADDRESS : 13809748200
       -WIND. SIZE IN : 2                  -WIND. SIZE OUT: 2
       -THROUGHPUT IN : 9600               -THROUGHPUT OUT: 9600
       -PACK. SIZE IN : 128                -PACK. SIZE OUT: 128
       -FIRST PVC     : 1                  -LAST  PVC      : 4
       -FIRST  SVC IN : 6                  -LAST  SVC IN   : 8
       -FIRST  2W SVC : 10                 -LAST   2W SVC : 16
       -FIRST  SVC OUT:                    -LAST  SVC OUT :
       -FIRST POOL PRT: A3                 -LAST POOL PRT : C2
       -D-BIT         : NO
       -PKT. NUMBERING: 8
       -FAC. SUPPORTED: PKT.SZ          THO.PT  RV.CGA
       -ASSOC.  PVC   : 1:A2,2:A3,3:B1,4:C4
       ------------------------------------------------------------

HSA:
```

## DIALOGUE FOR MESSAGE CONFIGURATION

```
HSA: MSG <cr>                    Define internal message.
PAD Mess header? `Login:    '
Welcome message? `old welcome message'
Password ? `hp2334  '

HSA:
```

## LISTING OF MESSAGE CONFIGURATION

```
HSA: LISTMSG <cr>

HP2334 CONFIGURATION X.25 LEVEL IV
       ------------------------------------------------------------
       -WELCOME  MESSAGE: old welcome message   -PASSWORD: hp2334
       -PAD MESS. HEADER: Login:
       ------------------------------------------------------------
HSA:
```

## DIALOGUE FOR LUG CONFIGURATION

```
HSA: LUG <cr>                    Define the Local User Group `members'
Add or Clear? ADD <cr>
Remote addr?75XX20XXXX <cr>
Remote addr? <cr>


HSA:
```

## LISTING OF LUG CONFIGURATION

```
HSA: LISTLUG <cr>                List the LUG configuration

HP2334 CONFIGURATION  X.25  LUG
       ------------------------------------------------------------
       -REMOTE ADDRESS
       -138020555
       -138020555XX ----------> sub-address place holder
       -75XX20XXXX
       ------------------------------------------------------------

HSA:
```

DIALOGUE FOR SRA CONFIGURATION

```
HSA: SRA <cr>                    Define the Symbolic Remote Addresses
ADD OR CLEAR? CLEAR <cr>
Sra ? USA <cr>
REMOTE ADDR ASS.?0311030300044 <cr>
Sra ? GRENOBLE <cr>
REMOTE ADDR ASS.?138020666 <cr>
Sra ? <cr>

HSA:
```

LISTING OF SRA CONFIGURATION

```
HSA: LISTSRA <cr>                List the SRA configuration
HP2334 CONFIGURATION  X.25  SRA
       ------------------------------------------------------------
       -REMOTE ADDRESS
       -0311030300044<---USA
       -138020666<---GRENOBLE
       ------------------------------------------------------------

HSA: <cr>                        Exit synchronous network configuration
```

PROFILE ASSIGNMENT

```
* ASG <cr>                       Call assignment mode

ASG: LIST <cr>                   List the profile assignment

      assignment for each port

         .    1   2   3   4

         D    1   1   1   1
         C    1   1   1   1
         B    1   1   1   1
         A    1   1   1   1
```

```
ASG: B,C1:2 <cr>                Select profile #  2 for ports:
                                B1 to B4 and C1

ASG: LIST <cr>                  List assignment again
          assignment for HSA

          .    1   2   3   4

          D    1   1   1   1
          C    2   1   1   1
          B    2   2   2   2
          A    1   1   1   1


ASG: <cr>                       Exit assignment mode.

*                               Standard configuration prompt
```

## AUTOMATIC DIAL

```
* ADL <cr>                      Call automatic dial
ADL: LIST <cr>                  list the SRA assignment

            assignment for each port

             .   1   2   3   4

             D   -   -   -   -
             C   -   -   -   -
             B   -   -   -   -
             A   1   2   2   -
ADL: A1:2              automatic dial for A1 with SRA # 2

ADL: A2:-              disable automatic dial for A2 port.


ADL: LIST <cr>


          assignment for each port
             .    1   2   3   4
             D    -   -   -   -
             C    -   -   -   -
             B    -   -   -   -
             A    2   -   2   -
ADL: <cr>
```

USER DEFINED PROFILE

```
*UDP

Prof. number ? 72


  PROFILE NUMBER: 72              FREE SPACE : 43 parameters
 EXISTING PROFILE: 1,2,21,31,51,61,71,100,101,121,141,142


UDP: set 12:0,0:13,24:142

PAR 12:0,0:13,24:142

UDP:    <cr>

Prof number ? 72
  PROFILE NUMBER: 72              FREE SPACE : 43 parameters
 EXISTING PROFILE: 1,2,21,31,51,61,71,72,100,101,121,141,142
UDP:    <cr>

Prof number ?  <cr>
*
```

## 6.10.2 X.25 Stat Mux Configuration Example

ON THE FIRST HP2334A (DEVICES SIDE)

NOTE: The X.25 configuration is similar to the one used for the X.25 Cluster Controller configuration example hence only listings are provided. For a detailed description of the configuration dialogue refer to Section 6.4, X.25 CONFIGURATION LEVELS.

```
*LIST

HSA    02334-80320 . 02334-80330 .

 HP2334  CONFIGURATION X.25 LEVEL I

      ------------------------------------------------------------------
      -PHYS. LINK  : X.21bis DTE                -LINE SPEED  : 9600
      ------------------------------------------------------------------
 HP2334  CONFIGURATION X.25 LEVEL II

      ------------------------------------------------------------------
      -NETWORK TYPE: NET,0                      -EQUIP. TYPE : LAP-B DTE
      -FRAME WINDOW: 7                          -TIMER  T1   : 1600  ms
      -RET. CNT N2 : 20                         -I-FRAME     : 131 bytes
      ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 LEVEL III

      ------------------------------------------------------------------
      -LOCAL ADDRESS : 13809748200
      -WIND. SIZE IN : 2                        -WIND. SIZE OUT: 2
      -THROUGHPUT IN : 9600                     -THROUGHPUT OUT: 9600
      -PACK. SIZE IN : 128                      -PACK. SIZE OUT: 128
      -FIRST  PVC    : 1                        -LAST  PVC     : 4
      -FIRST  SVC IN : 6                        -LAST  SVC IN  : 8
      -FIRST  2W SVC : 10                       -LAST  2W SVC  : 16
      -FIRST  SVC OUT:                          -LAST  SVC OUT :
      -FIRST POOL PRT: A3                       -LAST POOL PRT : C2
      -D-BIT         : NO
      -PKT. NUMBERING: 8
      -FAC. SUPPORTED: PKT.SZ            THO.PT   RV.CGA
      -PVC ASSOC. PRT:  1:A2, 2:A3, 3:B1, 4:C4
      ------------------------------------------------------------------
 HP2334  CONFIGURATION X.25 LUG

      ------------------------------------------------------------------
      -REMOTE ADDRESS

      ------------------------------------------------------------------
```

```
 HP2334  CONFIGURATION X.25 SRA

       ------------------------------------------------------------------
       -REMOTE ADDRESS

       ------------------------------------------------------------------
ASG
    Assignment for each port


    .    1    2    3    4

    D    1    1    1    1
    C    1    1    1    1
    B    1    1    1    1
    A    1    1    1    1

       ------------------------------------------------------------------
CPU    02334-80300 . 02334-80310 .
SC-D               .           .
SC-C   05180-2039  . 05180-2040  . RS232C  4 ports
SC-B   05180-2039  . 05180-2040  . RS232C  4 ports
SC-A   05180-2039  . 05180-2040  . RS232C  4 ports
```

ON THE SECOND HP2334A (HOST COMPUTER PORTS SIDE)

```
*LIST

HSA    02334-80320 . 02334-80330 .
 HP2334  CONFIGURATION X.25 LEVEL I
       ------------------------------------------------------------------
       -PHYS. LINK  : X.21bis DTE                -LINE SPEED  : 9600
       ------------------------------------------------------------------
 HP2334  CONFIGURATION X.25 LEVEL II

       ------------------------------------------------------------------
       -NETWORK TYPE: NET,0                      -EQUIP. TYPE : LAP-B DTE
       -FRAME WINDOW: 7                          -TIMER  T1   : 1600  ms
       -RET. CNT N2 : 20                         -I-FRAME     : 131 bytes
       ------------------------------------------------------------------
```

```
HP2334  CONFIGURATION X.25 LEVEL III

      ------------------------------------------------------------------
      -LOCAL ADDRESS : 13802066600
      -WIND. SIZE IN : 2                          -WIND. SIZE OUT: 2
      -THROUGHPUT IN : 9600                       -THROUGHPUT OUT: 9600
      -PACK. SIZE IN : 128                        -PACK. SIZE OUT: 128
      -FIRST  PVC    : 1                          -LAST  PVC     : 4
      -FIRST  SVC IN :                            -LAST  SVC IN  :
      -FIRST  2W SVC : 5                          -LAST  2W SVC  : 16
      -FIRST  SVC OUT:                            -LAST  SVC OUT :
      -FIRST POOL PRT: B1                         -LAST POOL PRT : D4
      -D-BIT         : NO
      -PKT. NUMBERING: 8
      -FAC. SUPPORTED:                          RV.CGA
      -PVC ASSOC. PRT:  1:A1, 2:A2, 3:A3, 4:A4
      ------------------------------------------------------------------

HP2334  CONFIGURATION X.25 LUG

      ------------------------------------------------------------------
      -REMOTE ADDRESS

      ------------------------------------------------------------------
HP2334  CONFIGURATION X.25 SRA

      ------------------------------------------------------------------
      -REMOTE ADDRESS

      ------------------------------------------------------------------
ASG
    Assignment for each port


    .    1    2    3    4
    D    1    1    1    1
    C    1    1    1    1
    B    1    1    1    1
    A    1    1    1    1
      ------------------------------------------------------------------
CPU    02334-80300 . 02334-80310 .
SC-D                .             .
SC-C   05180-2039  . 05180-2040  . RS232MOD 4 ports
SC-B   05180-2039  . 05180-2040  . RS232MOD 4 ports
SC-A   05180-2039  . 05180-2040  . RS232MOD 4 ports
```

```
*UDP

Prof number? 144


       -PROFILE : 144                              -FREE SPACE : 43 parameters

       -EXISTING PROFILES : 1,2,3,21,22,31,51,61,71,73,100,101,121,141,143

UDP: PAR?

PAR 1:1, 2:0, 3:127, 4:0, 5:1, 6:5, 7:21, 8:0, 9:0, 10:0, 11:14, 12:1, 13:0, 14:
 0, 15:0, 16:8, 17:24, 18:0, 0:13, 1:0, 2:96, 3:0, 4:0, 5:0, 6:0, 7:128, 8:25,
9:64, 10:0, 11:0, 12:0, 13:1, 14:0, 15:0, 16:0, 17:0, 18:12, 19:255, 20:0, 21:0,
22:92, 23:1, 24:0, 25:0
UDP: SET 2:1,3:2,4:0,15:1,0:13,4:30,5:13,14:1
UDP: PAR?

PAR 1:1, 2:1, 3:2, 4:0, 5:1, 6:5, 7:21, 8:0, 9:0, 10:0, 11:14, 12:1, 13:0, 14:0,
 15:1, 16:8, 17:24, 18:0, 0:13, 1:0, 2:96, 3:0, 4:30, 5:13, 6:0, 7:128, 8:25, 9:
  64, 10:0, 11:0, 12:0, 13:1, 14:1, 15:0, 16:0, 17:0, 18:12, 19:255, 20:0, 21:0,
 22:92, 23:1, 24:0, 25:0
UDP:
Prof number? 74


       -PROFILE : 74                               -FREE SPACE : 43 parameters

       -EXISTING PROFILES : 1,2,3,21,22,31,51,61,71,73,100,101,121,141,143,144

UDP: SET 0:13,24:144


UDP: PAR?

PAR 1:0, 2:0, 3:127, 4:0, 5:1, 6:0, 7:0, 8:0, 9:0, 10:0, 11:14, 12:0, 13:0, 14:0
, 15:0, 16:8, 17:24, 18:0, 0:13, 1:0, 2:0, 3:0, 4:0, 5:0, 6:0, 7:128, 8:0, 9:0,
10:0, 11:0, 12:0, 13:3, 14:0, 15:0, 16:0, 17:0, 18:0, 19:128, 20:0, 21:0, 22:96,
 23:1, 24:144, 25:0
UDP:

Prof number?

*ASG
ASG: A:71
ASG: B:71

ASG: C:71
```

```
ASG: LIST

    Assignment for each port


    .     1     2     3     4

    D     1     1     1     1
    C    71    71    71    71
    B    71    71    71    71
    A    71    71    71    71

ASG:

*
```

## 6.10.3 Stat Mux (Non-PSN) Configuration Example

CONFIGURATION LISTING EXAMPLES:

ON THE FIRST HP2334A (DEVICES SIDE)

```
* LIST

HSA    02334-80320 . 02334-80330 .
 HP2334  CONFIGURATION X.25 LEVEL I

       ------------------------------------------------------------------
       -PHYS. LINK  : X.21bis DTE                -LINE SPEED  : 19200
       ------------------------------------------------------------------
 HP2334  CONFIGURATION X.25 LEVEL II
       ------------------------------------------------------------------
       -NETWORK TYPE: NET,0                      -EQUIP. TYPE : LAP-B DTE
       -FRAME WINDOW: 7                          -TIMER  T1   : 3000  ms
       -RET. CNT N2 : 20                         -I-FRAME     : 131 bytes
       ------------------------------------------------------------------
 HP2334  CONFIGURATION X.25 LEVEL III

       ------------------------------------------------------------------
       -LOCAL ADDRESS : 00
       -WIND. SIZE IN : 4                        -WIND. SIZE OUT: 4
       -THROUGHPUT IN : 19200                    -THROUGHPUT OUT: 19200
       -PACK. SIZE IN : 128                      -PACK. SIZE OUT: 128
       -FIRST  PVC    : 1                        -LAST  PVC     : 4
       -FIRST  SVC IN :                          -LAST  SVC IN  :
       -FIRST  2W SVC : 5                        -LAST  2W SVC  : 8
       -FIRST  SVC OUT:                          -LAST  SVC OUT :
       -FIRST POOL PRT: B1                       -LAST POOL PRT : B4
       -D-BIT         : NO
       -PKT. NUMBERING: 8
       -FAC. SUPPORTED:
       -PVC ASSOC. PRT:  1:A1, 2:A2, 3:A3, 4:A4
       ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 LUG

       ------------------------------------------------------------------
       -REMOTE ADDRESS

       ------------------------------------------------------------------
```

```
 HP2334  CONFIGURATION X.25 SRA

       ------------------------------------------------------------------
       -REMOTE ADDRESS

       ------------------------------------------------------------------
ASG
    Assignment for each port
    .    1    2    3    4
    D    1    1    1    1
    C    1    1    1    1
    B    1    1    1    1
    A    1    1    1    1

       ------------------------------------------------------------------
CPU    02334-80300 . 02334-80310 .
SC-D               .             .
SC-C               .             .
SC-B   05180-2039  . 05180-2040  . RS232C  4 ports
SC-A   05180-2039  . 05180-2040  . RS232C  4 ports

*
       ON THE SECOND HP2334A (HOST COMPUTER PORTS SIDE)
       ________________________________________________
* LIST


HSA    02334-80320 . 02334-80330 .

 HP2334  CONFIGURATION X.25 LEVEL I

       ------------------------------------------------------------------
       -PHYS. LINK  : X.21bis DTE                -LINE SPEED  : 19200
       ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 LEVEL II
       ------------------------------------------------------------------
       -NETWORK TYPE: DCE,0                      -EQUIP. TYPE : LAP-B DCE
       -FRAME WINDOW: 7                          -TIMER  T1   : 3000  ms
       -RET. CNT N2 : 20                         -I-FRAME     : 131 bytes
       ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 LEVEL III

       ------------------------------------------------------------------
       -LOCAL ADDRESS : 00
       -WIND. SIZE IN : 4                        -WIND. SIZE OUT: 4
       -THROUGHPUT IN : 19200                    -THROUGHPUT OUT: 19200
       -PACK. SIZE IN : 128                      -PACK. SIZE OUT: 128
       -FIRST  PVC    : 1                        -LAST  PVC     : 4
       -FIRST  SVC IN :                          -LAST  SVC IN  :
       -FIRST  2W SVC : 5                        -LAST  2W SVC  : 8
       -FIRST  SVC OUT:                          -LAST  SVC OUT :
       -FIRST POOL PRT: B1                       -LAST POOL PRT : B4
```

```
       -D-BIT          : NO
       -PKT. NUMBERING: 8
       -FAC. SUPPORTED:
       -PVC ASSOC. PRT:  1:A1, 2:A2, 3:A3, 4:A4
       ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 LUG

       ------------------------------------------------------------------
       -REMOTE ADDRESS

       ------------------------------------------------------------------

 HP2334  CONFIGURATION X.25 SRA
       ------------------------------------------------------------------
       -REMOTE ADDRESS
       ------------------------------------------------------------------
ASG
    Assignment for each port

    .    1    2    3    4

    D    1    1    1    1
    C    1    1    1    1
    B   71   71   71   71
    A   71   71   71   71

       ------------------------------------------------------------------
CPU    02334-80300 . 02334-80310 .
SC-D               .             .
SC-C               .             .
SC-B   05180-2039  . 05180-2040  . RS232MOD4 ports
SC-A   05180-2039  . 05180-2040  . RS232C  4 ports

*
```

# OPERATION

CHAPTER 7

## 7.1 INTRODUCTION

This chapter describes how to operate the HP2334A and how the HP2334A PAD is controlled from a local terminal by using X.28 PAD commands.

The HP2334A physical controls (i.e. the CPU Card's LEDs, DIP switches and reset push-button) are detailed in Section 7.2 together with a description of how to enter RUN mode and obtain display information on the CPU Card LEDs.

Section 7.3 describes how to enter the PAD command and data transfer states and how to establish and terminate a connection (make and clear a call).

How to control the HP2334A PAD locally from a terminal by using X.28 commands is described in Section 7.4. This section details the standard X.28 PAD commands and service signals and the non-standard X.28 RPROF command. Section 7.5 is included for reference purposes and describes how an HP2334A PAD is controlled remotely by the PAD support software using X.29 PAD commands.

In case of difficulty the user should refer to Section 7.6 which provides user troubleshooting information.

## 7.2 CPU CARD LEDs, DIP SWITCHES AND RESET

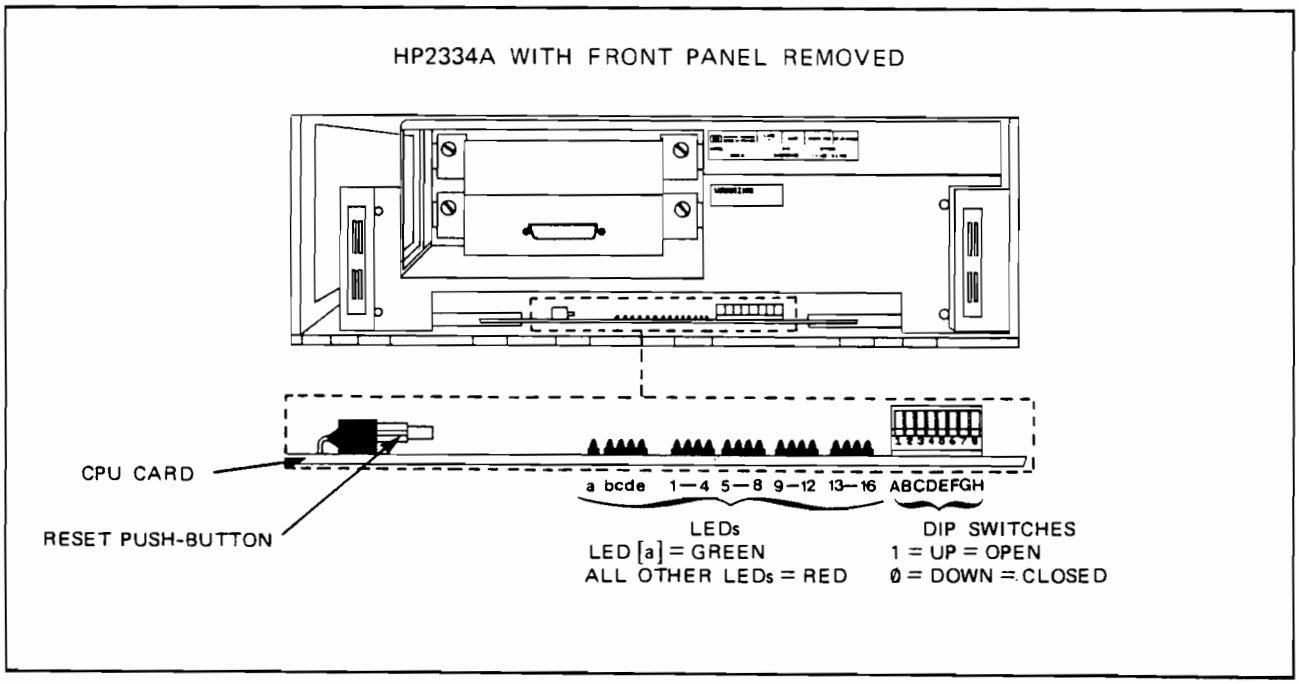



**Figure 7-1 CPU Card LEDs and Switches**

Mounted on the CPU Card are the Reset push-button, eight DIP switches and 21 LEDs (Light Emitting Diodes) as shown in Figure 7-1.

- **Reset Push-button.** The Reset push-button is used to reset the HP2334A to the "power-on" state. This enables the HP2334A to be initialized without having to power-off and then power-on again.

- **DIP Switches.** The eight DIP switches are used as follows:

  1) Switches ABCD enable the user to select the data displayed on the CPU Card's LEDs. These switches are sensed at all times after power-on (except if switches EFGH are set to 0100) and are interpreted in different ways according to the operating mode of the HP2334A (see below).

  2) Switches EFGH are sensed only at power-on or when the HP2334A is initialized by pressing the Reset push-button. These switches are used primarily to select the HP2334A's operating mode (RUN mode, CONFIGURE mode or TEST mode) after a successful power-on test following a power-on or reset. They are also used to select the diagnostic test to be performed (some tests require switches ABCD to be set to a precise position).

- **LEDs.** The 21 LEDs are as follows:

  The green LED [a] is extinguished during execution of the self diagnostic tests and when the HP2334A is halted due to an error. It is continuously lit when the HP2334A is in either the RUN or CONFIGURE mode and operating correctly and flashes to signal the end of a diagnostic test.

  LEDs [b] to [e] and [1] to [16] illuminate according to the HP2334A's mode of operation. The normal operating mode of the HP2334A is RUN mode; the procedure for entering RUN mode, the valid DIP switch settings and the available LED display information are detailed in 7.2.1.

## 7.2.1 Entering RUN mode

The normal mode of operation of the HP2334A is RUN mode. In RUN mode a connected asynchronous device can communicate with a remote DTE (host computer) via the the HP2334A and the synchronous network (or PSN).

**Preparation.** Before RUN mode can be entered the HP2334A must be configured off-line with the synchronous network X.25 communication parameters (Levels 1 to 3) and the PAD (or CAS/PAD) asynchronous port profile assignments as described in Chapter 6.

**Procedure.** To enter RUN mode the DIP switches (see Figure 7-1) must first be set as follows:

| DIP Switch: | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Setting: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The HP2334A can then be powered-on (or if already ON then press the Reset push-button for initialization) and it will perform the standard Power-On Test (see Section 4.8) and enter RUN mode if the test is successful. If the test is unsuccessful or if there is a synchronous network configuration error then the HP2334A will halt and indicate the error on the LED display. For details of the LED displayed error messages refer to Section 7-6 or Chapter 14. In RUN mode, LEDs [a] to [e] illuminate as follows:

| LED DISPLAY | | | | | MODE |
|---|---|---|---|---|---|
| [a] | [b] | [c] | [d] | [e] | |
| 1 | b | b | 1 | 1 | RUN Mode |

Where 1 = LED ON
b = LED BLINKING (OFF/ON.)

NOTE: LED [a] is continuously lit and LEDs [b] and [c] blink alternately. LED [d] is continuously lit as soon as the CTS and DSR signals are received from the synchronous network modem, indicating that X.25 Level 1 is established. LED [e] is continuously lit as soon as X.25 Level 2 (Link Level) data communication is established.

With the DIP switches set as shown above LEDs [1] to [16] provide a port recognition display indicating when each device port is "ready". If the LED display fails to provide a "ready" indication as expected for a required device port then refer to Section 7.6.

In RUN mode, LEDs [1] to [16] display information specified by the position of DIP switches ABCD. There are four settings available as follows:

```
1)  A B C D E F G H          Where: 1 = UP (OPEN)
    0 0 0 0 0 0 0 0                 0 = DOWN (CLOSED)
```

This setting provides an LED display of asynchronous port recognition with each LED lit when its corresponding port is "ready". A port is not ready until the speed/parity is sensed (by entering a Cr character) if auto speed/parity is selected in the port profile. When a Modem Control Adapter Card is used AND the modem signals are monitored the port is "ready" when the modem control signals are set (ON) (see 4.10.1). When a Direct Connect Adapter Card is used the port is "ready" as soon as the HP2334A enters RUN mode.

The LEDs are associated to the asynchronous device ports as follows.

```
LEDs [ 1  2  3  4] = PORTS A1 A2 A3 A4
LEDs [ 5  6  7  8] = PORTS B1 B2 B3 B4
LEDs [ 9 10 11 12] = PORTS C1 C2 C3 C4
LEDs [13 14 15 16] = PORTS D1 D2 D3 D4
```

```
2)  A B C D E F G H          Where: 1 = UP (OPEN)
    0 1 0 0 0 0 0 0                 0 = DOWN (CLOSED)
```

This setting provides an LED indication of the virtual circuit (VC) activity on the HP2334A device ports. Each LED is lit when a VC is established on its corresponding port; the LED blinks (ON/OFF) rapidly when data is being transferred. The LEDs correspond to the device ports as shown above.

```
3)  A B C D E F G H          Where: 1 = UP (OPEN)
    1 1 1 0 0 0 0 0                 0 = DOWN (CLOSED)
```

This setting provides an LED indication of frame level activity. LEDs [1] to [8] display the corresponding frame receive (next expected frame) sequence numbers N(R) (0 to 7) and LEDS [9] to [16] display the corresponding frame send sequence numbers N(S) (0 to 7).

```
4)  A B C D E F G H          Where: 1 = UP (OPEN)
    1 1 0 0 0 0 0 0                 0 = DOWN (CLOSED)
```

This setting provides an LED indication of the amount of HP2334A internal buffer memory available. The 16 LEDs provide a bar graph display where:

```
All LEDs ON  = 100% of memory is available
All LEDs OFF = 100% of memory is full
One LED  ON  = 6.25% of memory is available
```

## 7.3 MAKING AND CLEARING A CONNECTION

**Introduction.** When a call is made an SVC is established between the devices (or computer ports) at the called and the calling addresses. When the call is terminated the SVC is cleared. The HP2334A must normally be in the PAD command state to establish or clear an SVC and in the PAD data transfer state when communication is established. Thus in operation, the HP2334A is in either the PAD command state or the PAD data transfer state.

In the PAD data transfer state a virtual circuit is established between the calling DTE (e.g. the user's terminal) and the remote DTE (e.g. the remote host computer) enabling data to be transferred. In the PAD command state the user may enter X.28 PAD commands from the terminal to control the HP2334A PAD and perform the functions shown in Table 5-1 (e.g. establishing an SVC).

**Operation.** Once RUN mode has been entered (see 7.2.1), the synchronous network is operational (X.25 Levels 1, 2 and 3 set) and the required device ports are "ready", the HP2334A PAD will perform as follows:

- A virtual circuit is established and the PAD data transfer state is entered for all devices connected to device ports which have either a PVC or the ADL automatic dial facility assigned to them. Note that this does not occur if an ADL assigned port has the auto speed/parity parameter (local parm. #15) enabled in its assigned PAD profile (see 6.7.2) unless a RETURN (or Cr) character is entered. This parameter is not enabled in any BDPs.

- The PAD command state is entered for all terminals (or any other device) connected to device ports without PVCs or the ADL facility assigned to them.

**NOTE:** In Stat Mux configurations, virtual circuits between output devices (i.e. printers, plotters, etc.) and the associated remote host computer(s) should be established by using PVCs or through ADL assignment on the device port (printer side) if SVCs are used. In Cluster Controller configurations the host computer PAD support controller is normally able to initiate a call to a remote output device.

**Making a call (SVC establishment).** To establish an SVC the HP2334A must be in the PAD command state and be displaying the PAD selection command signal prompt (an " @ "), if defined, at the terminal.

An X.28 PAD selection command signal can then be entered in order to make a call (establish an SVC). When making a call the "one-way outgoing" and "two-way" SVCs are used and the HP2334A will establish the call on the first free SVC in the required category (for more details refer to VC assignment in 6.4.3). Note that if a "one-way outgoing" SVC is used the communication will be full duplex once the call is established and that any outgoing (or 2 way) SVC can be used as the remote address is specified in the selection command (see Figure 7-2).

**NOTE:** Only non-PVC assigned ports can establish an SVC. Ports which have a CAS profile assigned to them can only receive calls and not initiate them.

**NOTE:** When entering a PAD selection command, editing must be enabled (see X.3 parameters #15, #16 and #17) in order to be able to use the character delete (normally backspace) and line delete (normally CONTROL [X]) characters. If editing is not enabled then these characters are accepted but no action is performed and they are displayed as a vertical bar "|" when entered with a RETURN (Cr) character.

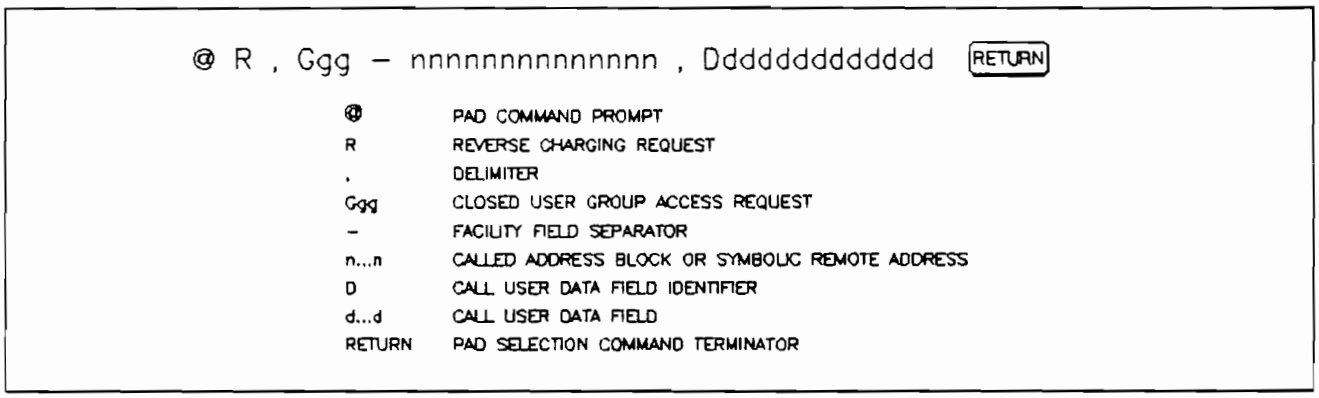



**Figure 7-2 X.28 Selection Command Format (for PSNs)**

*OPTIONAL:*

| | |
|---|---|
| R<br>,<br>Ggg<br>- | Requests Reverse Charging (" , " =delimiter)<br>G = Request access to PSN Closed User Group,<br>gg = CUG identification (gg = 00 to 99)<br>" - " = facility field separator |

*MANDATORY:*

| | |
|---|---|
| nnnnnnnnnnnnnn | Called address, may include sub-address last two digits (15 digits max.). (See Fig. 4-7) |
| or | |
| qqqqqqqqqqqq.pp | q = called address (13 digits max.)<br>pp = sub-address (2 digits max.)(Fig. 4-7) |
| or | |
| #ssssssss | # denotes SRA (see Section 6.5)<br>s = symbolic address (8 characters maximum) |
| or | |
| xxxyy[.pp] | Abbreviated TELENET type network address:<br>xxx = area code(3 digits)<br>yy = local address (1 to 4 digits)+ optional<br>pp = sub-address (2 digits), see NOTE. |
| then | |

*OPTIONAL:*

| | |
|---|---|
| ,Ddddddddddddd | D = Call User Data field identifier<br>d = user data field (maximum 12 characters; bytes 4 to 16). " , " = delimiter. |
| then | |

*MANDATORY:*

| | |
|---|---|
| RETURN | The Cr character (or +) must be used as the selection command terminator. |

NOTE: For TELENET type networks only. The address is expanded automatically (zeroes filled) into X.121 format in the call request packet.

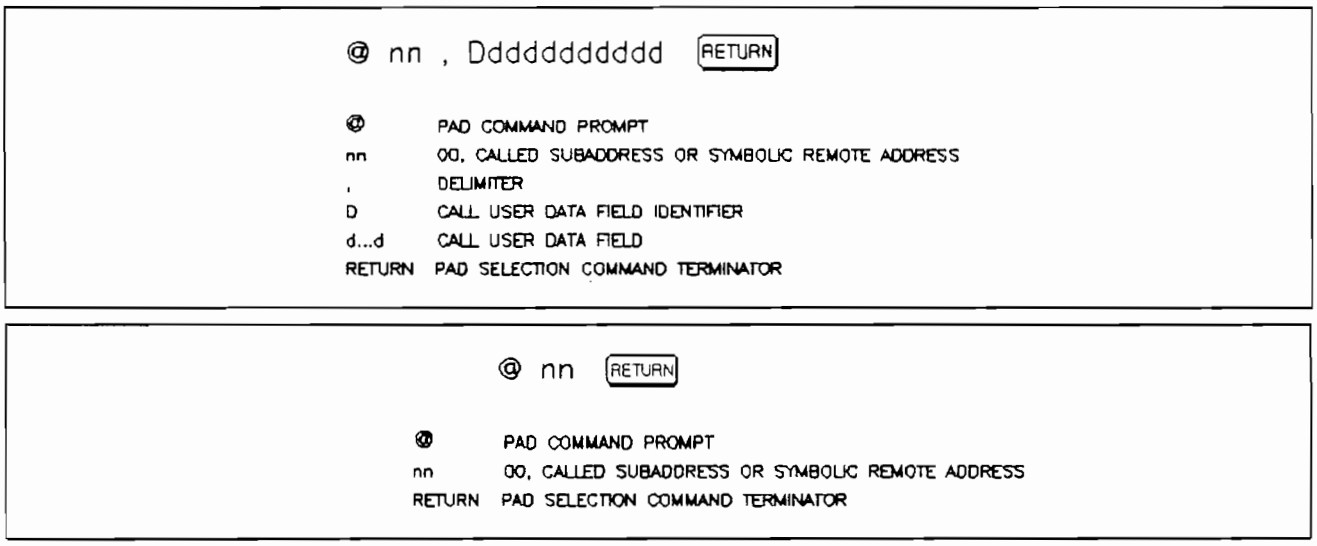



**Figure 7-3 PAD Selection Command (with no PSN)**

To establish an SVC on a modem-link synchronous network (non-PSN) once the PAD command prompt " @ " is obtained, simply enter the sub-address (or SRA) of the required remote device port (use the relative sub-address base, usually 00 for the pool port), followed by the Call User Data (if any) and then the RETURN (Cr) character.

Once the SVC is established the connected PAD service signal "COM" is displayed followed by the remote host computer prompt enabling a session to be established. Note that a RETURN (Cr) character may need to be entered after "COM" is displayed to obtain the remote host computer prompt.

**Clearing a call (Clearing an SVC).** Clearing an SVC normally requires the HP2334A to be in the PAD command state.

The HP2334A will switch temporarily from the PAD data transfer state to the PAD command state by entering the data transfer escape character. The data transfer escape character (normally DLE or CONTROL [P]) is defined in X.3 parameters #1 and #7. The HP2334A will then forward the previous data input (if any) and return the PAD command prompt " @ " to the user.

If the next characters entered are:

- CLR RETURN - The CLR PAD command signal followed by a (Cr) carriage return character clears the SVC. The HP2334A PAD responds with a "CLR CONF" service signal and PAD command prompt " @ " which are displayed at the terminal. The HP2334A is then in PAD command state and the call is cleared.

- RETURN (Cr) or " + " - The PAD command terminator returns the HP2334A to the PAD data transfer state and returns an "ERR" error message to the terminal.

- CONTROL [P] - The DLE character (or defined character in X.3 par. #1) returns the HP2334A to the PAD data transfer state and one "escape from data transfer" character (the DLE) is stored in the buffer as data.

- If any other character is entered (except character and line delete) then the input is buffered until a RETURN (Cr) or " + " terminator is entered.

**NOTE**: When a terminal has an SVC with a remote host computer which uses modem control signals to establish/terminate a session or an X.25 Cluster Controller configuration is used then terminating the session will also clear the SVC.

**Example SVC establishment/clearing dialogue.**

| | |
|---|---|
| Power-on/Reset | Initializes HP2334A (1st time) |
| | (If auto speed/parity are selected in the port profile then press RETURN) |
| HP2334A ON TRANSPAC | PAD identification signal (user defined WELCOME message) |
| @ | PAD command prompt |
| R-138123456 RETURN | Selection PAD command (Reverse Charge requested to called address: 138123456) |
| COM | Connected PAD service signal (Call is accepted and SVC established) |
| : | Remote host computer prompt (may differ); RETURN (Cr) may be needed to get prompt (consult your computer system operator) |
| HELLO USER.ACCOUNT,GROUP | Remote session initiation (session is then established until BYE command is entered) |
| CONTROL [P] | Escape from PAD data transfer state |
| @ | PAD command prompt |
| CLR RETURN | Clears the SVC |
| CLR CONF | Clear confirmation service signal |
| @ | PAD command prompt is returned |

## 7.4 LOCAL CONTROL OF THE HP2334A PAD (X.28)

The X.28 Recommendation defines the interface between the asynchronous DTE (terminal) and the PAD and the commands that may be used to control the PAD locally. The HP2334A PAD may be in either the data transfer state or the command state. When in the PAD command state any data exchanged between the terminal and the PAD is not transferred to the remote DTE.

Whenever a PAD command signal is sent from the terminal to the PAD it responds by returning a PAD service signal which is displayed at the terminal. An example of a PAD response is the connected PAD service signal "COM". If a VC cannot be established or it is prematurely cleared then the PAD provides a clearing service signal "CLR" and indicates the reason for the clear (e.g. OCC = remote DTE occupied (busy), DER = remote DTE out of order, NA =Closed User Group violation).

**NOTE**: Whenever a PAD service signal is described as being delivered to the asynchronous DTE (terminal) the action is only effected if the value of X.3 parameter #6 is not 0.

| PAD COMMAND SIGNAL FORMAT | FUNCTION | PAD SERVICE SIGNAL SENT IN RESPONSE |
|---|---|---|
| Selection PAD command signal | To establish an SVC | COM or CLR xxx |
| CLR | To clear an SVC | CLR CONF or CLR ERR |
| STAT | To request status information on a port | FREE or ENGAGED |
| RESET | To reset a VC | Acknowledgement |
| INT | To transmit an interrupt packet | Acknowledgement |
| PROF (identifier) | Temporarily sets the PAD parameters to new defined profile values | Acknowledgement |
| RPROF(identifier) (non-std. X.28) | To request remote CAS/PAD to temporarily use the specified profile | Acknowledgement |
| SET (List of parameters/values) | To temporarily set/change parameter values | Acknowledgement |
| SET?(List of parameters with requested values) | To temporarily set/change parameter values and display them | PAR (Lists parameters and their values or INV) INV = invalid |
| PAR?(List of parameters) | To request values of the specified parameters | PAR (Lists parameters and values or INV) |

**Table 7-1 PAD Command Signals**

The operation of the PAD depends on the current values of assigned PAD profile parameters. Initially the PAD parameter values are those defined in the assigned port profile at the time a selection PAD command signal is sent.

PAD Command signals are provided for the following:

- Establishing and clearing an SVC
- Selection of a pre-defined PAD profiles
- Selection of individual PAD parameter values
- Requesting the current PAD parameter values to be displayed
- Sending an INTerrupt
- Requesting VC status information
- Resetting a VC

The PAD service signals are provided in the following categories:

- Network status (specific to HP2334A)
- PAD identification (user defined)
- Virtual circuit status
- Acknowledgement of PAD command signals
- Profile information (parameters and values)
- HP2334A PAD operation (local errors - see Section 7.6)

## 7.4.1 PAD Command Signals

The PAD command signals that may be entered when the HP2334A is in PAD command state together with the type of PAD service signals that are sent in response are listed in Table 7-1. The PAD command signals are as follows:

**Selection Command.** The selection command allows a user connected to a non-PVC assigned port to establish an SVC with a specific remote DTE. When all the SVCs dedicated to outgoing calls (one-way outgoing and 2 way SVCs) are engaged, a virtual circuit congestion exists. If a selection command is then received the PAD will respond with a CLR PAD service signal.
The format of the service signal for virtual circuit congestion is:

```
CLR VCC
```

Symbolic Remote Addressing may be used in the selection command. For details of the selection command format refer to Section 7.3.

**NOTE:** When entering a PAD selection command, editing must be enabled (see X.3 parameters #15, #16 and #17) in order to be able to use the character delete (normally backspace) and line delete (normally CONTROL [X]) characters. If editing is not enabled then these characters are accepted but no action is performed and they are displayed as a vertical bar "|" when entered with a RETURN (Cr) character.

**CLR (Clear) Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The CLR command enables the user to clear an SVC and the PAD responds by sending a clear confirmation PAD service signal. The format of the clear command is:

```
CLR [RETURN]
```

The format of the clear confirmation service signal is:

```
CLR CONF
```

**NOTE:** If the CLR command is entered on a PVC then the PAD will respond with an "ERR" error message.

**STAT (Status) Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The STAT command allows the user to request the status of the VC at the PAD interface (for that port).
The format of the status PAD command is:

```
STAT [RETURN]
```

The PAD service signals sent in response are as follows:

```
FREE XX       If no VC is established
ENGAGED XX    If a VC is established

Where XX = the port designator (e.g. A2 = card A, port 2)
```

**RESET Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The RESET PAD command signal allows the user to reset an established VC.
The format of the reset PAD command is:

```
RESET [RETURN]
```

The HP2334A PAD then responds with an acknowledgement PAD service signal as follows:

```
RESET CONF
```

**INT (Interrupt) Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The INT command may be used to send an interrupt packet from the HP2334A PAD to the remote DTE.
The format of the interrupt command is:

```
INT [RETURN]
```

The only acknowledgement PAD service signal for an interrupt command is a "Cr Lf Cr" which results in the terminal cursor moving down by one line.

**PROF (Profile) Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The PROF command enables the user to temporarily set the PAD profile parameters to the values of a defined PAD profile (i.e. a profile numbered less then 51). If the requested profile is not defined in the HP2334A, it responds with an "ERR" error PAD service signal. The command must be followed by the profile identifier.

The format of the standard profile selection PAD command signal is:

```
PROF nn (RETURN)

Where nn = the profile identifier
```

Once the PROF command is entered the HP2334A changes the values of the parameters (where required) and sends an acknowledgement PAD service signal. The parameters change back to the original profile values when the SVC is cleared or when the HP2334A is reset if the command applies to a PVC.

If the PROF command is entered with no profile identifier then the assigned profile reverts back to its original values.

**RPROF Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. RPROF is a non-standard X.28 command that enables the user to request a remote HP2334A CAS/PAD to temporarily use a new profile specified by the "nn" profile identifier following the command. The profile transmitted to the remote CAS/PAD using the RPROF command (e.g. UDP #73) will automatically download the necessary parameters in X.29 packet format to temporarily redefine the local PAD profile using a "PAD associated to CAS/PAD" profile (e.g. UDP #143). As new parameter values can be temporarily set at each end of the synchronous link using the RPROF command, this command provides the versatility required when, for example, the mode of data transfer needs to be changed (e.g. for a transparent binary transfer).

The format of the RPROF PAD command is:

```
RPROF nn (RETURN)

Where nn = the profile identifier (must be between 51 and 99)
```

**NOTE:** Only a remote HP2334A with a CAS/PAD profile on the target port will be able to execute this function completely.

If the command is entered incorrectly this will result in an "ERR" message. If entered correctly, the local PAD responds with an acknowledgement service signal. The remote action of the command will result in an acknowledgement PAD service signal from the remote CAS/PAD having the following format:

```
RPROF DONE
```

If the required CAS/PAD profile is not defined in the remote HP2334A (it can be defined using the UDP command), then the RPROF command will be rejected by the remote CAS/PAD and an error message will be displayed as follows:

```
NOT FOUND
```

The RPROF command only sets the new profile parameters temporarily as each parameter changes back to its original profile value when the SVC is cleared or when the HP2334A is reset if the command is used

over a PVC. If the command is entered with no profile identifier then the assigned profile reverts back to its original values.

**NOTE**: The RPROF command can only be used when the remote PAD is an HP2334A.

**SET Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The SET command enables the user to temporarily change one or several parameter values by including the parameter numbers and the values to be modified.

The command format is normally SET followed by the parameter number, a colon and then the new value to be set. If more than one "parameter:value" is to be modified then the "parameter:value" couples must be separated by a comma.

- If a parameter number is not given then the parameter value remains the same value as that defined in the profile.
- If one parameter number or one value is invalid then parameters up to but excluding the erroneous one will set.
- The SET command size is limited to 128 characters.
- The local parameters are accessed through parameter #0 set at value 13 which acts a a separator.

```
Example:
        SET 2:0, 4:1, 5:0, 0:13, 2:0 [RETURN]  (space character is optional)

This sets parameter #2 to value 0, parameter #4 to value 1,
parameter #5 to value 0 and local parameter #2 to value 0.
```

The SET command only sets the new parameter values temporarily as each parameter changes back to its original profile value when the SVC is cleared or when the HP2334A is reset if the command is used over a PVC. If the SET command is entered without parameter(s)/value(s) then the original assigned profile parameter values are reset.

**SET? Command.** The SET? command is identical to the SET command but also displays the new values of the modified parameters.

**PAR? Command.** This command must be used in the PAD command state after escaping from the PAD data transfer state if it is enabled. The PAR? command enables the user to list one, several or all of the current parameter values of the assigned profile. To list all of the profile parameters simply enter PAR? (then press RETURN). Alternatively enter the command PAR? followed by the parameter number(s). If more than one parameter value is required the parameter numbers must be separated by comma. Note that the PAR? command size is limited to 128 characters.

The format of the PAR? command is as follows:

```
PAR? 2,4,54,0,22 RETURN                    (space character is optional)
```

The HP2334A PAD then responds by providing a listing, the format of which is: "PAR" followed by a list of parameter numbers and the corresponding requested values. Note that parameter number 0 set at a value of 13 is a separator indicating that the parameters which follow are local parameters.

The parameter/value listing in response to a PAR? command is as follows:

```
PAR 2:1, 4:0, 54:INV, 0:13, 22:64
```

In this example the value of a non-existent standard X.3 parameter number 54 has been requested and the INValid response is listed.

## 7.4.2 PAD Service Signals

**PAD Message Header.** The PAD message header is an HP2334A user facility which enables the user to define, during configuration, a message which will be output before any PAD service signal. The PAD message header may comprise terminal escape sequences to reset the terminal or clear the display.

**Network Status Service Signal.** If X.25 Level 3 cannot be established then a network status service signal is displayed, the format of which is as follows:

```
NETWORK DOWN
```

**PAD Identification Service Signal.** The format of the PAD identification service signal is identical to the format of the WELCOME message defined during off-line configuration of the HP2334A. It can comprise up to 20 characters from IA5 except (CONTROL) [W] which is used to disable the PAD identification service signal.

**NOTE:** The WELCOME message is not sent to PVC assigned device ports.

**Incoming Call Service Signal.** The format of an incoming call service signal is shown in Figure 7-4.

```
nnnnnnnnnnnnnn R D Gnn
ddddddddddddd
COM
```

| | |
|---|---|
| n...n | CALLING DTE ADDRESS BLOCK |
| space | DELIMITER |
| R | REVERSE CHARGING REQUEST (OPTIONAL) |
| D | END-TO-END ACKNOWLEDGMENT REQUEST (OPTIONAL) |
| Gnn | CLOSED USER GROUP ACCESS REQUEST (OPTIONAL) |
| d...d | CALL USER DATA FIELD (OPTIONAL) |
| COM | CONNECTED PAD SERVICE SIGNAL |

**Figure 7-4 Format of an Incoming Call Service Signal**

**Connected PAD Service Signal.** The connected PAD service signal indicates that the call is accepted and the VC is established. It is displayed as follows:

```
COM
```

**Clear Indication PAD Service Signals.** If a call (SVC establishment) is unsuccessful the PAD will indicate the reason for the clear in the clear indication PAD service signal. When X.3 parameter #6 (PAD messages) is set to a value of 1 or 5 then a clear indication PAD service signal may be sent to the device (terminal) and the HP2334A enters the PAD command state. The format of a clear indication PAD service signal is:

```
CLR
```

followed by one of the following clear indications:

```
CONF  -  Confirmation of CLR command.
DTE   -  The remote DTE has cleared the SVC.
OCC   -  The remote DTE is occupied (busy).
INV   -  Invalid facility request field.
NC    -  Network congestion.
DER   -  The remote DTE/network is out of order
         or remote DTE/network have restarted.
NA    -  Connection not permitted (PSN CUG).
NP    -  Not obtainable.
RPE   -  Remote procedure error.
ERR   -  Local procedure error.
RPO   -  RPOA out of order.
RCA   -  Reverse charge acceptance not
         subscribed by the remote DTE.
INC   -  Incompatible destination address.
VCC   -  All outgoing (and 2 way) SVCs are
         engaged (non-standard X.28).
```

The clear indication PAD service signals may have a numeric diagnostic cause code. For details of the diagnostic cause codes refer to the CCITT X.1 to X.29 Recommendations (see Appendix E).

**NOTE:** If the PSN or the remote DTE performs a restart on an established SVC or stops communication then the HP2334A PAD sends a clear PAD service signal with a DER cause indication to every port not assigned to a PVC. A (RETURN) (Cr) character must be entered and the PAD will respond with a network status service signal if the network is not operational. When the network is operational (X.25 Levels 1 and 2 set) the PAD identification service signal (HP2334A defined WELCOME message) is displayed and the HP2334A enters the PAD command state.

**Reset PAD Service Signal.** When a restart occurs on PVCs or when the network is down the reset PAD service signal followed by a DER (restart) cause indication is displayed as follows:

```
RESET DER  -  Indicates that the remote DTE/network
              is out of order or has restarted.
```

When the network is operational (X.25 Levels 1 and 2 set) a reset PAD service signal is displayed as follows:

```
RESET NOP  -  Indicates that the PVC is
              now operational.
```

**NOTE:** When a PVC is established for the first time (see Section 7.3) the RESET NOP service signal is displayed to indicate that the PVC is operational.

When in the PAD command state the user may reset a VC by entering the RESET PAD command (see

7.4.1). The HP2334A then responds by providing the following acknowledgement PAD service signal:

```
RESET CONF
```

Other cause indications that may follow the reset PAD service signal are as follows:

```
DTE     -    The remote DTE has performed a reset.
DER     -    The remote DTE is out of order.
RPE     -    Remote procedure error.
ERR     -    Local procedure error (network reset).
LPE     -    Local procedure error (PAD reset).
NC      -    Network congestion.
RDO     -    Remote DTE operational.
NOP     -    Network operational.
INC     -    Incompatible destination.
```

**Status PAD Service Signal.** The status PAD service signal is provided as an acknowledgement to the status PAD command. The format of the acknowledgement is as follows:

```
FREE XX       If no VC is established.
ENGAGED XX    If a VC is established.

Where XX = the port designator (e.g. A2 = card A, port 2)
```

**Acknowledgement PAD Service Signals.** These PAD service signals provide acknowledgement when a command (e.g. an INTerrupt) is entered. They are as follows:

PROF Command. The action of this command is acknowledged with the following PAD service signals:

```
"Cr Lf Cr" -  Cursor moves down one line
              confirming profile change.
ERR        -  Local procedure error, requested profile
              is not found (not defined in HP2334A).
```

RPROF Command. The remote action of this command is acknowledged with the following PAD service signals:

```
RPROF DONE -  Profile change confirmed.
NOT FOUND  -  Requested profile is not found
              (not defined in remote HP2334A).
```

SET? and PAR? Commands. These commands are acknowledged with the parameter value PAD service signal providing a listing as follows:

```
PAR n:v, n:v, n:INV    Where n = parameter number
                             v = parameter value
                             INV = invalid request
```

INT Command. The acknowledgement of this command is simply a "Cr Lf Cr" sent to the asynchronous device (terminal); the terminal cursor returns and moves down the screen by one line.

# 7.5 REMOTE CONTROL OF THE PAD (X.29)

## 7.5.1 Introduction

The CCITT X.29 Recommendation defines the interaction between a PAD and a packet mode DTE (e.g. another HP2334A) by which the PAD parameters and behavior may be controlled remotely across the synchronous network (or PSN).

As the user has no direct interface with X.29 commands except through their action on, or setting of the HP2334A, the information provided in this section is included for reference purposes only.

## 7.5.2 X.29 Implementation

### Packet Formats

X.29 control information is sent across the synchronous network (or PSN) in X.25 packet format in either call packets or data packets which are identified to indicate X.29 content.

In a call packet the first four bytes (octet) of the Call User Data field form the Protocol Identifier field and setting the first byte (byte 0) to 1 indicates that the call is from a PAD. A data packet is a PAD Message packet when the Q-Bit (bit 8 of byte 1) is set to 1 and it then contains only X.29 control information.

The packet formats are as shown in Figures 7-5 and 7-6. For further information refer to the CCITT X.1 to X.29 Recommendations (see Appendix E).

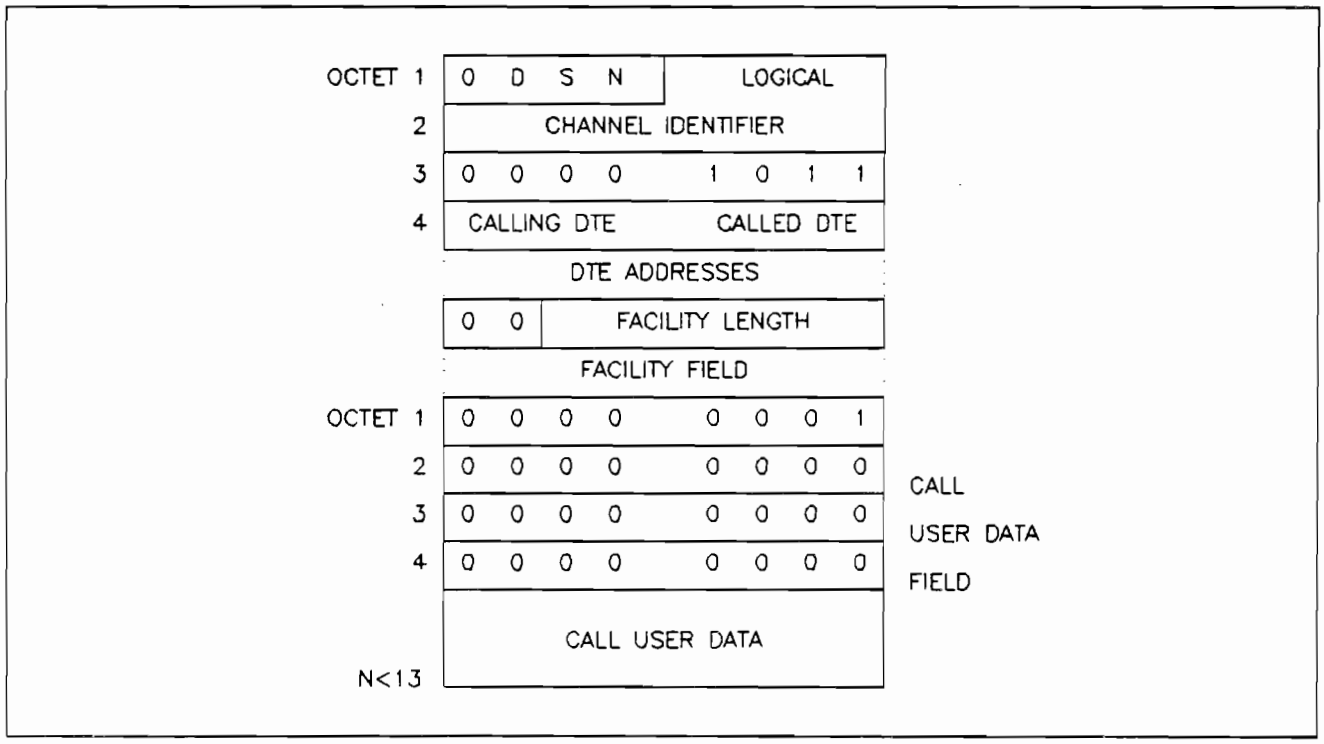



Figure 7-5 PAD Call Packet Format

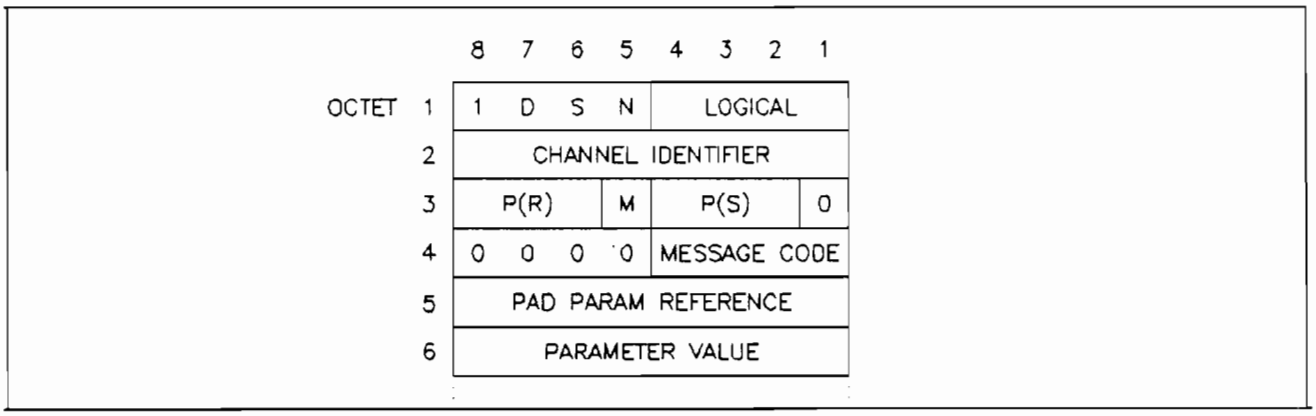



**Figure 7-6 PAD Message Packet Format**

## Incoming Calls on a CAS/PAD

When an incoming call occurs on a CAS/PAD, it must perform some specific actions. First, it supports the remote calling PAD and then it sends a SET & READ of the "remote PAD associated to CAS/PAD" parameters to the remote PAD, the defined values of which are compatible with the CAS/PAD profile.

Upon completion of this phase the call is either maintained or canceled if there are problems with the remote PAD.

The CAS/PAD will clear an SVC or reset a PVC upon a PAD error message condition (e.g. if a public PAD makes a call to an HP2334A CAS/PAD with BDP #71).

## Implementation of X.29 PAD Commands

The X.29 PAD commands and responses which can be transmitted or received by a standard PAD or CAS/PAD are shown in Table 7-2.

**NOTE:** If an error message is received by a CAS/PAD then this results in a Clear for an SVC and a Reset for a PVC.

| CAS/PAD | |
|---|---|
| RECEIVE | TRANSMIT |
| Parm.indication<br>Ind.of break<br>Error message | Set<br>Set & Read |

| PAD | |
|---|---|
| RECEIVE | TRANSMIT |
| Set<br>Set & Read<br>Read<br>Invit. to clear | Parm. indication<br>Ind. of break<br>Error message |

**Table 7-2 X.29 Commands and Responses**

## Packet Forwarding Conditions

Packets are forwarded from a PAD upon receipt of a Parameter Indication message, Indication of Break message, Invitation to Clear message, Error message or in the event of any other data forwarding condition.

Packets are forwarded from a CAS/PAD upon receipt of a SET, SET & READ or READ message, an Invitation to Clear message or in the event of any other data forwarding condition.

## 7.5.3 PAD Control Procedures

## Procedure for Read/Set/Set & Read of PAD Parameters

The current values of PAD parameters may be changed (SET) and/or read by transmitting to the PAD a SET, READ, or SET & READ PAD message.

When the PAD receives a SET, READ, or SET & READ PAD message, any data previously received will be delivered to the terminal (device) before taking the action defined in the PAD message. The arrival of one of these PAD messages is taken as a data forwarding condition.

The PAD responds to a valid READ or SET & READ PAD message by transmitting a parameter indication PAD message with the parameter field containing a list of the numbers and current values (after modification) of the PAD parameters to which the PAD message received referred. Note that the PAD does not return a parameter indication message in response to receiving a valid SET PAD message.

Both the PAD and the CAS/PAD will send the "SET X.3 parameter #8 to 0" PAD message upon receipt of an Indication of Break PAD message in order to resume output to the remote asynchronous device (terminal).

The CAS/PAD will send a SET & READ PAD message and receive the parameter indication message upon receiving an incoming call on a SVC or a Reset occurs on a PVC. The CAS/PAD outputs a Break command signal to the asynchronous DTE upon receipt of an INTerrupt packet.

The PAD's response to a SET, READ and SET & READ PAD message is shown in Table 7-3 and the PAD message code identification is shown in Table 7-4.

| PAD message sent from the DTE | | Action upon the PAD's parameters | Corresponding parameter indication PAD message transmitted to the DTE |
|---|---|---|---|
| Type | Parameter field | | |
| SET | None | Reset all the implemented X.3 parameters to their initial profile values | None |
| | List of selected parameters with the desired values | Set selected to given values<br>a) if no error<br>b) PAD fails to modify some parameters | a) none<br>b) List these invalid parameters with the error bit set |
| SET & READ | None | Reset all the implemented X.3 params to their initial profile values | List all the implemented X.3 parameters, and their initial values |
| | List of selected parameters with the desired values | Set selected parameters to given values | List of these parameters with new values |
| READ | None | None | List all implemented X.3 parameters with their current values |
| | List of selected parameters | None | List of these parameters with their current values |

**Table 7-3 PAD Response to a SET, READ or SET & READ PAD Message**

| PAD MESSAGE TYPE | MESSAGE CODE bits 4 3 2 1 |
|---|---|
| Set PAD parameters | 0 0 1 0 |
| Read PAD parameters | 0 1 0 0 |
| Set and read PAD parameters | 0 1 1 0 |
| Parameter indication | 0 0 0 0 |
| Invitation to clear | 0 0 0 1 |
| Indication of break | 0 0 1 1 |
| Error | 0 1 0 1 |

**Table 7-4 PAD Message Code Identification**

## Procedure for Invitation to Clear

The Invitation to Clear PAD message is used to request the PAD to clear the virtual call, after transmission to the terminal of all previous data.

The Clear indication packet, which is transmitted by the PAD after delivery of the last character to the terminal has a clearing cause field set to DTE clearing.

Upon receipt of an invitation to clear on a PVC, the PAD sends an X.29 error message to the remote DTE.

## Interrupt and Discard Procedures

If X.3 parameter #7 is set to 21, the PAD transmits an interrupt packet with all bits of the interrupt user data field set to 0 followed by an Indication of Break PAD message to indicate that the PAD, at the request of the terminal, is discarding the user sequences received. The PAD message contains an indication in its parameter field that X.3 parameter #8 has been set to 1 (discard output).

Before resuming data transmission to the PAD, the response to the Indication of Break PAD message is a SET PAD message, indicating that X.3 parameter #8 should be set to 0 (normal data delivery). The CAS/PAD provides this function.

If a PAD receives an Indication of Break PAD message which contains a parameter field as described above, it responds by sending a SET PAD message indicating that X.3 parameter #8 should be set to 0. If a PAD receives an Indication of Break PAD message which does not contain a parameter field, it will not respond to the packet mode DTE. When the PAD transmits an INTerrupt packet after receipt of an INTerrupt or Break PAD command signal from the asynchronous device, if X.3 parameter #7 is set to 1 then the interrupt user data field is coded 0.

If the PAD receives an INTerrupt packet it is confirmed in accordance with the CCITT X.25 Recommendation. The PAD does not transmit the contents of the interrupt user data field to the asynchronous device and it disregards the values.

## Reset Procedures

The reset procedures used are those defined in the CCITT X.25 Recommendation. The resetting procedure has the effect of resetting the value of X.3 parameter #8 to 0 (normal data delivery). The current values of all other PAD parameters are not affected.

## PAD Error Handling Procedures

If the PAD receives a SET, READ, or SET & READ PAD message containing an invalid PAD parameter, then the parameter field within the parameter indication PAD message transmitted by the PAD contains an error indication. The remaining valid PAD parameters are processed by the PAD.

Possible reasons for an invalid PAD parameter are as follows:

- The parameter does not exist.
- The parameter corresponds to a user facility which is not supported.
- The parameter is a "read only" parameter.
- The requested parameter value is invalid.
- The parameter follows an invalid parameter separator.

The PAD transmits an error PAD message containing the message code of an invalid PAD message received under the following conditions:

- If the PAD receives an unrecognizable message code.
- If the parameter field following a recognizable message code is incorrect or incompatible with the message code.
- If the parameter field following a recognizable message code has an invalid format.

**NOTE:** The PAD transmits an error PAD message if a PAD message containing less than 8 bits is received. If the PAD receives an error PAD message it does not respond with a PAD message of any type.

# 7.6 USER TROUBLESHOOTING

## 7.6.1 Introduction

This section provides troubleshooting information for a user experiencing or suspecting abnormal behavior of the HP2334A. This may occur in the following situations:

- While operating the HP2334A (i.e. entering RUN mode, in CONFIGURATION mode or in TEST mode).
- At a connected terminal when trying to establish communication with a remote host computer.
- At a connected terminal with communication (a virtual circuit) already established.

The first thing to check is the LED display error indication with reference to the LED error indications shown in 7.6.2.

When a terminal is being used (e.g. during Configuration or in Run mode) and it is not responding (e.g. no prompt or WELCOME message is displayed on the screen) then refer to 7.6.3.

If communication (i.e. a virtual circuit) cannot be established with the remote host computer then refer to 7.6.4.

The error messages that can occur when the HP2334A is operating are detailed in 7.6.5.

If a connection (VC) is established and an application that is to run on the remote host computer does not execute properly then the PAD profile assigned to the connected port must be verified. For details of the PAD profiles and their assignment refer to Chapter 6, Configuration. Note that verification may also be necessary on the remote host computer configuration.

If the HP2334A line fuse or power supply fuse blows then refer to Chapters 12 and 14.

## 7.6.2 LED Display

LEGEND:

DIP SWITCHES
1 = UP = OPEN
0 = DOWN = CLOSED
X = DON'T CARE

LED DISPLAY
1 = LED ON
0 = LED OFF
X = DON'T CARE

1) For ANY DIP switch setting ABCDEFGH
XXXXXXXX (Don't care)

- AFTER POWER ON OR RESET:

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | X | X | X | X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The above LED displays all indicate a hardware fault. Refer to chapter 14 (Troubleshooting) or contact the nearest HP Sales and Service office.

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

This indicates an invalid switch setting:
a) Set the DIP switches to a valid position and RESET the HP2334A.
b) If the LED display remains the same after resetting, run the SWITCH TEST.

- AT ANY TIME:

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

An HP2334A software failure is detected. Record the pattern displayed on LEDS [1] to [16]. Check the DIP switch setting and reset the HP2334A. If the failure persists, contact the nearest HP sales and Service office.

2) If DIP switch setting is SWITCH TEST
ABCDEFGH after power-on or reset:
00000011

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | A | B | C | D | E | F | G | H |

Leds [9] to [16] show the state of SWITCHES A to H, i.e. LED ON (1) when switch is UP, LED OFF (0) when switch is DOWN. If a different pattern is displayed on LEDs [9] to [16] : this is a hardware fault. Refer to Chapter 14 (Troubleshooting) or contact the nearest HP Sales and Service office.

3) If DIP switch setting is CONFIGURATION ABCDEFGH 00000001 after power-on or reset:

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

1) A card is missing in slot A for configuration
2) or a hardware fault is detected. Refer to Chapter 14 (Troubleshooting) or contact the nearest HP sales and Service office.

4) If DIP switch setting is RUN MODE ABCDEFGH XXXX0000 after power-on or reset.

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 |

No X.25 level I configuration. Go to CONFIGURATION mode.

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | X | 1 | X |

No X.25 level II configuration. Go to CONFIGURATION mode.

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | X | X |

No X.25 level III configuration. Go to CONFIGURATION mode.

| a | b | c | d | e | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | X | X | X |

Too many PVCs configured. Go to CONFIGURATION mode.

### 5) AVAILABLE LED DISPLAY IN RUN MODE

| a | b | c | d | e |
|---|---|---|---|---|
| 0 | B | B | X | X |

When the HP2334A has entered the Run mode:
- LEDS [b] and [c] blink (B) (the operating system is up).
- LED [d] is ON (lit) when the X.25 level 1 is UP (i.e. Data Carrier Detect RS-232/V.24 signal from the synchronous modem is ON.)
- LED [e] is ON (lit) when the X.25 level 2 is UP (i.e. is in data transfer mode, allowing level 3 communication (VC) to be established.)

- If DIP switch setting is

```
RUN MODE
PORT READY (ASYNCHRONOUS LEVEL 1 UP)
ABCDEFGH
00000000
```

LEDS [1] to [16] are lit (or ON ) when the corresponding ports (A1 for [1],..D4 for [16]) are:

a) on a Direct Connect Adapter card
b) on a Modem Control Adapter card and the asynchronous level 1 is UP (the RS-232/V.24 modem control signals are ON allowing data transmission to occur.) If the corresponding LED is OFF, check the connection between the device and the HP2334A port and refer to section 7.6.3.
c) on a Modem Control Adapter card port configured for a Direct Connect behavior (see local parameter # 14)

A LED is dim or (OFF) when the corresponding port has not been speed-sensed or parity-sensed as may be required in its profile (see local parameter # 15)

| EXAMPLE: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

Slot A is fitted with a Direct Connect Adapter card.
Slot B and C are fitted with Modem Control Adapter cards and the links between the HP2334A and devices connected to ports B1, B2, C1 and C3 are ready for data transmision.
Slot D is either empty or none of ports D1 to D4 are ready.

- If DIP switch setting is

```
RUN MODE
VIRTUAL CIRCUIT STATUS
ABCDEFGH
01000000
```

LEDS [1] to [16] are lit (ON) when the corresponding ports (A1 for [1],..D4 for [16]) have a virtual circuit established.

| EXAMPLE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

Virtual circuits are established for ports A1, A2, B2, B3 and C3.

- If DIP switch setting is

```
RUN MODE
FREE MEMORY
ABCDEFGH
11000000
```

LEDS [1] to [16] are used as a bar graph to display the percentage of free memory.

| EXAMPLE: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |

14/16 = 87.5 per cent of memory is free.

```
                                RUN_MODE
                                X.25_LEVEL_2_ACTIVITY
• If DIP switch setting is      ABCDEFGH
                                11100000
```

LEDS [1] to [8] show the N(R) counter, LEDS [9] to [16] show the N(S) counter.
(a lit LED propagates between [1] and [8] as N(R) cycles between 0 and 7
a lit LED propagates between [9] and [16] as N(S) cycles between 0 and 7.)

```
EXAMPLE:        1  2  3  4     5  6  7  8     9 10 11 12     13 14 15 16
                0  0  1  0     0  0  0  0     0  0  0  1      0  0  0  0
```

N(R) = 2, N(S) = 3

```
                                SELF_DIAGNOSTICS
6)    If DIP switch setting is   ABCDEFGH
                                XXXX0100

      or
                                TERMINAL_LOOPBACK_MODE
      If DIP switch setting is  ABCDEFGH
                                00000101

      or
                                MODEM_LOOPBACK_MODE
      If DIP switch setting is  ABCDEFGH
                                00000110
```

Refer to Chapter 14 (Troubleshooting) for a detailed troubleshooting procedure.

## 7.6.3 No Response from the Terminal

When a connected terminal is not responding (e.g. no PAD command prompt or no host computer prompt on a terminal connected to a PVC or with the ADL facility assigned) the following points must be checked:

- That the HP2334A is operational and in RUN mode (see 7.2.1 and Chapter 14).
- That the terminal is powered-on.
- That the terminal is connected to the correct HP2334A device port.
- That the connecting cable between the HP2334A and the terminal is correctly fitted.
- That the fitted cable is suitable for the application. Note that the Modem Control Adapter Card requires a terminal modem cable to monitor the modem control signals. If the device cannot provide modem control signals for the HP2334A, then the modem control behavior must be disabled on that Modem Control Card device port in the configuration (see local parameter #14).
- When the HP2334A and the terminal are connected via an asynchronous modem link, both asynchronous modems must be verified as operational.
- That the terminal correctly configured for the application.
- That the terminal datacomm configuration is correct for the following:
    - Speed
    - Parity
    - Flow control enabled

  These values must match those defined in the profile assigned to the port (e.g. speed 9600 bps, parity set to 0, ENQ/ACK and X-ON/X-OFF flow control enabled are the correct settings for BDP #1).

  **NOTE**: The terminal "mode" must also be checked: Block Mode OFF, Auto Linefeed OFF and Remote ON.

- That the profile assigned to the port is correct for the connected terminal (i.e. it is not a CAS or a printer profile). The PROF command may be used if necessary.

  **NOTE**: The "port ready" state can be verified with the RUN mode LED display; refer to 7.6.2.

## 7.6.4 Virtual Circuit Status

When a call cannot be established or received on a SVC or when a PVC connection is failing, the following actions can be performed:

- Check the PAD service signal (see 7.4.2).
- Determine whether the problem occurs on one (or more) specific HP2334A port or if it affects all the device ports. Verification of the HP2334A X.25 activity can be achieved using the RUN mode LED display (see 7.6.2).
- If the problem occurs on all ports then check the synchronous network link, check that the modem is powered-up and check that the remote host/device is operational (if necessary, check with the PSN or modem vendor).
- If the symptom occurs on all or most ports then verify that the HP2334A synchronous network configuration conforms with the PSN subscription and/or the remote HP2334A configuration (Stat Mux configuration). Refer to Chapter 6.
- Check the configured network type and local address.
- Check the PVC and SVC Subscription/Configuration/Assignment; verify the Callable Port Pool definition.
- Check the facilities Requested/Subscribed/Configured (e.g. when Reverse Charging is requested on an outgoing call, check the remote facilities subscribed).

For example: An incorrect VC assignment (shifted by one) or not enough outgoing SVCs will affect some ports only. Configuring the HP2334A with a non-subscribed facility will affect all the device ports.

## 7.6.5 HP2334A PAD Operation Error Messages

Some PAD messages are specific to the HP2334A and are sent to a device (terminal) when an error occurs on the communication link between the HP2334A and the connected device.

Possible PAD messages are as follows:

FRAMING ERROR

A null pattern is not recognized as a valid break character.

- Input a character sequence followed by a RETURN (Cr) character and verify that the sequence is echoed back correctly.
- Check the terminal/cabling/HP2334A (the power supply may be defective or the line voltage incorrect.)

PARITY ERROR

- The HP2334A verified the parity on the port connection (see Local Parameter #1) and a parity error occurred.
- Check the terminal parity configuration (against Local Parameter #1 value) and reconfigure the terminal parity if required.
- Check the connection between the terminal and the HP2334A.

HP2334A MEMORY OVERFLOW / DATA LOSS

- The memory buffer space allocated for the current data transfer is too small (see Local Parameters #18 and #19, Read length; i.e. maximum size of a block mode transfer.)
- To execute the application program correctly another associated remote PAD profile must be assigned to the port with a larger value set for Local Parameters #18 and #19 (within the maximum of 16 kbytes).
- The flow control of the terminal by the HP2334A must be checked. The terminal must be able to support and be configured for X-ON/X-OFF flow control and X.3 parameter #5 must be set to a value of 1.
- This message is likely to be experienced in a Stat Mux configuration only. If suitable profiles are already defined, the RPROF command can be used to temporarily modify the CAS/PAD profile (and consequently its associated remote PAD profile). If a UDP needs to be created or modified, refer to Chapter 6 (a CAS/PAD profile and its associated remote PAD profile must be created or modified.)

# USING THE TEST PORT

CHAPTER 8

## 8.1 INTRODUCTION

The HP2334A Test Port provides the following primary functions:

- On-line modification of the HP2334A configuration.
- Listing of HP2334A installed firmware (ROM part numbers).
- Display of X.25 Level 2 statistical information.
- Remote HP2334A Reset.
- Communications testing (text retransmission).

## 8.2 ACCESSING THE TEST PORT

The HP2334A test port may be accessed when the unit is operating on-line, i.e. in RUN mode. The HP2334A (or public PAD) must be in PAD command state (@ prompt) for the terminal (device) accessing the test port in order that an SVC can be established with the test port sub-address. The PAD profile used when accessing the test port is the profile assigned to the calling device (port).

**NOTE**: At least one incoming plus one outgoing SVC or two 2-way SVCs must be configured in the HP2334A (and subscribed for if used with a PSN) in order to access the test port.

If the HP2334A is connected to a PSN, then the test port may be accessed locally by entering the PAD selection command with the HP2334A local address and the test port sub-address. The test port of a remote HP2334A may be accessed, again using the PAD selection command and defining the test port sub-address if the HP2334A is connected to a PSN or a Stat Mux configured network (see Figure 8-1).

**NOTE**: The HP2334A test port can only be accessed remotely in a Stat Mux configured (non-PSN) network (i.e. loopback is only possible when the HP2334A is connected to a PSN).

The HP2334A test port sub-address is always the defined relative port sub-address plus 17 (see Fig. 4-7). Thus if the relative port sub-address is defined as 00 then the test port sub-address is 17, as shown in the following example:

```
Example:
        @ 13845678917 RETURN   PAD selection command (relative
                               port sub-address = 00)
        COM
```

Note that with Stat Mux configured networks only the test port sub-address needs to be entered once the PAD command prompt (@) is obtained in order to establish an SVC with the remote HP2334A test port. Alternatively a symbolic remote address (SRA) may be defined in the HP2334A for the test port sub-address (configured off-line or on-line) and this may be used to establish the SVC with the required test port.

Once the SVC is established (COM) the echo is disabled and the HP2334A waits for the correct test port password (defined during off-line configuration, see Section 6.5) to be entered. If the password is entered incorrectly then the SVC is cleared automatically. If the password is entered correctly then the HP2334A provides an acknowledgement by displaying the "**Welcome to the test port**" message at the user's terminal and re-enables the echo.

After the welcome message no prompt is provided by the test port and the user should then enter one of the escape sequences (i.e. control sequences headed by the ASCII Escape character, decimal 27) shown in Table 8-1 according to the action or information required.

**NOTE:** Only one escape sequence can be entered at any one time. If an escape sequence is entered incorrectly it is discarded by the test port and no error message is provided.

In order to exit from the test port the SVC must be cleared in the normal way, i.e. the data transfer escape character (normally DLE or CONTROL [P] ) must be entered to return the PAD command prompt " @ " followed by the CLR PAD command (CLR RETURN) to clear the SVC.

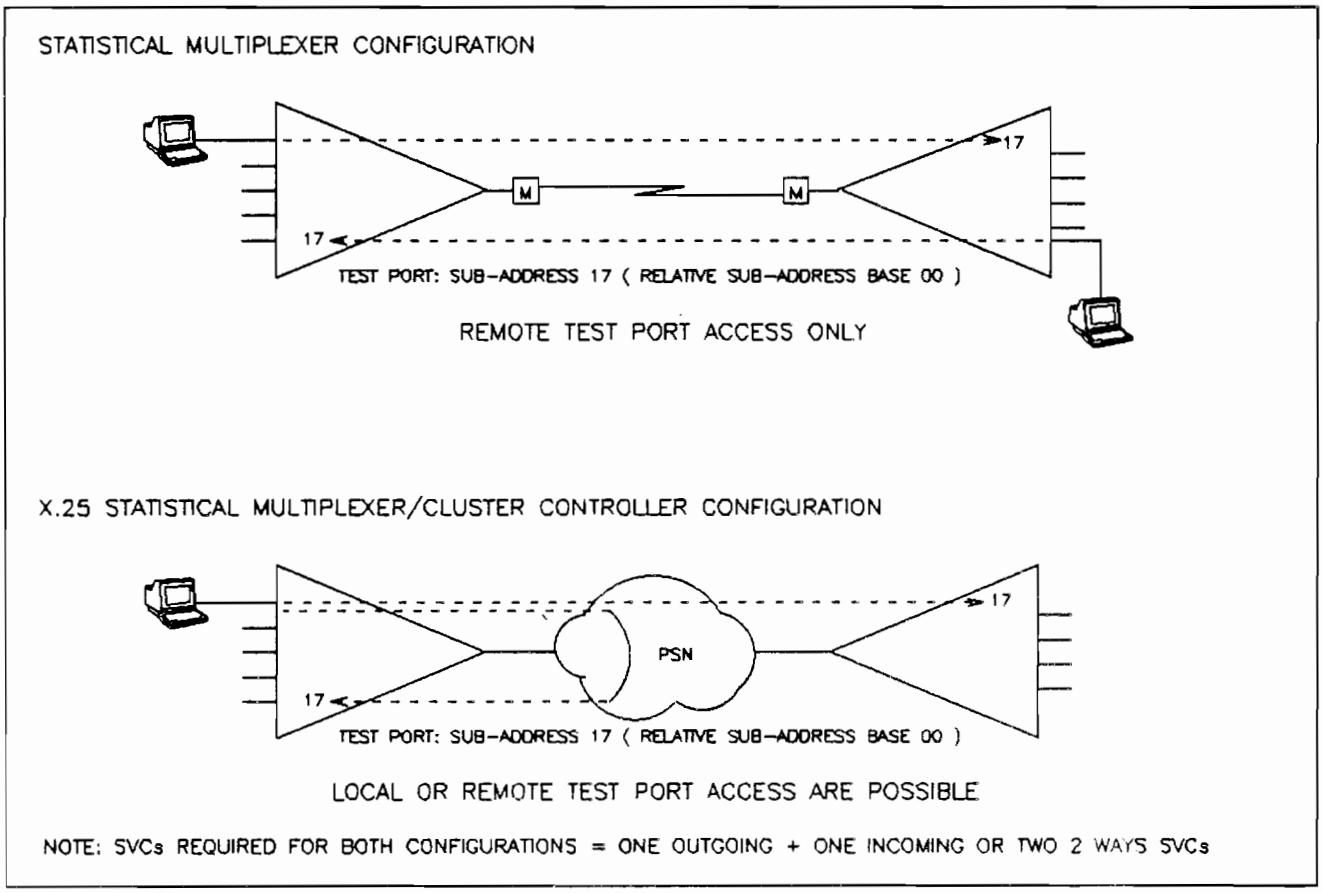



**Figure 8-1 HP2334A Test Port Access**

| ESCAPE SEQUENCE | HP2334A RESPONSE | EXPLANATION |
|---|---|---|
| ESC C | Configuration Listing | HP2334A enters On-Line Configuration mode. |
| ESC E | None | HP2334A performs RESET (like a power-on or using the reset push-button). |
| text ESC d | text | HP2334A retransmits the text as it has been received (text = 1 to 127 bytes). |
| ESC *s^ | 2334A | Equipment type identification. |
| ESC /x0R | ROM part numbers | HP2334A provides a listing of the installed ROM part numbers. |
| ESC /x0S | Statistical Information | Read and Reset statistics. |
| ESC /x1S | Statistical Information | Read statistics only. |

**Table 8-1 HP2334A Test Port Escape Sequences**

## 8.3 ON-LINE MODIFICATION OF CONFIGURATION

To enter on-line configuration mode the " ESC C " escape sequence must be entered (i.e. simply press the [ESC], [C] and then the (RETURN) key) either once communication with the test port is established (see Section 8.2) or once the test port has completed the action of a previously entered escape sequence. Note that no prompt is provided by the test port in test port mode.

**NOTE:** When entering this escape sequence the terminal must be in display function mode so that the escape sequence is sent and not executed by the terminal.

On entering on-line configuration mode the HP2334A configuration is listed in the same way as in off-line configuration mode (see 6.2.3) and the CONFIGURE asterisk prompt " * " is then displayed. The configuration commands available are exactly the same as those available during off-line configuration (see Chapter 6). There is one additional command which is used to exit on-line configuration mode and return the user to the test port mode as follows:

| PROMPT | COMMAND | ACTION |
|---|---|---|
| * | EXIT (RETURN) | HP2334A exits from on-line configuration mode. |

**WARNING:** Care must be taken when modifying certain X.25 parameters. For example, if a negotiation facility which is not subscribed for with the PSN is configured in the HP2334A then the next call will be rejected by the PSN.

Because the HP2334A is operating on-line (i.e. in RUN mode) when on-line modification of the HP2334A configuration is made using the test port, the time when the modification(s) becomes effective depends upon the parameter (or facility) being modified. The available parameters/facilities and when modifications to them become effective are as follows:

- **X.25 Levels 1, 2 & 3 and the LUG, MSG & SRA Facilities.** Any modifications made are effective (in HP2334A memory) as soon as the sub-level (e.g. Level 2) is exited. For example, if the "window size out" parameter is modified then the new value is used from the moment Level 3 configuration is exited. A modification to the LUG list is effective for the next incoming call.

- **ADL Facility.** If the ADL configuration is modified then it is effective in HP2334A memory as soon as the ADL sub-level is exited. The new automatic dial address assigned to a device port will then be used according the Device Adapter Card as follows:

    - Direct Connect Adapter: When the HP2334A is RESET (locally using the Reset push-button switch, or remotely using the test port (see Section 8.4)), or after a CLEAR (CLR).

    - Modem Control Adapter: When the device (terminal) connected to the ADL assigned device port is powered off/on; when the HP2334A is RESET as above, or after a CLEAR (CLR).

- **ASG Profile Assignment.** When a BDP or a new UDP is assigned to a port the time it becomes effective depends upon the type of profile, the state of the port (i.e. free or engaged) and whether or not it has a PVC assigned to it.

  - PAD Profile:

  1) If the port is engaged on an SVC then the new assigned profile is effective after the SVC is cleared (i.e. after a CLR [RETURN] is entered).

  2) If the port is free (no SVC established) then on the next call made the OLD profile is used. The new profile is effective after a CLR [RETURN] is entered.

  3) If the port has a PVC assigned to it then the new profile is effective following a RESET (performed locally using the Reset push-button switch or remotely using the test port (see Section 8.4)).

  4) If the port is engaged on an SVC or a PVC the data transfer escape character (normally DLE or [CONTROL] [P] ) may be entered to return temporarily to the PAD command state so that the PROF command can be entered. If the port is free (no SVC established or PVC assigned) then it is already in the PAD command state. The new profile assignment can then be made effective by entering the PROF (X.28) command with or without the device port/profile reference. The recommended method is to enter the PROF command without the port/profile reference.

  - CAS/PAD Profile:

  1) If the port is engaged on an SVC then the new assigned profile is effective after the SVC is cleared (i.e. after a CLR [RETURN] is entered).

  2) If the port is free (no SVC established) then on the next call made the OLD profile is used. The new profile is effective after a CLR [RETURN] is entered.

  3) By entering PAD command state the new profile assignment can be made effective by entering the RPROF nn command where "nn" is the profile reference which MUST be specified.

  - Remote PAD (associated to CAS/PAD) Profile:

  1) If the port is engaged (SVC established) then enter the data transfer escape character (normally DLE or [CONTROL] [P]) to return to the PAD command state and use the RPROF nn command to make the new CAS profile assignment effective. This CAS profile will then download the Remote PAD (associated to CAS/PAD) profile.

  2) If the port is free then the new profile assignment is effective for the next call (next SVC to be established).

  3) If the port has a PVC assigned to it then the new profile is effective following a RESET (performed locally using the Reset push-button switch or remotely using the test port (see Section 8.4)).

  **NOTE:** Use of the RPROF nn command as detailed above is recommended for PVC assigned ports.

## 8.4 REMOTE RESET OF THE HP2334A

The HP2334A may be reset (initialized in the same way as using the Reset push-button or performing a power-off/on locally) from a remote location through the HP2334A test port.

Once communication is established with the remote HP2334A test port (see Section 8.2) a reset may be performed by entering the " ESC E " escape sequence (see Table 8-1) followed by a RETURN (Cr) character.

**NOTE:** When entering this escape sequence the terminal must be in display function mode so that the escape sequence is sent and not executed by the terminal.

Another escape sequence may then be entered or communication with the remote test port can be cleared as detailed in Section 8.2.

**WARNING:** If the test port is accessed locally and an "Esc E" escape sequence is entered, this will reset the HP2334A. If this escape sequence is entered when the test port is accessed remotely then the SVC is cleared.

## 8.5 HP2334A COMMUNICATIONS TEST

A remote HP2334A test port can be accessed to provide a communications test between the local and the remote HP2334A locations by retransmitting a text input back to the terminal (device) exactly as it is received at the remote location.

Once communication is established with the remote HP2334A test port (see Section 8.2) the text to be retransmitted (comprising up to 127 characters) may be entered followed by the " ESC d " escape sequence (see Table 8-1) and a RETURN (Cr) character.

**NOTE:** When entering this escape sequence the terminal must be in display function mode so that the escape sequence is sent and not executed by the terminal.

The remote HP2334A will then retransmit the text, exactly as it is received, back to the terminal (device). Another escape sequence may then be entered or communication with the remote test port can be cleared as detailed in Section 8.2.

# 8.6 HP2334A IDENTIFICATION & STATISTICS

## 8.6.1 Equipment Type Identification

The HP2334A test port provides an equipment type identification when the " ESC *s ^ " escape sequence is entered (see Table 8-1) followed by a RETURN (Cr) character. The test port must be accessed as detailed in Section 8.2 and be in test port mode (i.e. no prompt) when the escape sequence is entered.

**NOTE:** When entering this escape sequence the terminal must be in display function mode so that the escape sequence is sent and not executed by the terminal.

The HP2334A identifies the equipment type by displaying the "2334A" message. Another escape sequence may then be entered or communication with the remote test port can be cleared as detailed in Section 8.2.

## 8.6.2 Firmware Identification

The HP2334A test port provides an installed firmware identification by displaying the part numbers of up to 12 ROMs (Read Only Memory) in response to entering the "ESC /x0R" escape sequence (see Table 8-1) followed by a RETURN (Cr) character. The test port must be accessed as detailed in Section 8.2 and be in test port mode (i.e. no prompt) when the escape sequence is entered.

**NOTE:** When entering this escape sequence the terminal must be in display function mode so that the escape sequence is sent and not executed by the terminal.

Twelve ROM part numbers can be stored in the memory buffer of 144 bytes. Between six and twelve ROMs may be in the HP2334A according to the number of Device Interface (4 Channel Processor) Cards fitted and each has a part number which is 12 characters long and the following format:

"xxxxx-xxxxx "

If a ROM is not fitted then its part number is not displayed and a space is displayed at its corresponding position in the ROM part number list. The part numbers of the fitted ROMs are listed in the following order:

CPU ROM 0, CPU ROM 1, CPU ROM 2, CPU ROM 3, (followed by the ROMs fitted to the Device Interface (4 Channel Processor) PCA) SER ROM 0, SER ROM 1.

After the ROM part numbers have been listed another escape sequence may be entered or communication with the test port can be cleared as detailed in Section 8.2.

## 8.6.3 X.25 Level 2 Statistics

The X.25 Level 2 statistical information is held in a buffer of 66 bytes organized in 11 decimal words (5 decimal ASCII coded digits per word) separated by 11 "space" characters (ASCII 20H).

Each word contains a statistical value and these are listed in the following order:

1) Number of I-frames received.

2) Number of RR-frames received.

3) Number of RNR-frames received.

4) Number of REJ-frames received.

5) Number of FRMR-frames received.

6) Number of receiver overruns.

7) Number of frames received with bad FCS.

8) Number of aborted frames received.

9) Number of times hunt mode entered.

10) Number of receiver buffer overflow conditions.

11) Number of frames received with incorrect addressing.

The above statistical information is displayed on entering either the "ESC /x0S" or "ESC /x1S" escape sequence (see Table 8-1) followed by a RETURN (Cr) character. The "ESC /x1S" escape sequence allows the user to read the statistical information without resetting the counters while the "ESC /x0S" escape sequence will display the current values and then reset all the counters to zero.

**NOTE:** On counter overflow,the counter is resetted.

```
  Example:

ESC /x1S RETURN

00529 00218 00001 00000 00000 00000 00000 00000 00748 00000 00000

(means 529 I-frames, 218 RR-frames, 1 RNR-frame, 748 hunt modes)
```

# DETAILED PRODUCT DESCRIPTION

CHAPTER 9



## 9.1 PACKAGE OVERVIEW

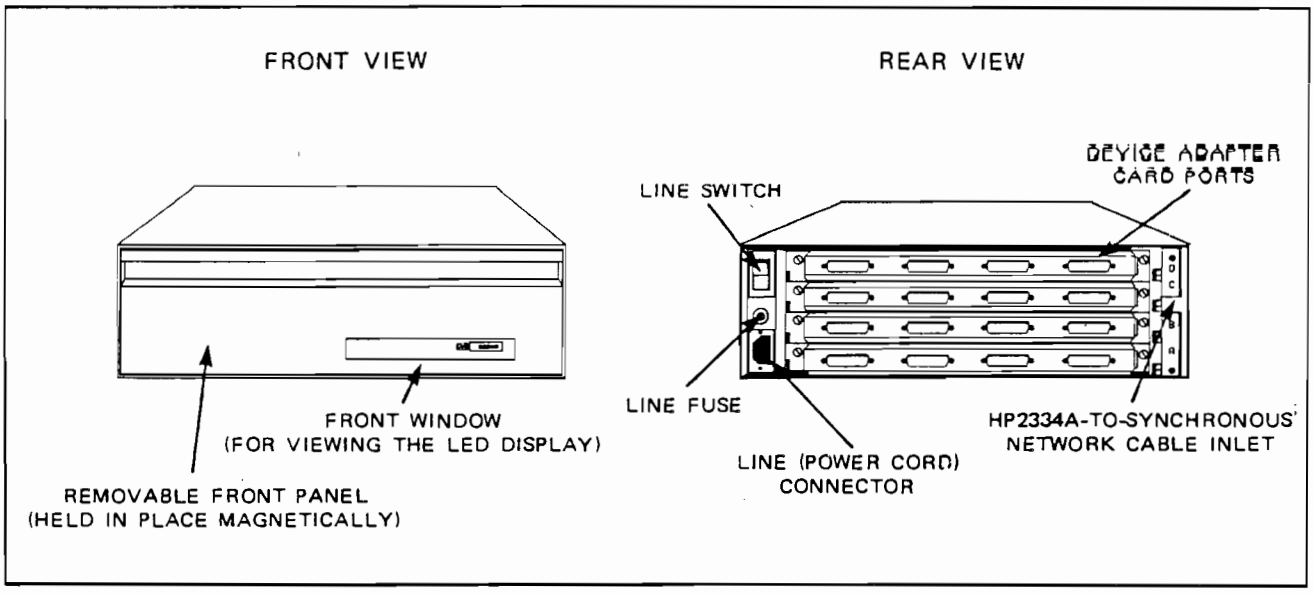



**Figure 9-1 HP2334A Multimux**

The HP2334A is housed in a system II type cabinet which can be used "stand alone" or rack mounted. A fan is fitted inside the cabinet on the right hand side (front view) in order to provide efficient component cooling. The air is drawn in through a ventilation grille on the right hand side of the cabinet (front view) at room temperature and is forced out of the cabinet through a ventilation grille on the left hand side. As there are no ventilation holes on the top or on the bottom of the cabinet the unit can be rack mounted.

At the front of the unit is a removable panel which is held in place by two magnets. The front panel is fitted with a brown tinted plastic window to give view to the 21 LED indicators (see Fig. 9-1). Removing the front panel gives access to the synchronous network connector port and the eight DIP switches, LEDs and reset push-button mounted at the front of the CPU Card (see Fig. 9-2).

At the rear of the unit are the line (power cord) connector, switch and fuse together with up to 16 asynchronous RS-232-C device ports (incremented in modules of 4 ports per Device Adapter Card). The device ports are labeled as follows:

| Port # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 |

When the HP2334A is supplied with less than 4 Device Adapter Cards, blanking panels are fitted to cover the unused card slot positions.

Removing the fitted Device Adapter Cards and blanking panels gives access to the Voltage Selection Compartment and the Device Interface Cards (see Fig. 9-2).

The HP2334A-to-synchronous network connecting cable enters the unit through an aperture at the rear and is routed to its connector on the Synchronous Network Adapter Card at the front of the unit (accessed by removing the front panel).

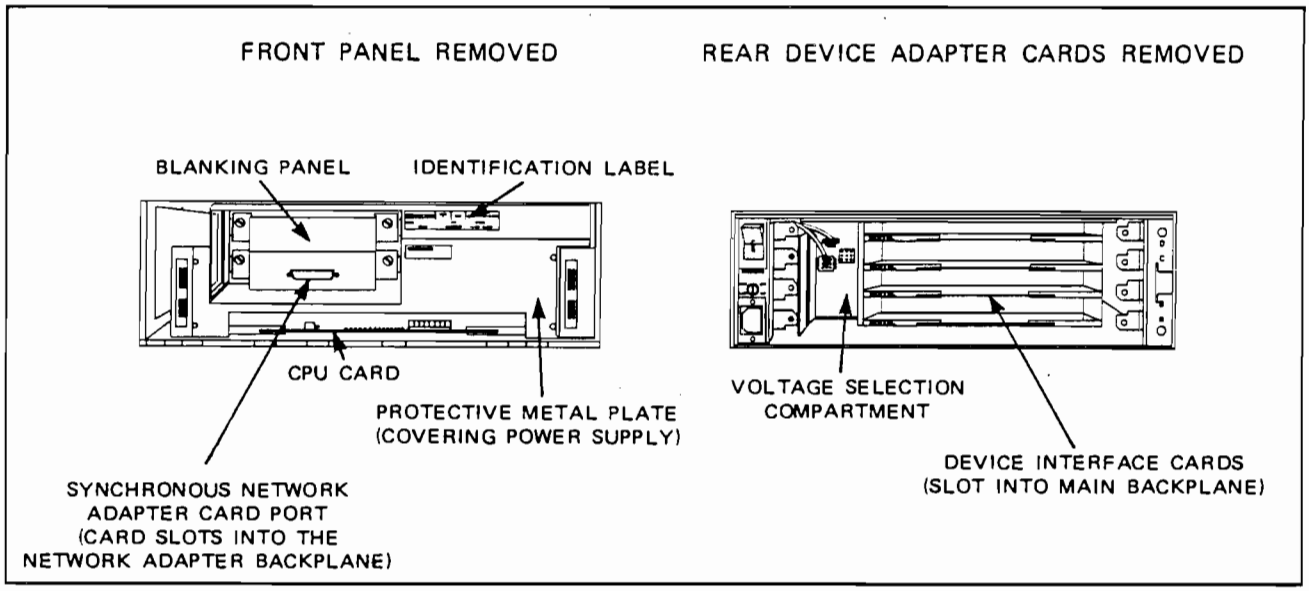



**Figure 9-2 HP2334A With Front Panel And Rear Cards/Panels Removed**

## 9.2 ARCHITECTURE

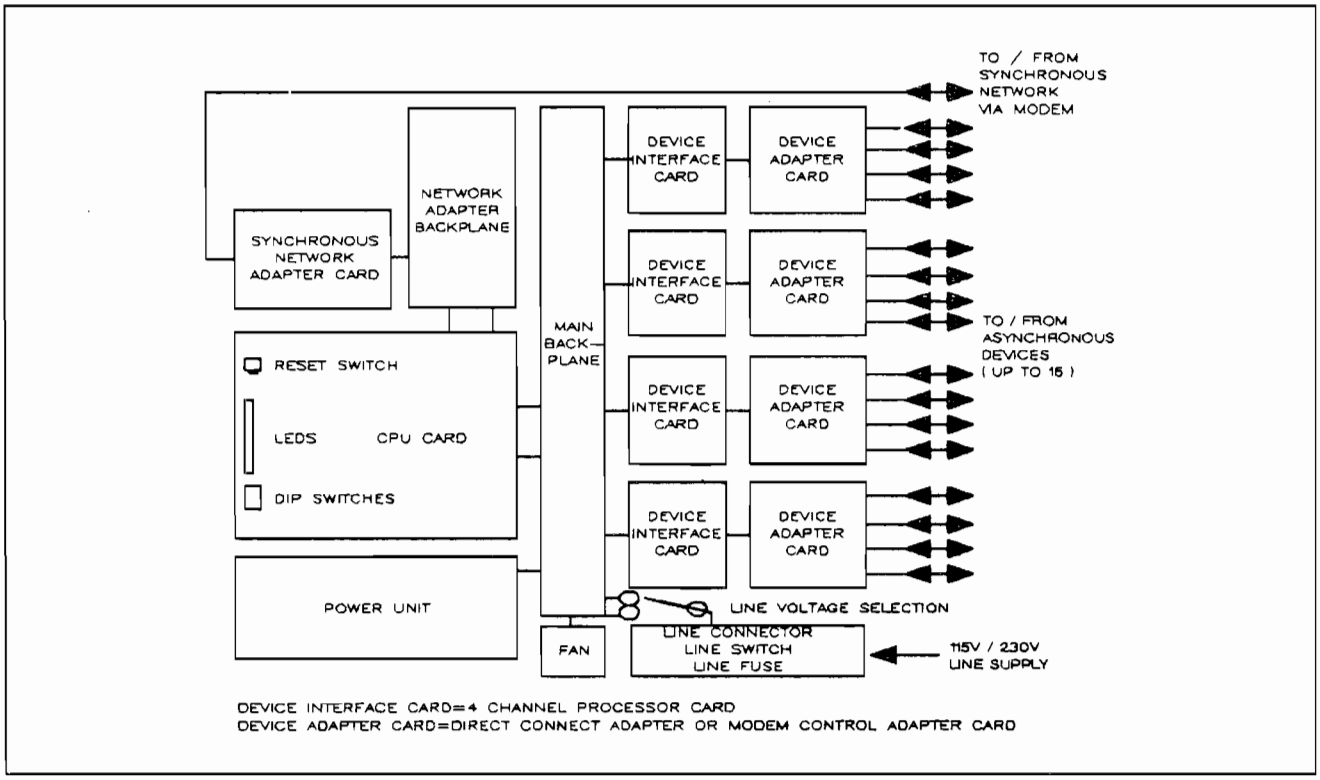



**Figure 9-3 HP2334A Internal Architecture**

The HP2334A internal architecture is shown in Figure 9-3; it comprises the following:

- A Synchronous Network Adapter Card which is connected via the Network Adapter Backplane to:
- the CPU Card.
- A Main Backplane connects the CPU Card to up to four Device Interface (4 Channel Processor) Cards. The Main Backplane also provides for connection to the power supply and the fan.
- Up to four Device Adapter Cards (Direct Connect Adapter and/or Modem Control Adapter Cards), each one connected to its associated Device Interface (4 Channel Processor) Card and offering four RS-232-C ports for asynchronous device connection.

**Synchronous Network Adapter Card.** This card provides for connection to the synchronous network (PSN or modem link) modem and provides an interface between the network and the HP2334A. Operating at speeds of up to 19.2k bps it provides communication using the X.25 protocols and must be connected to the synchronous network via a full duplex synchronous modem. It is accessible and slides into the unit from the front (front panel removed), connecting with the Network Adapter Backplane. The Synchronous Network Adapter Card is a 4 layer printed circuit board that measures 155 x 175 mm and contains:

- One RS-232-C 25 pin male connector.
- RS-232-C buffers, transceiver and receiver.
- One bit rate generator type MC14411.

**Network Adapter Backplane.** The Network Adapter Backplane is a small printed circuit board measuring 109 x 118 mm. It provides for connection between the Synchronous Network Adapter Card and the CPU Card.

**CPU Card.** The CPU Card is a 2 layer printed circuit board measuring 308 x 256 mm. It controls the operation of the HP2334A, managing the X.25 protocols, controlling the internal bus, data streams and dynamic memory allocation. The CPU Card is accessible and slides into the unit from the front (front panel and protective metal plate removed) connecting with the Main Backplane. Mounted on the CPU Card are:

- A Reset push-button switch for re-initializing the HP2334A.
- 21 LED status indicators (LED [a] is green; all other LEDs are red).
- 8 DIP switches for HP2334A operating mode/test selection.
- One Z80A microprocessor.
- One Z80A serial I/O (SIO) controller type MK3887N-4.
- One Z80A Direct Memory Access (DMA) controller type MK388XN-4.
- One Z80A parallel I/O (PIO) controller type MK3881N-4.
- One Z80A counter/timer circuit (CTC) type MK3882N-4.
- 32 kbytes of dynamic RAM.
- Four type 2764 UV-EPROMs (8 Kbytes each).
- 1 kbyte static CMOS RAM (contains configuration).
- One Lithium cell (battery back-up).

**Main Backplane.** The Main Backplane is a printed circuit board measuring 173 x 118 mm which is simply fitted with connectors on both sides. It acts as a "middleplane" for connection of the printed circuit boards and facilitates the modular design of the HP2334A. This modularity ensures that the installation, service and upgrading of the HP2334A can be easily accomplished in the field.

The CPU Card, up to four Device Interface Cards and the Power Supply printed circuit board plug into the connectors on the Main Backplane.

**Device Interface Card(s).** (i.e. 4 Channel Processor Card) The Device Interface Card is a 2 layer printed circuit board measuring 230 x 175 mm. Each Device Interface Card can drive 4 channels, controlling the timing, software handshake and modem control signals for each asynchronous device (or computer port) and assembling/disassembling blocks of data. It provides interfacing and multiplexes the signals from its associated Device Adapter Card into one slot of the Main Backplane.

The Device Interface Cards are accessible and slide into the unit from the rear (Device Adapter Card(s) removed), connecting with the Main Backplane and the associated Device Adapter Card. Each card contains:

- One Z80A microprocessor.
- Four Universal Asynchronous Receiver/Transmitters (UARTs) type SY6551.
- 2 Kbytes of static RAM.
- Two type 2764 UV-EPROMs (8 Kbytes each).

**Device Adapter Card(s).** (i.e. Direct Connect Adapter Card or Modem Control Adapter Card) The Device Adapter Card is a 2 layer printed circuit board measuring 70 x 355 mm. Each card offers four connectors and provides an interface between the connected asynchronous devices (or computer ports) and the HP2334A. The Device Adapter Cards are screw mounted at the rear of the unit and each card connects internally with its associated Device Interface Card. Each card contains:

- Four RS-232-C 25 pin female connectors.
- RS-232-C buffers, drivers and receivers for four channels.

**Power Supply.** The Power Supply (part number 0950-1717) connects with the Main Backplane. Its printed circuit board measures 126 x 265 mm. The two sockets which are mounted on the main backplane are provided for voltage selection. The only cable harnesses in the HP2334A run from the line power connector, filter, switch and fuse to the main backplane and from the main backplane to the fan.

## 9.3 FIRMWARE DESCRIPTION

In the HP2334A each EPROM is organized as a separate module with identification, part numbers and jump tables at the beginning. Thus a firmware error can be corrected with a single ROM change and new firmware can be added by accessing the defined jump tables.

### CPU

| Firmware module partitioning: | kbytes |
|---|---|
| Initialization, task dispatcher | 2.5 |
| Power-on self-test, self diagnostic | 3 |
| Memory management & library | 2.5 |
| Internal bus driver; PAD functions | 8 |
| Total: | 16.0 |
| Datacomm driver: X.25 Levels 1, 2 and 3 | 9.5 |
| Configuration | 6.5 |
| Total: | 16.0 |

### Device Interface (4 Channel Processor)

| Firmware module partitioning: | kbytes |
|---|---|
| Initialization, task dispatcher | 1 |
| Soft. configuration | 1 |
| Power on self-test, self diagnostic | 1 |
| Internal bus driver; slave functions | 2 |
| Datacomm driver: pt-to-pt physical driver, logical driver | 3 |
| Total: | 8 |

## 9.4 ENVIRONMENTAL SPECIFICATIONS

The HP2334A is designed for the office environment and it can be used "stand alone" on a table or mounted in a suitable rack. It is designed to comply with HP class B environmental specifications and is resistant to electrostatic discharge (onto the cabinet) and electromagnetic interference.

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Temperature (free ambient) | Operating:<br>Non-operating: | 0 to +55 degrees Celsius.<br>-40 to +75 degrees Celsius. |
| Humidity | Operating:<br><br>Non-operating: | 5% to 95% (non condensing) at 40 degrees Celsius.<br><br>90% at +65 degrees Celsius to 95% at +40 degrees Celsius. |
| Altitude | Operating:<br><br>Non-operating: | 4600 metres<br><br>15300 metres |
| Vibration | Operating and non-operating: | Max. peak-to-peak 0.38mm (.015in) in range 5 - 55Hz on 3 axis for 15 minutes with 10 minute dwells possible on each major resonance. |
| Shock | Operating:<br>Non-operating:<br>Transportation handling: | 102 mm tilt drop.<br>30g for 11ms / half sine.<br>752 mm drop (in packaging). |
| Magnetic Field Interference | Operating:<br><br>Non-operating | Max. 5 Gauss p-p.<br><br>Max. 5.25 mG at 0.9 metres. |
| Magnetic Field Susceptibility | Operating and non-operating: | 1 Gauss p-p at 47.5 to 198 Hz and from 0.1 Gauss at 30 Hz to 0.1 mG at 30 kHz. |
| Radiation Susceptibility | Operating and non-operating: | Max. 3 V/metre from 14 kHz to 1 GHz. |
| Radio Freq. Interference | Conducted and radiated: | RFI complies with VDE 0871 Level A interference limits. FTZ Licence Number: C118/82. |
| Static Discharge | Operating and non-operating: | Maximum onto casing:<br>15 kV - no errors, 20kV - no loss of data, 25 kV - no damage. |

**Table 9-1 HP2334A Environmental Specifications**

## 9.5 PHYSICAL SPECIFICATIONS

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Weight | Minimum (cabinet plus CPU Card & PSN Adapter Card) | 11 kg (24 lbs) |
| | Maximum (cabinet plus all cards) | 13 kg (29 lbs) |
| | Maximum (crated for transportation) | 17 kg (38 lbs) |
| Size | Cabinet | 54.0 L x 42.5 W x 13.5 H (14 with feet) cms |
| | | 21.25 L x 16.75 W x 5.25 H (5.45 w/feet) ins |
| | Transportation Crate | 65.0 L x 55.5 W x 34.0 H cms |
| | | 25.6 L x 21.9 W x 13.3 H ins |

**Table 9-2 HP2334A Physical Specifications**

## 9.6 ELECTRICAL SPECIFICATIONS

| PARAMETER | CONDITION | SPECIFICATION |
|---|---|---|
| Power Consumption | Typical | 115 VA |
| Line Frequency | Range | 47 Hz to 63 Hz |
| Line Voltage (a.c.) | Single phase,<br>115V - standard<br>230V - Option 015 | <br>86.25 to 126.5 Volts<br>195.5 to 253.0 Volts |
| Maximum Voltages | Between phase / neutral:<br>Between phase / ground:<br>Between neutral / ground: | 253 Volts<br>253 Volts<br><1 V rms |
| Power Line Susceptibility | Voltage Fluctuations | 80% min for 15 cycles, 70% min for 10 cycles; 150% max for 0.5 cycles, 120% max for 20 cycles, 105% max for 300 cycles. |
| | Transient Noise | 1500V - 10ns risetime - 250ns width<br>1000V - 30ns risetime - 375ns width<br>500V - 40ns risetime - 400ns width |
| | Power Interruption | Total loss of power for up to 2 cycles. |

**Table 9-3 HP2334A Power Requirements**

## 9.7 SAFETY APPROVALS

The HP2334A Multimux has the following safety approvals:

- UL (Underwriters' Laboratories)
  under standard UL 478 for EDP equipment;
  under standard UL 114 for office equipment.
- CSA (Canadian Safety Agency)
  under factory certification program CSA C22.2-154 for EDP equipment.
- VDE (Verband Deutcher Elektrotecniker)
  under standard VDE 0730 part 2P, for both EDP and office equipment.
- IEC (International Electrotechnical Commission)
  complies with IEC 380 for office equipment;
  complies with IEC 435 for EDP equipment.

# DETAILED THEORY OF OPERATION

CHAPTER 10

## 10.1 INTRODUCTION

This chapter describes the theory of operation of the HP2334A Multimux to block diagram level.

As depicted in Figure 10-1, the HP2334A comprises a Power Supply PCA (printed circuit assembly), CPU PCA, Main Backplane and Network Adapter Backplane. One Synchronous Network Adapter PCA may be plugged into the Network Adapter Backplane, for connection to the synchronous network (or PSN) modem. The Main Backplane can accommodate up to four Device Interface PCAs (i.e. 4 Channel Processor PCAs) for connection to the asynchronous devices via the Device Adapter PCAs (i.e. Direct Connect Adapter PCAs or Modem Control Adapter PCAs).

## 10.2 CPU PCA

In the following description, refer to the CPU PCA block diagram (Figure 10-2).

The CPU PCA is controlled by an 8-bit Z80A microprocessor. This microprocessor accesses the RAM (Random Access Memory) and ROM (Read Only Memory) via a bus. The 32 kbyte RAM is used to statistically buffer the data sent from the synchronous network (PSN) to the devices, and the data sent from the devices to the synchronous network (PSN). The 32 kbyte ROM (four type 2764 UV-EPROMs of 8 kbyte each) contains the control program.

A power fail detect signal is routed from the Main Backplane to the reset line to re-initialize the HP2334A and provide automatic recovery in the event of a temporary loss of line (mains) power.

A Chip Enable circuit allows the microprocessor to address the following components:

- One Serial Input/Output Controller (SIO).
- One Direct Memory Access Controller (DMA).
- One Parallel Input/Output Controller (PIO).
- One Counter/Timer Circuit (CTC).
- Transmitter/Receiver Circuits.
- 1 kbyte static CMOS RAM.

**Serial Input/Output Controller (SIO).** The Z80A SIO (or MK3887N-4) performs serial-to-parallel and parallel-to-serial conversion on two independent full-duplex channels. In the HP2334A one SIO channel is dedicated to the synchronous network data communication and uses the synchronous protocols defined in the CCITT X.25 Recommendation; the second channel is reserved.

Operating at speeds of up to 800 kbits/second this LSI offers full compatibility with the Z80 I/O structure using daisy chain interrupt vectoring for interrupts. It supports byte or bit oriented synchronous or asynchronous protocols. The CRC generation/checking, synchronous character, zero insertion/deletion and flag insertion are performed automatically.

**Direct Memory Access Controller (DMA).** The Z80A DMA (or MK388XN-4) manages the microprocessor's independent transfers from the memory to the SIO in a byte-at-a-time transfer mode. This LSI features transfers, searches and search/transfers with dual port addressing in direct memory or in SIO. Capable of next operation loading during active transfer and of sequence repeats, it is compatible with the Z80 family bus request and prioritized interrupt-request daisy chains without external logic.
In the HP2334A the following cycle is repeated for each byte to be transmitted to the synchronous network (PSN):

- The SIO generates the Ready signal.
- The DMA generates the Bus Request signal.
- The microprocessor address bus, data bus and control signals go to a high impedance state.
- The microprocessor provides the Bus Acknowledge signal to the DMA.
- The DMA controls the bus and one byte is transferred from the memory to the SIO.
- The DMA releases the Bus Request signal.
- The microprocessor takes back control of the bus.

**Parallel Input/Output Controller (PIO).** The Z80A PIO (or MK3881N-4) interfaces with the Main Backplane. This LSI features two ports with an interrupt driven handshake; it is compatible with the Z80 family bus request and prioritized interrupt-request daisy chains without external logic.

- The four Slave-Enable signals select the correct Device Interface (4 Channel Processor) PCA during a read or write operation.
- The four Slave-Identify signals show which Device Interface PCA has sent an Interrupt-Slave signal.
- The Interrupt-Master signal is generated when either data or commands need to be sent to one of the Device Interface PCAs. After transmission of the first byte, the signal is removed.
- The Interrupt-Slave signal is received for each transfer of data from the devices. After transmission of the first byte, the signal is removed.
- The Handshake-Read-Slave and Handshake-Read-Master signals are used to transfer the data from the Device Interface PCA to the CPU PCA. The Handshake-Write-Master and Handshake-Write-Slave signals are used to transfer data in the opposite direction.

**Counter Timer Circuit (CTC).** The Z80A CTC (or MK3882N-4) is used for time out processing. This LSI has four independently programmable counter/timer channels and is fully compatible with the Z80 family daisy chain interrupt structure to provide fully vectored, prioritized interrupts without external logic. The CTC is programmed for the following tasks:

- To generate a 600 Hz signal used by the Device Interface PCAs.
- To generate an interrupt every 10 milliseconds. The 10ms timer is used for internal process control.
- To monitor the synchronous network Receive Data clock signals.

**Transmitter/Receiver Circuits.** These circuits allow the microprocessor to read the setting of the front panel DIP switches, to monitor some signals from the Synchronous Network Adapter PCA, to program the synchronous network communication bit rate, and to display diagnostic test results and HP2334A activity on the front panel LEDs. The Empty Slot Detection signal provides HP2334A configuration information. A low level forces each PCA plugged into the Main Backplane to generate a low true Identity signal.

**1kbyte Static CMOS RAM.** The 1 kbyte of static CMOS RAM is used to store the HP2334A configuration. This non-volatile memory is powered by a lithium cell located on the CPU PCA in the event of a power-down and a standby circuit prevents read and write operations during the power-down condition. At power-on a CRC-16 check is performed on the contents of the static CMOS RAM. If the contents are not valid, an error code is displayed on the CPU Card LEDs (see Chapter 14, Troubleshooting).

The lithium cell provides the static CMOS RAM with power via a connection on the Main Backplane. If the CPU PCA is disconnected from the Main Backplane the contents of the static CMOS RAM are automatically erased and the HP2334A must be re-configured when either the same or another CPU PCA is re-connected.

The SIO, DMA, PIO and CTC are daisy chained (in this order) on the priority line. An **ON** condition on the priority line input signal of one of the above components enables an interrupt to be generated by the component. If generated, an **OFF** condition is automatically set on the priority output signal linked to the priority line input signal of the next component and this is passed down the line to the last component.

## 10.3 SYNCHRONOUS NETWORK ADAPTER PCA

In the following description, refer to the Synchronous Network Adapter PCA block diagram (Figure 10-3); the available HP2334A-to-synchronous network signals are listed in Table 4-4. The Synchronous Network Adapter PCA converts TTL to RS-232-C electrical level, drives the synchronous network (or PSN) full duplex synchronous modem and contains the following:

- One 25 pin RS-232-C male connector.
- RS-232-C buffers, drivers and receivers.
- Transmitter/Receiver Circuits.
- One Bit Rate Generator.

The Bit Rate Generator (type MC14411) is an LSI which utilizes a frequency divider network to provide a wide range of baud rates from a single 1.8432 MHz clock. The Transmit Clock and Receive Clock signals are normally transmitted by the synchronous network modem to the HP2334A. When these signals are not available (e.g. when using modem eliminators) the Transmit Clock Out signal provided by the Bit Rate Generator is used. The clock signal frequency is one multiplied by the bit rate.

## 10.4 4 CHANNEL PROCESSOR PCA

In the following description, refer to 4 Channel Processor PCA block diagram (Figure 10-4). The 4 Channel Processor PCA (Device Interface Card) is controlled by an 8-bit Z80A microprocessor. It provides multiplexing/demultiplexing between the four serial port channels and one slot of the internal bus; it also provides the timing and software handshake used to control each terminal (asynchronous device).

The microprocessor accesses the RAM and ROM via a bus. The 2 kbyte static RAM provides buffering for data sent by the devices (terminals) to the CPU PCA, or transmitted by the CPU PCA to the devices. This enables blocks of data to be assembled from the characters received from the devices (terminals) and conversely to disassemble the data blocks received from the internal bus.

The 16 kbyte ROM (two type 2764 UV-EPROMs of 8 kbytes) contains the control program. Four type SY6551 Universal Asynchronous Receiver Transmitters (UARTs) interface the microprocessor with the four serial ports. Each UART is addressed by the microprocessor through the bus, has its own programmable baud rate generator and features programmable interrupt and status register, word length, number of stop bits and parity bit generation/detection.

The Priority Encoder gathers the interrupt sources, sends one interrupt signal to the microprocessor, and is able to provide the interrupt source identity on the address bus when requested by the microprocessor. The interrupt sources are as follows:

- Universal Asynchronous Receiver Transmitters (UARTs).
- Timer (one interrupt every 10 milliseconds).
- Interrupt-Master signal from the CPU PCA.
- Handshake-Read-Master signal from the CPU PCA.
- Handshake-Write-Master signal from the CPU PCA.

The Chip Enable Circuit allows the microprocessor to access the following components:

- ROM.
- RAM.
- Serial port Transmitter/Receiver Circuit.
- Main Backplane transmit/receive circuit.
- Main Backplane handshake circuit.

## 10.5 DIRECT CONNECT ADAPTER PCA

As shown in the Direct Connect Adapter PCA block diagram (Figure 10-5), one Driver and one Receiver per channel adapt the Device Interface (4 Channel Processor) PCA signals to RS-232-C levels (the signals available at each port are listed in Table 4-2).

The Direct Connect Adapter PCA (Device Adapter Card) provides the user with four 25-pin female RS-232-C connectors. The Request To Send signal (pin 4) is linked to the Clear To Send signal (pin 5). The Data Set Ready signal (pin 6) is linked to the Data Terminal Ready signal (pin 20). For details of the function and behavior of the Direct Connect Adapter Card port signals refer to Section 4.10.

## 10.6 MODEM CONTROL ADAPTER PCA

As shown in the Modem Control Adapter PCA block diagram (Figure 10-6), three Drivers and three Receivers per channel adapt the 4 Channel Processor PCA (Device Interface Card) signals to RS-232-C levels (the signals available at each port are listed in Table 4-3).

The Modem Control Adapter PCA (Device Adapter Card) provides the user with four 25-pin female connectors. For details of the function and behavior of the Modem Control Adapter Card port signals refer to Section 4.10.

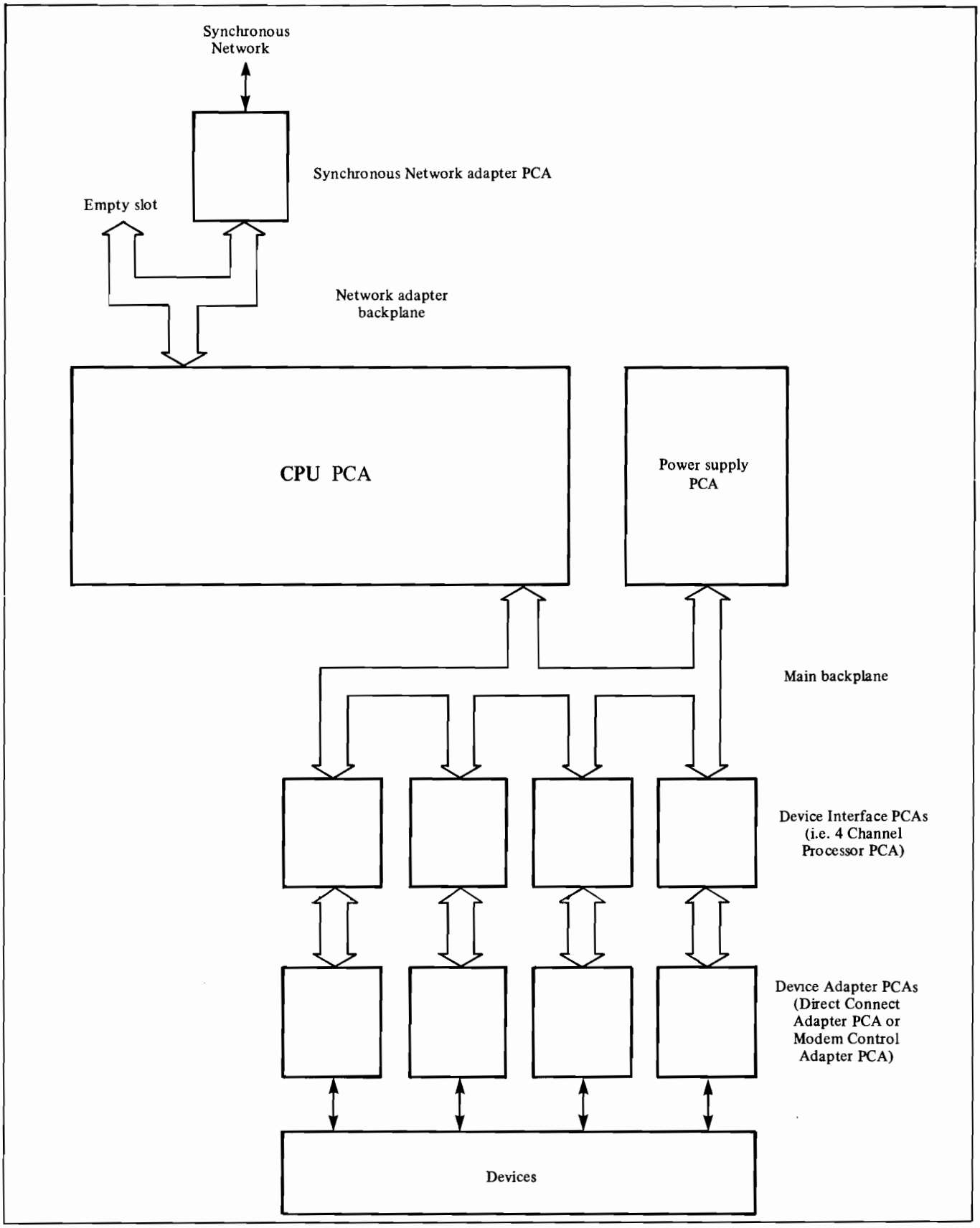



Figure 10-1 HP 2334A Overall Block Diagram

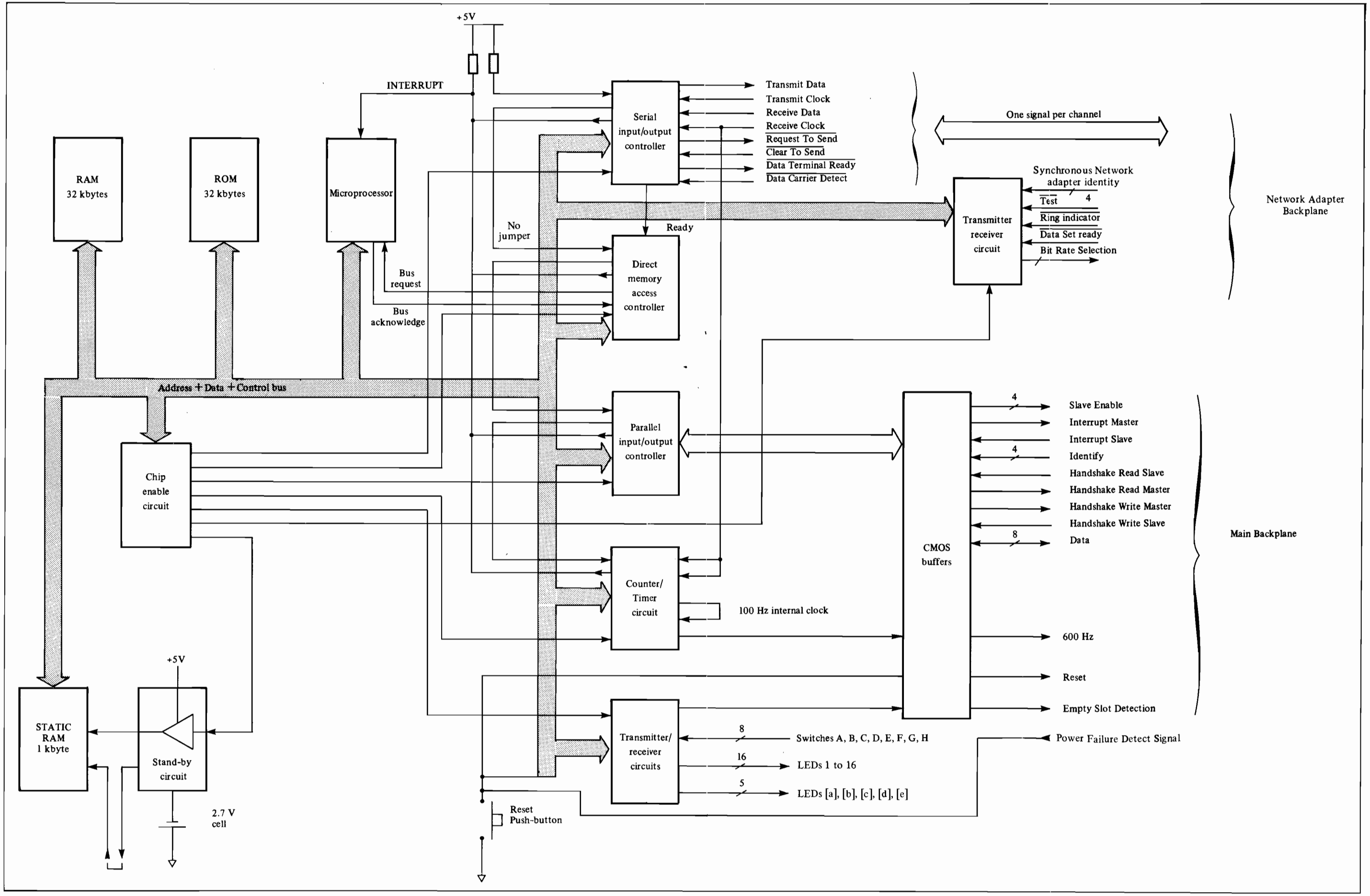



Figure 10-2 CPU PCA Block Diagram

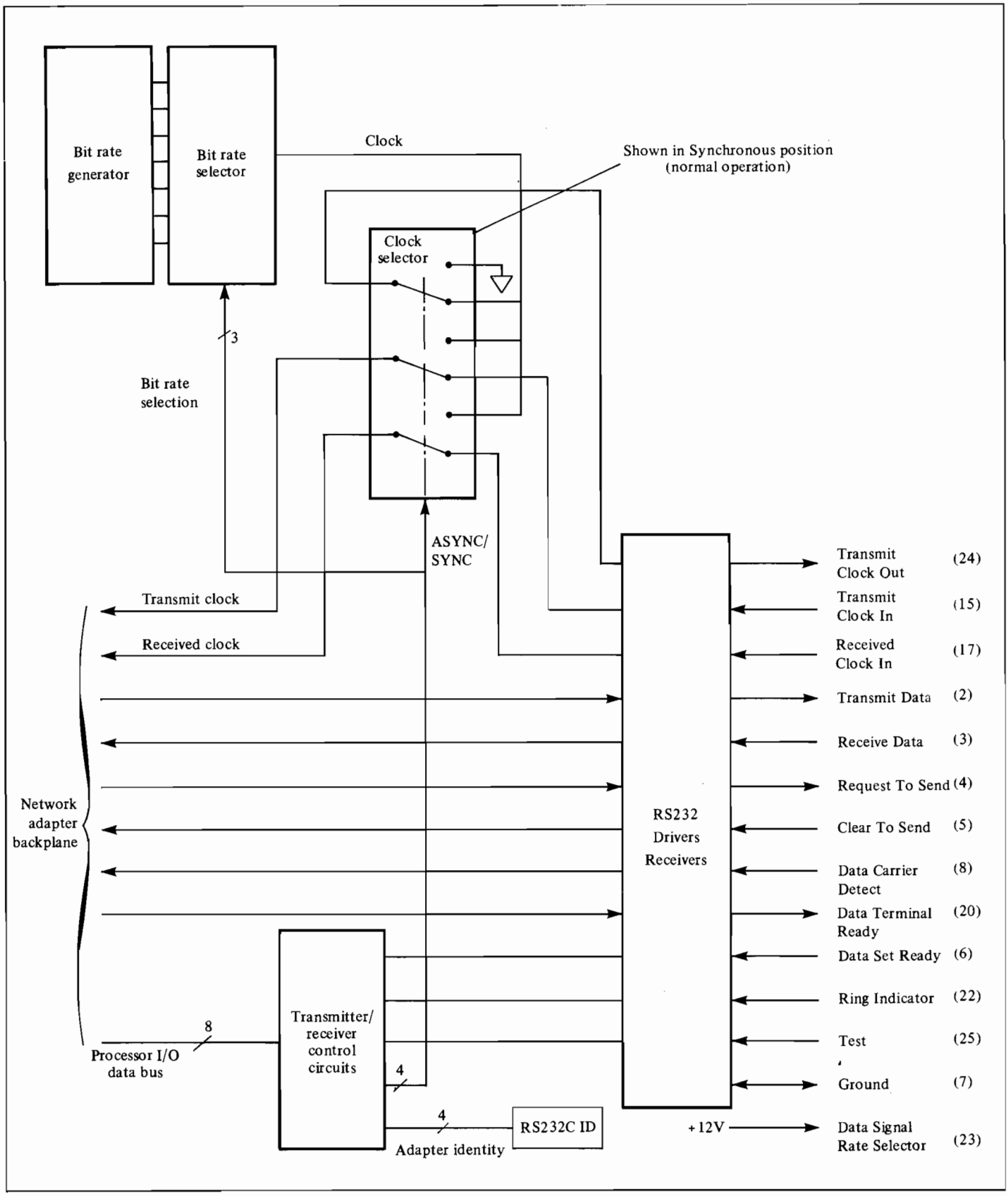



Figure 10-3 Synchronous Network Adapter PCA Block Diagram

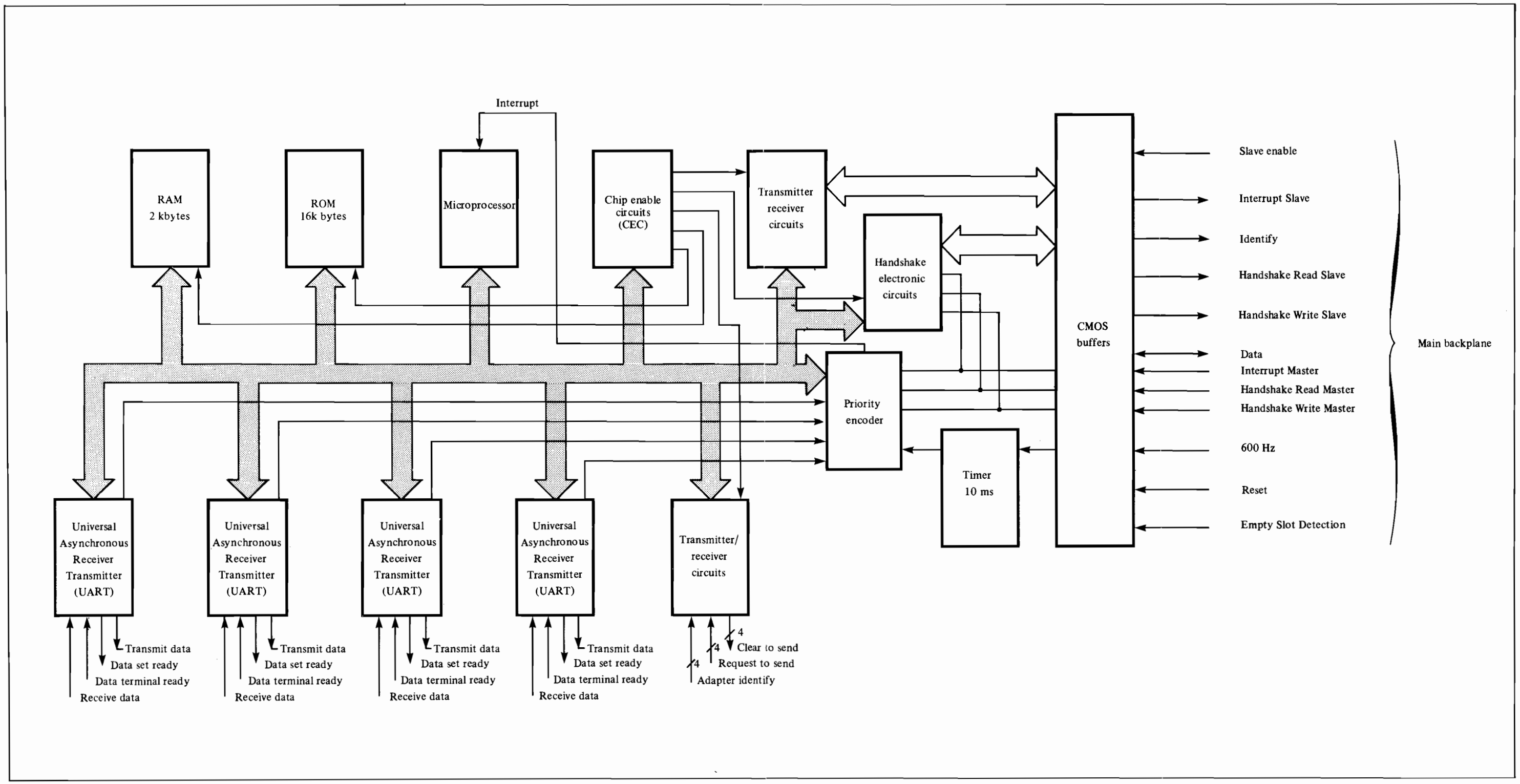



Figure 10-4 4 Channel Processor PCA Block Diagram

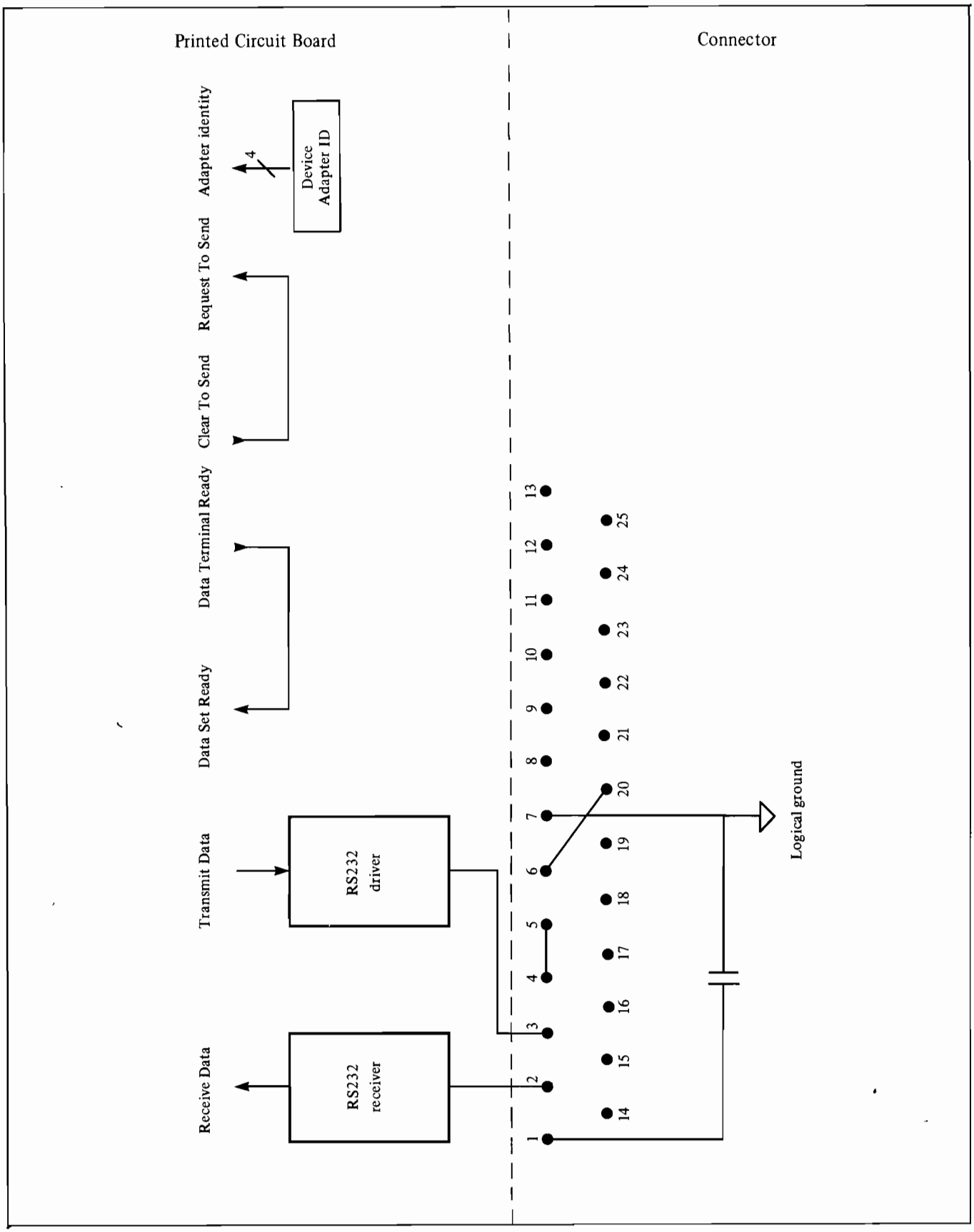



Figure 10-5 Direct Connect Adapter PCA Block Diagram

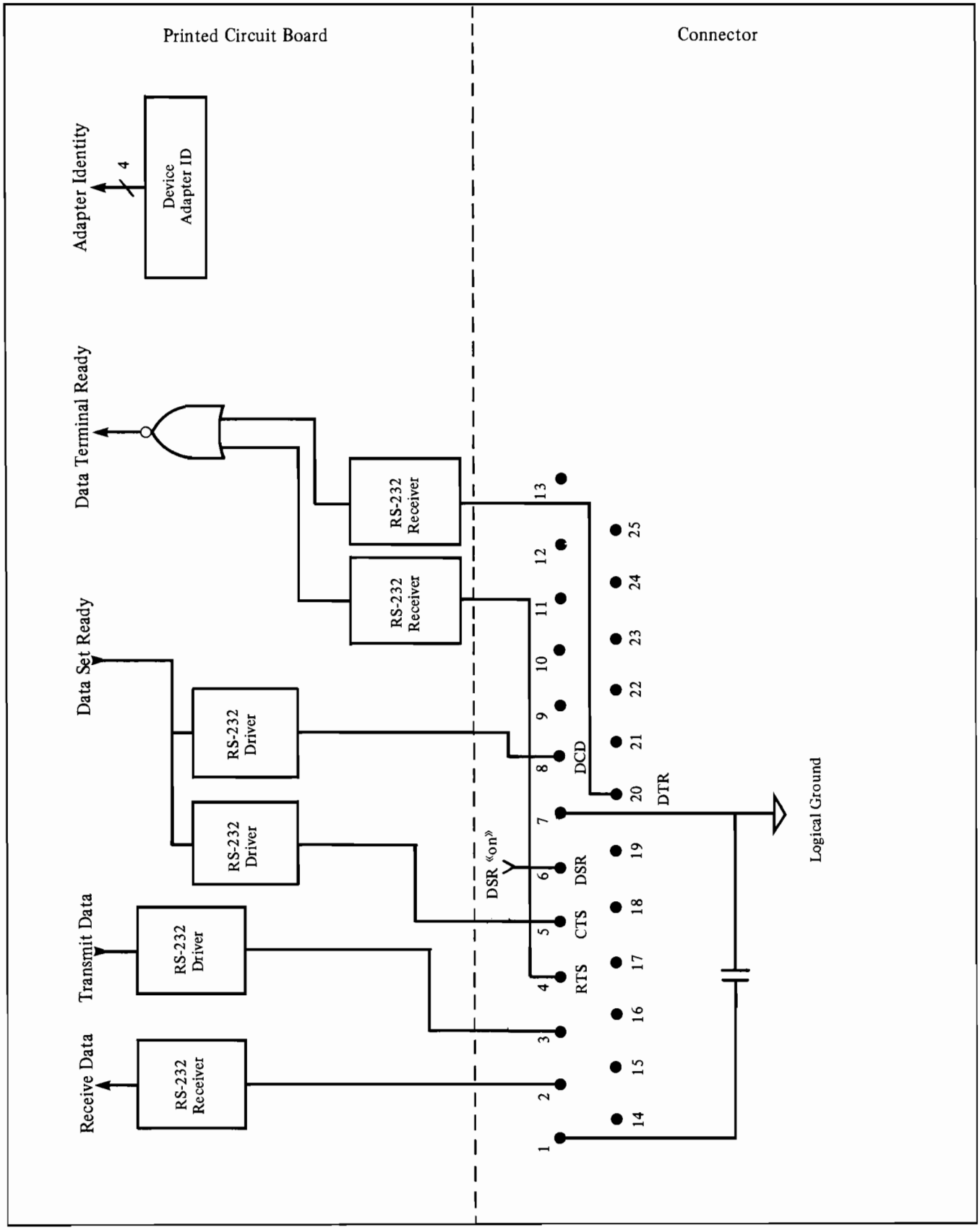



Figure 10-6 Modem Control Adapter PCA Block Diagram

# ROUTINE MAINTENANCE

CHAPTER 11

## 11.1 INTRODUCTION

The HP2334A Multimux does NOT require any routine preventive maintenance. However, the gray protective case may be cleaned periodically (see Section 11-3) and, at least once per month, the fan should be visually checked to ensure that it is operating correctly (see Section 11-2).

## 11.2 CHECKING FAN OPERATION

The HP2334A's fan is located at approximately the mid-point on the right hand side of the unit (front view). It cools the PCAs by drawing air into the unit (right hand side) and blowing the air at room temperature across them.

The fan operation should be verified at least once per month by performing a visual/tactile inspection. Check that the fan is rotating by looking through the ventilation grille on the right hand side of the unit. Then check that air is being drawn into the unit (e.g. by holding a sheet of paper in front of the ventilation grille).

If the fan has failed or is not operating correctly then the HP2334A should either not be used (i.e. power-off) or, if its use is essential, then it should be powered-on for limited periods only. Then contact the nearest HP office as soon as possible (HP Sales and Service offices are listed at the end of this manual).

## 11.3 OUTER CASE CLEANING

**CAUTION**

WATER MUST **NOT** BE SPRAYED DIRECTLY ON THE CASING, CARDS OR CONNECTORS.

DO **NOT** USE PETROLEUM BASED CLEANERS OR CLEANERS CONTAINING ACETONE, AMMONIA, BENZENE OR TRICHLORETHYLENE AS THEY MAY DAMAGE THE OUTER CASE.

If the HP2334A cabinet outer casing becomes dirty it may be wiped clean using a lint-free cloth lightly moistened with warm soapy water.

# POWER SUPPLY VOLTAGE & FUSE CHECKING

CHAPTER 12

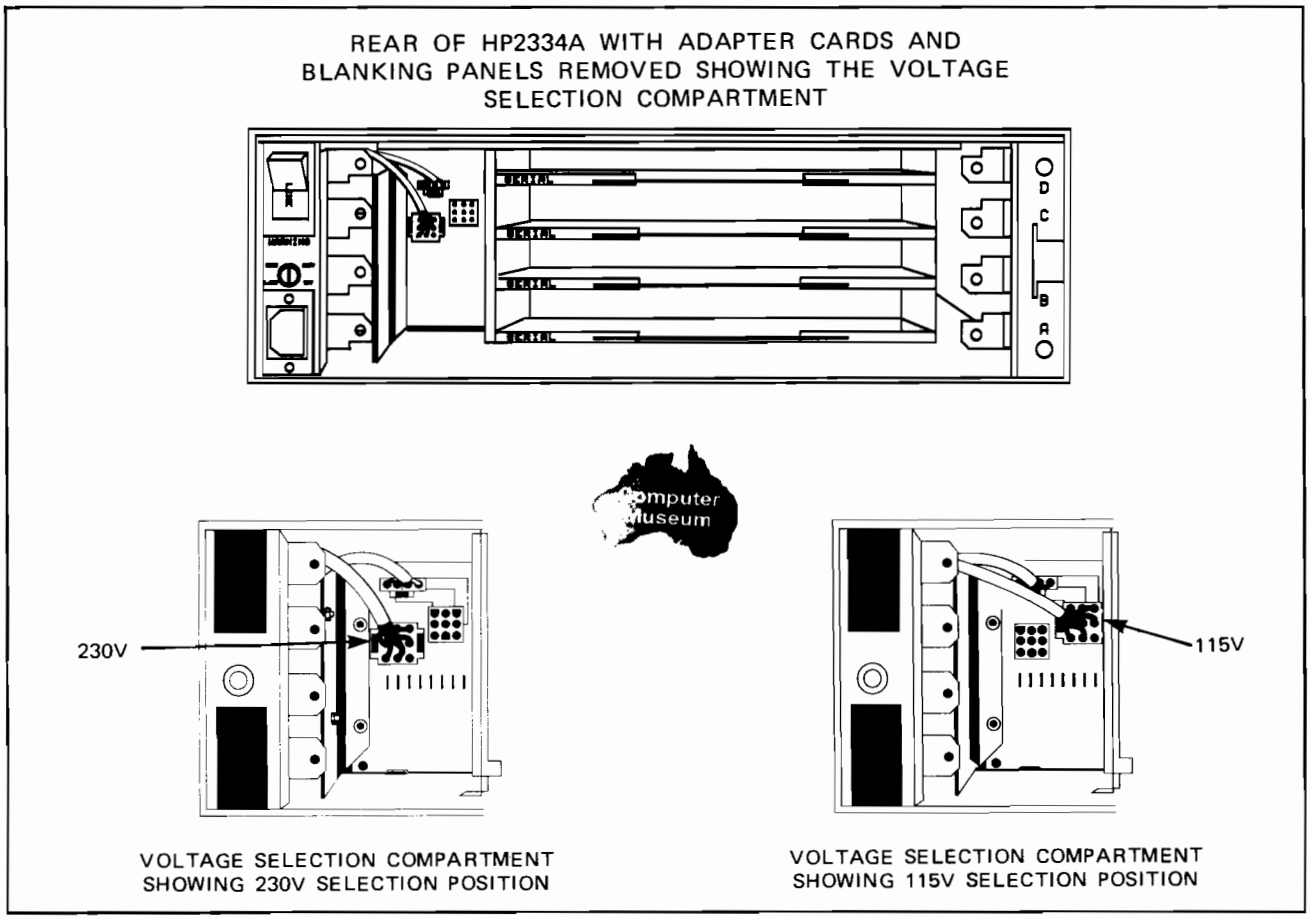



**Figure 12-1 HP2334A Voltage Selector and Line Fuse**

**WARNING**

THE POWER SUPPLY CONTAINS HIGH-VOLTAGE COMPONENTS. ENSURE THAT THE HP2334A IS DISCONNECTED FROM THE LINE (MAINS POWER) SUPPLY BEFORE PROCEEDING WITH THE VOLTAGE/FUSE CHECKING AND VOLTAGE SELECTION PROCEDURES. THESE PROCEDURES MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY.

## 12.1 INTRODUCTION

The HP2334A is fitted with a 75W power supply part number 0950-1717 which does not require any voltage adjustment. The HP2334A's power requirement is detailed on the product identification label (see Section 4.3). The user should verify that the HP2334A power requirement shown on the label conforms with the site power supply before commencing the procedures detailed in this chapter.

## 12.2 VOLTAGE SELECTION

The HP2334A has a voltage selection compartment (see Fig. 12-1) which is accessible from the rear of the unit by removing the fitted Device Adapter Cards and blanking panels (if any). The voltage selection must conform with the voltage shown on the HP2334A identification label. This may be verified as follows:

1) Ensure the HP2334A is disconnected from the line (mains power) supply; i.e. by removing the power cord.

2) At the rear of the HP2334A remove ALL of the Device Adapter Cards/blanking panels (see Section 15.3). Each card/panel is secured to the rear of the HP2334A by two single slot screws. The screws are attached to the card/panel via spring clips and should NOT be removed.

3) In the line connection compartment, at the rear left-hand side of the HP2334A, visually check that the line (power supply) voltage is correctly set. The line voltage is set by connecting the square male connector on the internal power cable to the square female connector of an internal voltage socket mounted on the Main Backplane (see Fig. 12-1). The voltage selection sockets are as follows:

   - The lower left-hand socket is for a 230 V (i.e. 195 to 253 V) supply, this position is labeled 220.
   - The upper right-hand socket is for a 115 V (i.e. 86 to 127 V) supply, this position is labeled 115.

**NOTE**: The rectangular socket at the rear top of the compartment is for an internal power connection to the HP2334A's fan, and should NOT be touched.

4) If the voltage selection cable is incorrectly fitted (i.e. the voltage selection does not conform with the identification label and site power supply), the voltage selection may be changed by disconnecting the square male cable connector and reconnecting it to the correct female voltage selector socket. This should be done by carefully squeezing the plastic tabs on either side of the male connector and pulling it out of the selector socket. Then reconnect the male connector to the correct female socket; the shape of the connector's pins (i.e. some have flat edges) ensures that it can only be mated with the socket when they are aligned correctly.

5) Replace the rear cards/panels as required.

### 12.2.1 Line Fuse Checking

The HP2334A rear panel line fuse (see Fig. 12-1) should be checked as follows:

1) Using a flat blade screwdriver, unscrew the rear panel circular plastic fuse holder located below the LINE switch.

2) Withdraw both the cover and the fuse. Examine the fuse condition and ensure that it is correctly rated for the operating voltage. The fuse ratings are as follows:

   - 1.5 AT / 250 V (i.e. 1.5 Amps timelag = slow blow) for a 230 Volt line supply.
   - 3.0 AT / 250 V (i.e. 3 Amps timelag) for a 115 Volt line supply.

3) Fit a fuse of the correct rating as necessary.

**NOTE**: The fuse value is normally marked at one end of the fuse.

## 12.3 POWER SUPPLY VOLTAGE CHECKING

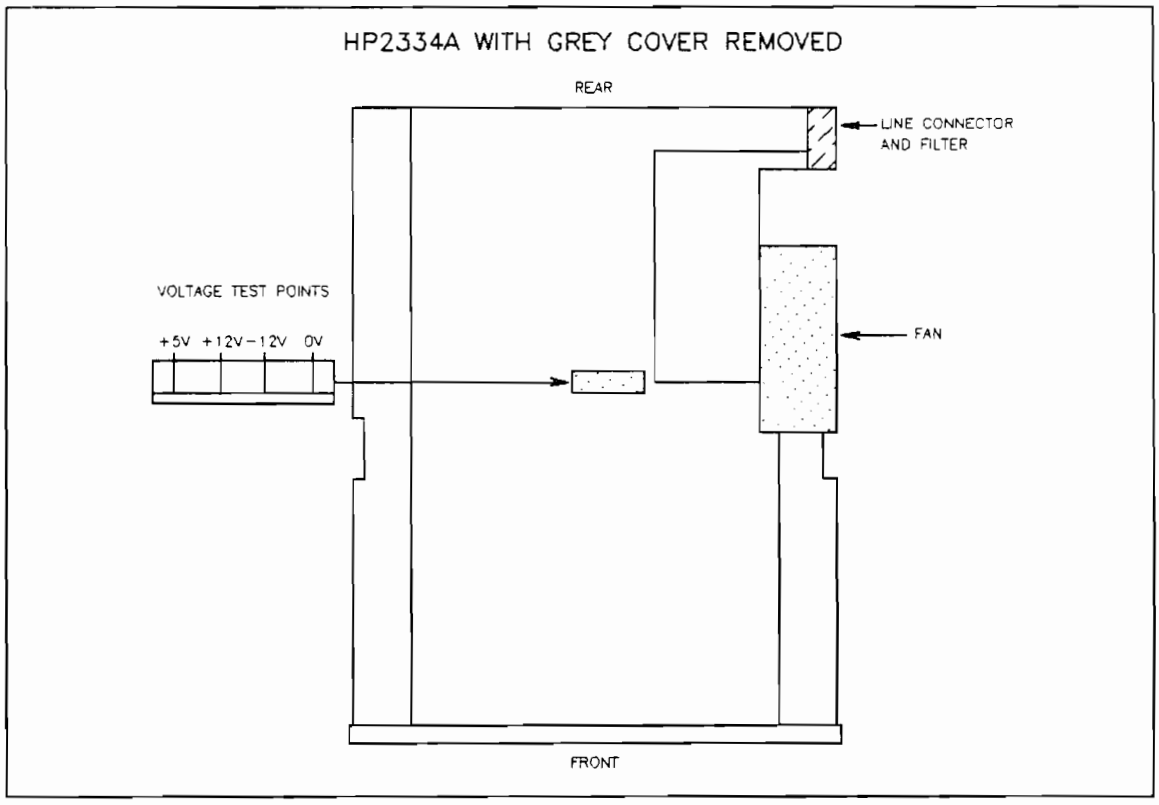



**Figure 12-2 HP2334A Power Supply Voltage Test Points**

The HP2334A is fitted with a 75W power supply part number 0950-1717 which does not require any voltage adjustments. Test points for checking the power supply d.c. voltages are available on the Main Backplane. The d.c. voltages should be checked if a faulty power supply is suspected (refer to Chapter 14, Troubleshooting).

The d.c. voltage checking should be performed as follows:

**Equipment.** The following equipment is required when checking the d.c. power supply test points:

- A 20,000 ohm/volt voltmeter with a fine voltage probe.
- A cross-head screwdriver.

**Preparation.** The HP2334A should be prepared as follows:

1) Switch OFF the HP2334A and remove the power cord.

2) Remove all the device cables and the synchronous network connecting cable. It is recommended that a written record is made of the cable to device port connections.

3) Remove the HP2334A's gray protective cover as described in Section 15.5, but leave the PCAs in position.

**Voltage Checking Procedure.** A rectangular aperture in the top of the HP2334A card cage provides access to the d.c. voltage test points located on the Main Backplane (see Figure 12-2). The test point identification labels are printed on the Main Backplane, above the test points.

**WARNING**

DO NOT TOUCH THE HP2334A's INTERNAL POWER CABLING OR FAN WHEN THE LINE POWER IS ON.

THE POWER UNIT CONTAINS HIGH-VOLTAGE COMPONENTS. USE EXTREME CAUTION AND DO NOT TOUCH ANY EXPOSED PARTS WHEN PERFORMING THE VOLTAGE CHECKING PROCEDURE. FAILURE TO DO SO CAN CAUSE SERIOUS INJURY.

Check the d.c. voltages as follows:

1) Reconnect the power cord and switch ON the HP2334A.

2) Check the Power Supply PCA voltages for accuracy (see Table 12-1) by connecting the voltmeter's ground clip to the test point 0V contact and touching the relevant test point contact with the voltmeter's fine voltage probe.

| Test Point | Voltage | Tolerance |
|---|---|---|
| +5V | +5V d.c. | $\pm$ 0.15V d.c. |
| +12V | +12V d.c. | $\pm$ 1.2 V d.c. |
| -12V | -12V d.c. | $\pm$ 1.2 V d.c. |

**Table 12-1 Test Point Voltages**

3) If the voltages are out of tolerance then the power supply must be replaced (refer to Chapter 16).

4) If the voltages are within tolerance then switch OFF the HP2334A and remove the power cord. Then replace the gray cover.

## 12.3.1 Power Supply Fuse Replacement

The power supply line fuse should be checked if the HP2334A does not respond when powered-on and the power supply line fuse is suspected (refer to Chapter 14, Troubleshooting). The power supply line fuse should be checked as follows:

1) Switch OFF the HP2334A and remove the power cord.

2) Remove the front panel (held in place magnetically).

3) Remove the CPU and power supply protective metal plate (see Section 15.3). This plate is held in place by four cross-head screws (each 1 cm/0.4 in long) and must be removed by sliding it out of the front of the HP2334A.

4) With the protective plate removed, withdraw the power supply from the front of the HP2334A.

5) Remove the line fuse from the spring clip fuse holder.

6) Check the fuse condition (examine for signs of burn/blow) and ensure that it is correctly rated at 2.5 AT 250 V (i.e. 2.5 Amps timelag). This fuse rating is correct for both 115 V and 230 V operation.

7) Fit a fuse of the correct rating as necessary.

8) Replace the power supply PCA, the protective metal plate and the front panel. The replacement procedure is a reversal of the removal procedure.

**NOTE**: The fuse value is normally marked at one end of the fuse.

# DEVICE INTERFACE/ADAPTER CARD INSTALLATION

CHAPTER 13

## 13.1 INTRODUCTION

The HP2334A is delivered ready assembled with all the ordered cards (i.e. Option(s) 122 and/or 123) in position. Figures 9-1, 9-2 and 13-1 depict the HP2334A's internal structure and assembly.

If add-on interface(s) (i.e. the HP40260A Direct Connect Interface or the HP40261A Modem Control Interface) are subsequently ordered, they may be installed as described in Section 13-2. Note that the available add-on products and accessories are detailed in Section 1.10.

**Tools required.** Installing the HP2334A add-on interface(s) requires a cross-head screwdriver and a flat-blade screwdriver.

**WARNING**

THE HP2334A ADD-ON INTERFACES MUST BE INSTALLED BY QUALIFIED PERSONNEL ONLY.

THE HP2334A **MUST** BE DISCONNECTED FROM THE LINE (MAINS) POWER SUPPLY BEFORE ADD-ON INTERFACE INSTALLATION.

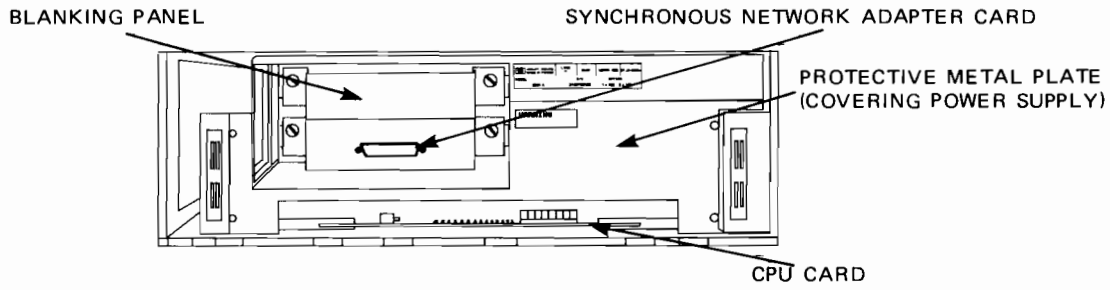
**CAUTION**

THE HP2334A COMPONENTS MUST BE HANDLED WITH CARE AND SHOULD NOT BE KNOCKED OR ALLOWED TO BE CONTAMINATED BY DIRT OR LIQUIDS.

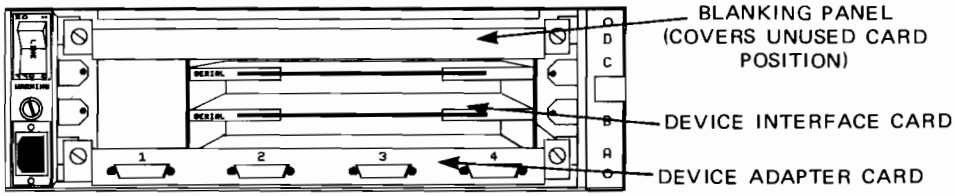
USE ANTI-STATIC HANDLING PROCEDURES WHEN INSTALLING OR REMOVING HP2334A DEVICE INTERFACE/ADAPTER CARDS.

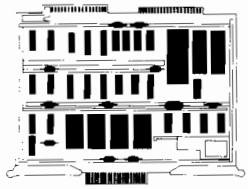
WHEN INSTALLING ANY CARD (PCA) ENSURE THAT IT IS CORRECTLY ALIGNED IN THE HP2334A SLOT RUNNERS.

HP2334A WITH FRONT PANEL REMOVED SHOWING
SYNCHRONOUS NETWORK ADAPTER AND CPU CARDS
IN POSITION

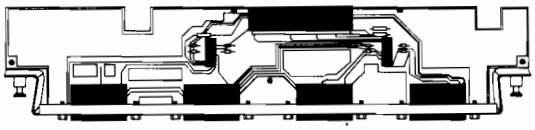



REAR OF HP2334A SHOWING DEVICE INTERFACE AND
ADAPTER CARDS

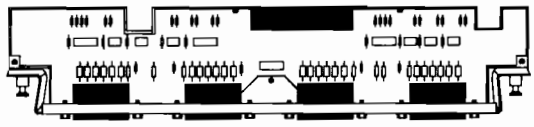


DEVICE INTERFACE CARD
(4 CHANNEL PROCESSOR CARD)



DIRECT CONNECT (RS-232-C) ADAPTER CARD



MODEM CONTROL (RS-232-C) ADAPTER CARD

**Figure 13-1 HP2334A Interface/Adapter Card Assembly**

## 13.2 ADD-ON INTERFACE INSTALLATION

Each HP2334A add-on interface comprises two cards as follows:

- A Device Interface Card (i.e. the 4 Channel Processor Card, part number 5061-3833) that plugs into a connector on the Main Backplane.
- A Device Adapter Card (either the Direct Connect Adapter Card, part number 40250-60001 or the Modem Control Adapter Card, part number 40261-60001) that connects with the Device Interface Card.

These cards must be installed in the HP2334A by qualified personnel following the installation procedures detailed in this Chapter with reference to the components shown in Figure 13-1. When the cards of an add-on interface are installed, the HP2334A should be mounted on a clean, dry, solid bench or table.

**NOTE:** At the rear of the HP2334A cabinet, blanking panels are fitted to cover each unused Device Adapter Card slot position. All unused Device Interface Card connectors on the Main Backplane are each fitted with a protective plastic dust cover.

### 13.2.1 Device Interface Card Installation

The Device Interface Card (i.e. the 4 Channel Processor Card, part number 5061-3835) is positioned between the HP2334A's Main Backplane and the Device Adapter Card (see Fig. 13-1).

The rear edge of the Device Interface Card is fitted with two connectors; the left-hand one is for connection to the Main Backplane while the right-hand one is not used. The front edge of the card fitted with one connector for connection to its associated Device Adapter Card and two extractors which are used to release and remove the card.

In order to provide access to install the Device Interface Card(s), the blanking panel(s) covering the slot position(s) at the rear of the HP2334A must be removed. This may be done by unscrewing the two screws securing each blanking panel to the rear of the HP2334A, and then removing the panel. The plastic dust cover(s) fitted over the Device Interface Card connector(s) on the Main Backplane must then be removed.

The Device Interface Card(s) may then be installed in the HP2334A as follows:

1) Hold the card by its extractors, component side uppermost. Then carefully slide it into the unit in the slot runners at the required position so that the rear of the card engages with the connector on the Main Backplane.

2) When the card is installed, close the extractors by moving them together. This engages the extractors with the card cage, locking the card in position.

When the Device Interface Card(s) has been installed its associated Device Adapter Card(s) may be fitted.

## 13.2.2 Device Adapter Card Installation

The Device Adapter Card (i.e. Direct Connect Adapter Card or Modem Control Adapter Card) connects with its associated Device Interface Card and is positioned at the rear of the HP2334A (see Fig. 13-1).

The rear edge of the Device Adapter Card is fitted with a connector for connecting it to its associated Device Interface Card. The front edge of the card is fitted with a metal panel which offers four ports (connectors) for connecting the device cable(s) to the HP2334A. Each port is assigned a unique sub-address, depending on the card's position in the HP2334A (see Figure 4-7).

The card must be mounted in slot A, B, C or D at the rear of the HP2334A and mated with its associated Device Interface Card. This may be done as follows:

1) Hold the Device Adapter Card by its metal panel, component side up. Carefully slide it rearwards along the slot runners at the required position (slot A, B, C or D) so that the card's connector aligns with the connector of the Device Interface Card. Then gently press the card's metal panel to ensure the connectors completely engage.

2) Secure the card in position by tightening the locking screw on either side of the metal panel.

When the Device Adapter Card(s) has been installed, any unused slot positions must be covered by replacing the blanking panels. Since the panel locking screws are off-center (with respect to the blanking panel's lateral center line), the panel must be horizontally mounted in position with the locking screws above the panel's center line.

The HP2334A may then be mounted on the site table or rack and then connected to the power supply and devices as required (see Chapter 4).

NOTE: The HP2334A configuration must be verified for the additional device ports. For further information on configuring the HP2334A refer to Chapter 6.

## 13.3 DIRECT CONNECT TO MODEM CONTROL UPGRADE

An HP2334A Direct Connect Interface (factory installed as Option 122 or customer installed as an add-on with HP40260A) may be upgraded to a Modem Control Interface by ordering and installing the add-on Option 001.

Option 001 is a standard Modem Control Adapter Card, supplied as an add-on, which can replace the Direct Connect Adapter Card of a fitted Direct Connect Interface. The existing Device Interface (4 Channel Processor) Card can be left in position after removing the fitted Direct Connect Adapter Card and the Modem Control Adapter card should then be installed as described above (see 13.2.2).

NOTE: The HP2334A configuration may require modification after installing upgrade Option 001; refer to Chapter 6 for information on configuring the HP2334A.

# TROUBLESHOOTING

CHAPTER 14


## 14.1 INTRODUCTION

This chapter provides the troubleshooting information and procedures required, in case of an HP2334A malfunction, to isolate a defective replaceable assembly or component. Once the defective assembly or component has been isolated it should be replaced with a new/exchange assembly or component (refer to Chapters 13, 15 and 16).

The HP2334A is of modular construction which ensures that installation, service and upgrading can be easily accomplished in the field.

The HP2334A troubleshooting procedure provides verification of the following:

- Correct HP2334A installation.
- HP2334A power supply voltages and fuses.
- All HP2334A PCAs (cards) using the power-on and self diagnostic tests.
- The HP2334A asynchronous (devices) and synchronous (modem) data communication using the loop back tests.

Before commencing the main troubleshooting procedure it is recommended that preliminary troubleshooting procedure be followed as described in Section 14.2.

The main troubleshooting procedure is detailed in Section 14.3 with reference to Figure 14-1 and Table 14-1. Table 14-2 provides details of the various DIP switch settings and the corresponding LED display interpretations.

**WARNING**

THE POWER UNIT CONTAINS HIGH-VOLTAGE COMPONENTS. USE EXTREME CAUTION AND DO NOT TOUCH ANY EXPOSED PARTS WHEN PERFORMING THE TROUBLESHOOTING PROCEDURES. FAILURE TO OBSERVE THESE PRECAUTIONS MAY CAUSE SERIOUS INJURY.

## 14.2 PRELIMINARY TROUBLESHOOTING

If the user is experiencing or suspecting abnormal behavior while operating the HP2334A, refer to Section 7.6, User Troubleshooting.

Before performing the main troubleshooting procedure the following preliminary troubleshooting should be performed in the order shown:

1) Check that the HP2334A site is correctly prepared, i.e. check all the cabling and verify the operation and setting of associated equipment (e.g. modem(s)) according to the manufacturer's instructions (see Chapter 3).

2) Verify the HP2334A installation (see Chapter 4).

3) If the HP2334A is to be used with a PSN, check that all subscription parameters and required facilities are correctly subscribed for with the PSN authority (see Chapter 5).

4) Check that the HP2334A has been correctly configured (see Chapter 6). Note that the HP2334A should be configured with the PSN (if any) subscribed parameters/facilities. Similarly the configured/assigned PAD profiles must be verified according to the device/application for each device port.

5) Check the HP2334A line and power supply fuses and that the power supply d.c. voltages are within tolerance; refer to subsection 14.2.1 and Chapter 12 for the verification procedure.

### 14.2.1 Voltage and Fuse Checking

Once the site preparation and the HP2334A installation have been checked (see, in particular, Sections 3.4, 4.3, 4.4 and 4.6), the power supply voltage and fuse checking procedures (see Chapter 12) should be performed under the following conditions:

- If the HP2334A fails the power-on self test (i.e. power-on test (1) fails, see Table 14-1).
- If the HP2334A line fuse or the power supply line fuse blows.
- If intermittent problems occur during normal operation or when performing the main troubleshooting procedure (see 14.3). In this case the power supply d.c. voltages must be verified and if they are found to be out of tolerance the power supply must be replaced.
- If replacement fuses keep blowing then re-check the site preparation and HP2334A installation.

## 14.3 MAIN TROUBLESHOOTING

HP2334A malfunctions are isolated by performing one, or more, of the self-tests. The test results are displayed on the 21 LEDs (light emitting diodes) mounted on the CPU PCA, behind the front panel window.

**Test Selection.** The eight DIP switches mounted on the CPU PCA allow the relevant self test to be selected. The DIP switch settings for each test (not required for the power-on test) are shown in Figure 14-1. When the setting of only four of the eight DIP switches is shown (e.g. switches EFGH or ABCD), the position of the other switches will not affect the selected test.

The reset push-button (also mounted at the front of the CPU PCA) enables the selected test to be initialized without having to power-off then power-on the HP2334A The DIP switches and reset push-button are described in Section 7.2.

**Troubleshooting.** If the HP2334A has a failure when operational, the troubleshooting procedure described below should be followed, as it minimizes the down-time by re-assembling the HP2334A on a step-by-step basis. The HP2334A testing is started with the minimum number of PCAs and additional PCAs are then progressively installed and verified (or, if defective, replaced and verified) one by one.

When performing the troubleshooting procedure refer to Figure 14-1 and Table 14-1. Figure 14-1 lists the sequence of events at power-on, and the mode/test selected depending on the DIP switch setting. Table 14-1 describes each self test, lists all the LED error readouts and details the action(s) that should be taken, depending on the error condition. Note that the self-tests stop execution at the first error detected and the error is then displayed on the LEDs.

**NOTE:** Chapter 15 details the PCA removal and replacement procedure.

**Test Connectors.** The following test connectors are required when performing the troubleshooting procedure:

- Four (4 to 16) test connectors for the Device Adapter Card ports - part number 02620-60062.
- One test connector for the Synchronous Network Adapter Card port - part number 02333-60006.

**Troubleshooting procedure.** Perform the troubleshooting as follows:

1) Power OFF. Remove ALL the Device Adapter PCAs, Device Interface (4 Channel Processor) PCAs and the Synchronous Network Adapter PCA so that the HP2334A only contains the CPU PCA, Power Supply PCA and the Main and Network Adapter Backplanes. The PCA removal procedure is detailed in Chapter 15.

2) **Power On Test:** Power ON. If the power-on test fails BEFORE the Device Interface PCA detection (Power On Test (8) in Table 14-1) then take the action described in Table 14-1; otherwise go to step (3) below.

3) Power OFF. Plug one Device Interface PCA into any slot. The PCA installation procedure is detailed in Chapter 15.

4) Power ON. If the power-on test fails BEFORE Device Interface PCA detection (Power On Test (8) in Table 14-1) then take the action detailed in Table 14-1; otherwise go to step (5).

5) **Switches Test:** Power OFF. Plug a Device Adapter PCA onto the Device Interface PCA already inserted. Then select the switches test (see Figure 14-1).

6) Power ON. If the power-on test fails BEFORE the switches test (see Table 14-1) then take the action detailed in Table 14-1; otherwise go to step (7).

7) Repeat steps (3) to (6) for each Device Interface/Device Adapter PCA that must be re-installed in the HP2334A. Then go to step (8).

8) Toggle ON and OFF switches A to H and ensure that LEDs [9] to [16] go ON (lit) and OFF (extinguished) accordingly.

9) **Self Diagnostic Tests:** Plug a test connector on each I/O port of the Device Adapter PCAs; i.e. use one connector part number 02620-60062 on each of the ports of the Device Adapter PCA (Modem Control or Direct Connect Adapter PCAs). Then select the off-line closed loop self diagnostic test to be performed on the Device Interface/Adapter PCA combination which is fitted with the test connectors (see Figure 14-1).

10) Press and release the Reset push-button mounted on the CPU PCA. If NO failure is detected, LED [a] illuminates for approximately one second after each pass of the test (i.e. the self diagnostic test is re-started as long as the power is ON and the test conditions are not changed). Then go to step (11). If a failure is detected, refer to Table 14-1.

**NOTE:** If a test connector is not fitted a failure will be detected and the failed port number is displayed on the corresponding LED between LEDs [13] and [16].

11) Repeat steps (9) and (10) for all the Device Interface/Adapter PCAs so that they are plugged into the HP2334A and tested sequentially.

12) Prepare the HP2334A to perform the Synchronous Network Adapter PCA closed loop self diagnostic test:

- Power OFF. Plug in the Synchronous Network Adapter PCA.
- Plug the test connector (part number 02333-60006) in the the Synchronous Network Adapter PCA connector port.
- Select the closed loop self diagnostic test to be performed on the Synchronous Network Adapter PCA (see Figure 14-1).

13) Power ON. If NO failure is detected, LED [a] illuminates for approximately one second after each pass of the test (i.e. the test continues to run provided the power is ON and the test conditions are not changed), in which case go to step (14). If a failure is detected, refer to Table 14-1.

14) Select the extended RAM test (see Table 14-1). Then, press and release the reset push-button. If NO failure is detected, LED [a] illuminates for approximately one second after each pass of the test, LED [c] is continuously lit, and LEDs [b], [d] and [e] blink; in which case go to step (15). If a failure is detected, refer to Table 14-1.

15) When the individual closed loop self diagnostic tests have been successfully performed, the complete set of tests may be repeated. To do this:

- Ensure that all of the PCAs are correctly fitted in the HP2334A. Then fit test connectors (part number 02620-60062) to all of the Device Adapter PCA ports and one test connector (part number 02333-60006) to the Synchronous Network Adapter PCA port.
- Select all the diagnostic tests to be cycled (see Table 14-1).
- Press and release the Reset push-button and let the test run for several minutes, i.e. sufficiently long for any intermittent errors to be detected. If NO errors are detected, go to step (16). If a failure occurs, refer to Table 14-1.

16) **Terminal Loop Back Test:** Remove ALL the test connectors, connect the terminals/devices to the HP2334A's device ports, then select the terminal loop back test (see Figure 14-1 and 14.3.1 for details of the test procedure). During this test the HP2334A is configured to exchange data with the terminals.

17) This step is designed to ensure the Synchronous Network Adapter PCA-to-synchronous modem RS-232-C cable is working correctly.

- Plug the modem cable (part number 02333-60008) connector into the Synchronous Network Adapter PCA port. On the other end of the cable, plug the test connector part number 02333-60006.
- Using the DIP switches select the Synchronous Network Adapter PCA closed loop self diagnostic test (see Table 14-1), then press and release the Reset push-button.

If NO failure is detected, LED [a] illuminates for approximately one second after each pass of the test and LED [c] is continuously lit. If the test fails the RS-232-C modem cable must be replaced.

18) **Modem Loop Back Test:** This step in the troubleshooting procedure only applies if the synchronous modem has a loop back capability. It is designed to ensure that the HP2334A- to-synchronous modem connection is operating correctly. Before starting, ensure that the HP2334A's configuration is correct for the connected modem (baud rate, transmission mode, etc.).

- Unplug the 02333-60006 test connector from the HP2334A-to-synchronous modem RS-232-C cable then plug the cable into the local synchronous modem.
- Set the local synchronous modem to enable the local modem loop back capability (see Figure 14-1 and 14.3.2 for a detailed procedure description).
- Set the DIP switches to perform the modem loop back test (see Table 14-1 and 14.3.2). Press and release the Reset push-button. The HP2334A then sends data to the local synchronous modem, which returns it. The test is stopped if a transmission error is detected, in which case refer to Table 14-1.

If no error occurs within several minutes then the HP2334A-to-synchronous modem communications are deemed to be operating correctly.

## 14.3.1 Terminal Loop Back Test

When the HP2334A is connected to the asynchronous devices (terminal(s)) and the HP2334A has been configured, the HP2334A-to-device communications may be checked using the terminal loop back test. This test causes a message to be sent from the HP2334A to the devices and allows data entered at a connected terminal to be echoed back to the terminal, thereby checking the HP2334A-to-device communications. The HP2334A may be connected to the synchronous network as required during the terminal loop back test.

**Preparation.** Prepare the terminal (device) loop back test as follows:

1) Remove the HP2334A front panel and set the DIP switches so that at power-on (or reset) it is set to perform a continuous terminal loop back test (see Figure 14-1); i.e. set DIP switches ABCDEFGH to 00000101.

**NOTE:** The terminal loop back test uses a pre-selected data communication configuration. Consequently, the test will only function correctly on devices set to operate as described in (2) below.

2) Switch ON all the terminals (devices) and then set them to operate as follows:

   - REMOTE (i.e. on-line).
   - Duplex - FULL.
   - Parity - parity bit always "0".
   - Baud rate - 1200 bps.
   - Automatic line feed - OFF.
   - Local echo - OFF.
   - Handshake - ENABLED. i.e.:
     - ENQ/ACK - ENABLED, or
     - X-ON/X-OFF - ENABLED as available on the terminal (device).
   - Mode - CHARACTER MODE

**Procedure.** To perform the terminal loop back test, simply press the Reset push-button (or if it is switched OFF, switch it ON). This causes:

1) The power-on test to be performed as described in Section 4.8.

2) If the power-on test is successful, the terminal loop back test is performed. i.e. LED [a] is ON (illuminated), LEDs [b] and [c] are blinking and LEDs [d] and [e] are OFF (extinguished).

   In addition (if the test is successful) LEDs 1 to 16 illuminate as data is received from the corresponding device port (i.e. LED 1 corresponds to device port A1).

**NOTE:** If the LEDs do not illuminate as described above then refer to Table 14-1.

3) The HP2334A sends the following message to all the attached terminals (devices):

   ```
   Cr Lf Lf HP 2334A LOOP-BACK TEST FEATURE ENABLED Cr Lf Lf
   ```

   Ensure that this message is displayed on ALL the terminals (devices).

4) Then at each terminal, enter any data followed by a [RETURN] (Cr character). Since the off-line loop back configuration enables the echo of terminal data, all of the characters transmitted by a terminal are echoed back to it. i.e. the HP2334A echoes each character as it is typed. When the terminal's

RETURN key is pressed (Cr character entered) the HP2334A transmits the line of data back to the terminal (i.e. the data appears twice).

**NOTE:** A maximum of 128 characters at a time are read by the test program before a Cr is generated and they are echoed back to the terminal.

**NOTE:** If the terminal does not support ENQ/ACK handshaking and the line typed contains more than 80 characters, then the HP2334A waits 10 seconds after the 80th character before continuing.

**Interpretation.** If the messages are correctly displayed on the terminal (device) then the HP2334A-to-device communications may be assumed to be correct. The HP2334A-to-synchronous network data communications may then be checked as described in 14.3.2 (Modem Loop Back Test).

If either no message or a corrupt message is displayed, then the HP2334A-to-device communications are incorrect. If this occurs:

1) Check that the correct cables have been used.

2) Check the integrity of all connections.

3) Check the terminal (device); e.g. by performing a self test.

4) Check the terminal (device) settings.

Then repeat the terminal (device) loop back test. If a fault still persists, refer to Table 14-1.

## 14.3.2 Modem Loop Back Test

Once the HP2334A has been connected to the asynchronous devices/synchronous network modem and configured, the HP2334A-to-synchronous network modem data communication may be tested.

This testing should be done using the modem loop back test, which is designed to ensure that both the local and the remote synchronous modems and the data communication link (PSN, leased line, etc.) between them are operating correctly.

**NOTE:** The modem loop back test can only be performed with modems having a loop back capability.

**Preparation.** The modem loop back test should be prepared as follows:

1) Set the DIP switches (see Section 7.2) so that at power-on (or reset) the HP2334A performs the continuous modem loop back test, i.e. set DIP switches ABCDEFGH to 00000110 respectively (see Figure 14-1).

2) Set the modem to the local mode, to enable a digital loop back (refer to the PSN authority or modem manufacturer's instructions).

**Procedure.** To perform the test simply press the Reset push-button (or if the HP2334A is switched OFF, switch it ON). This causes:

1) The power-on test to be performed as described in Section 4.8.

2) If the power-on test is successful, the modem loop back test is performed. This causes the Synchronous Network Adapter Card to continuously transmit a binary test pattern, which is echoed back to the card by the modem. The card checks that the received test pattern is the same as the transmitted pattern.

During the test, LED [a] is normally extinguished but blinks at the end of each test cycle (i.e. when the received data matches the transmitted data), LEDs [c] and [d] are ON (illuminated) and LEDs [b] and [e] are OFF. In addition, LEDs 1 to 16 remain extinguished.

**Interpretation.** If no errors are detected, the LEDs will remain illuminated as described above and the HP2334A-to-synchronous modem communication is deemed to be operating correctly. The test may then be repeated under the following conditions:

1) With communication between the local and remote modems established.

2) With the local modem set for normal operations and the remote modem set to enable an analog loop back.

If the test is successful, the HP2334A-to-host computer data communication may then be tested; refer to the host computer system software literature for details of this test.

If any errors are detected then the test is stopped, LED [a] is extinguished and LEDs [b] to [16] are continuously lit and display an error code (see Tables 14-1 and 14-2). If this occurs it indicates that the HP2334A-to-synchronous modem data communication is operating incorrectly and the following checks should be made:

1) Check the modem strapping.

2) Check the modem operation.

3) Check the HP2334A synchronous network configuration (X.25 Levels 1,2 and 3).

4) Check the cabling and connections.

Then repeat the modem loop back test. If the fault still occurs, refer to Table 14-1.

**NOTE:** If the Synchronous Network Adapter Card is NOT connected to a modem, the LEDs will indicate that the card has failed the test.

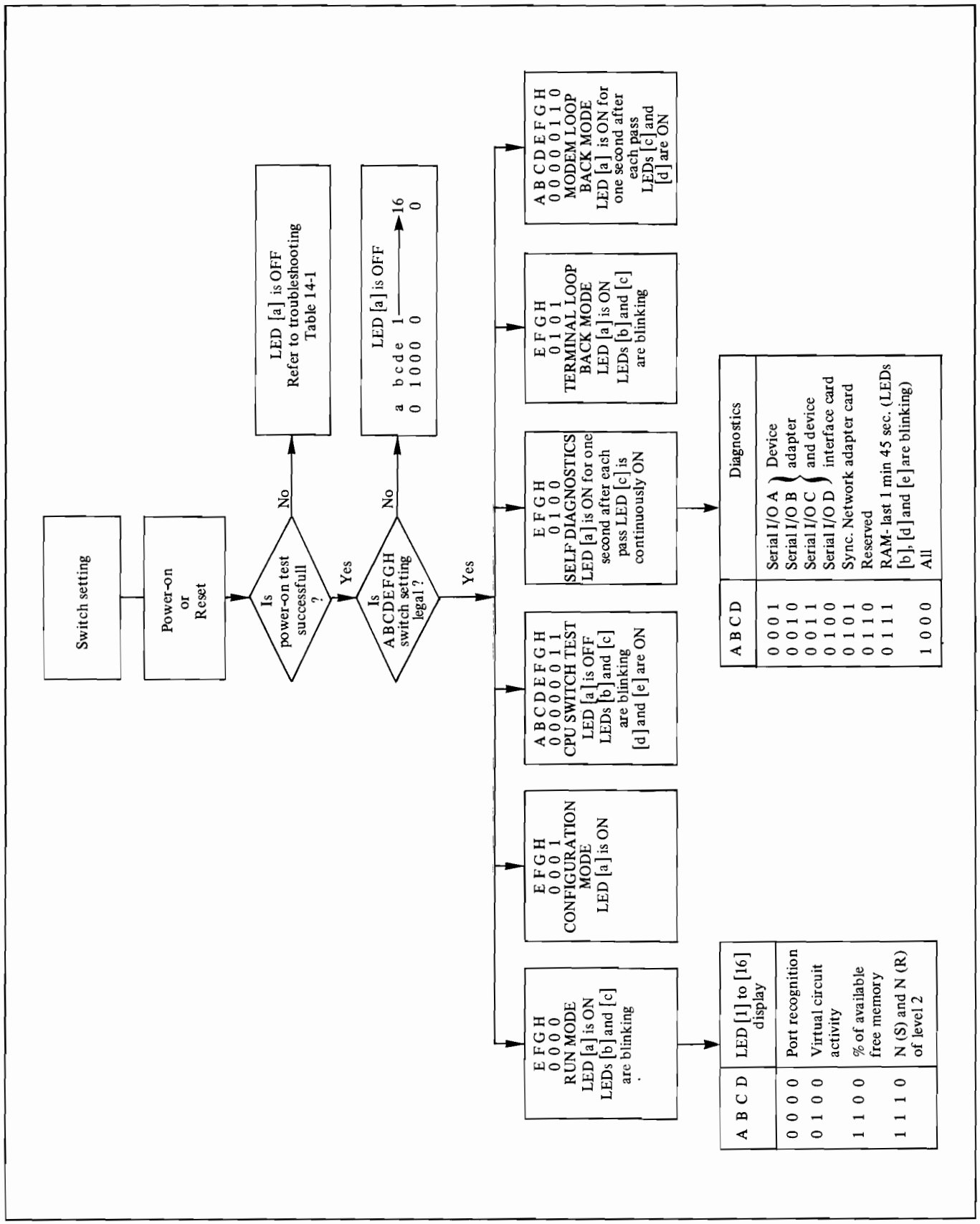



Figure 14-1 Power-On & Troubleshooting Sequence

| TESTS | TEST SEQUENCE | DESCRIPTION | LED ERROR READOUT<br>a b c d e 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | SUGGESTED ACTION<br>1 | 2 | 3 |
|---|---|---|---|---|---|---|
| Power-on test | Visual check of the LEDs (1) | All the LEDs are ON for 1 second, then OFF for 1 second, then a lit LED is propagated from [a] to [16]. | X X X X X X X X X X X X X X X X | Check power-supply | Replace CPU PCA | Replace CPU ROMs |
| | CPU ROM 0 test (2) | ROM 0 CRC checking | 0 0 0 0 1 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace CPU ROM 0 | Replace CPU PCA | |
| | CPU microprocessor test (3) | The microprocessor executes an instruction set. | 0 0 0 0 1 0 1 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace CPU PCA | Replace CPU ROMs | |
| | CPU RAM test (4) | Dynamic RAM and CMOS RAM checking | 0 0 0 0 1 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace CPU PCA | | |
| | CPU DMA test (5) | DMA check | 0 0 0 0 1 1 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace CPU DMA | Replace CPU PCA | |
| | CPU ROM test (6) | ROM CRC and compatibility checking | 0 0 0 0 1 0 0 1 0 1 1 1 0 0 0 0 0 0 0 0<br>0 0 0 0 1 0 0 1 1 1 1 1 0 0 0 0 0 0 0 0<br>0 0 0 0 1 0 1 0 0 1 1 1 0 0 0 0 0 0 0 0<br>0 0 0 0 1 0 1 0 1 1 1 1 0 0 0 0 0 0 0 0 | Replace CPU ROM 1<br>Replace CPU ROM 2<br>Replace CPU ROM 3<br>Make all ROM's compatible | Replace CPU PCA<br>Replace CPU PCA<br>Replace CPU PCA | |
| | CPU timer test (7) | Program and check Counter Timer Circuit | 0 0 0 0 1 1 1 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Check DMA is in | Replace CPU PCA | |
| | Internal bus and Device Interfaces test (8) | Device interface PCA detection | 0 0 0 1 0 1 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 | Plug a device interface | Replace CPU PCA | Replace Main Backplane PCA |
| | (9) | A write operation is performed on the device interface PCAs | 0 0 0 1 0 1 1 1 0 select code* (see note) 0 0 0 0 0 0 0 0 | Replace device interface PCA | Replace CPU PCA | Replace Main Backplane PCA |
| | (10) | A read operation is performed on the device interface PCAs | 0 0 0 1 0 1 1 1 1 select code* 0 0 0 0 0 0 0 0 | Replace device interface PCA | Replace CPU PCA | Replace Main Backplane PCA |
| | (11) | Device interface ROM 0 CRC checking | 0 0 0 1 0 0 0 0 1 select code* 0 0 0 0 0 0 0 0 | Replace ROM 0 on device interface PCA | Replace device interface PCA | |
| | (12) | Device interface microprocessor check | 0 0 0 1 0 0 1 1 0 select code* 0 0 0 0 0 0 0 0 | Replace device interface PCA | Replace device I/F ROM's | |
| | (13) | Device interface RAM test | 0 0 0 1 0 1 0 1 0 select code* 0 0 0 0 0 0 0 0 | Replace device interface PCA | | |
| | (14) | Device interface ROM CRC and compatibility checking | 0 0 0 1 0 0 0 1 0 select code* 0 0 0 0 0 0 0 0<br>0 0 0 1 0 0 1 0 1 select code* 0 0 0 0 0 0 0 0 | Replace device I/F ROM 1<br>Make device interface ROMs compatible | Replace device interface PCA | |
| | (15) | Check 600 Hz timer | 0 0 0 1 0 1 1 0 0 select code* 0 0 0 0 0 0 0 0 | Replace CPU PCA | Replace device interface PCA | |
| | (16) | Device adapter detection | 0 0 0 1 0 1 0 0 1 select code* 0 0 0 0 0 0 0 0 | Plug-in a device adapter PCA | Replace device interface PCA | |
| | Switch setting check (17) | Is the switch setting valid? | 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | Check switch setting | Run the switch test | |
| Switch test | | Switch states are displayed on LED 9 to 16 | 0 0 0 1 1 0 0 0 0 0 0 0 0 A B C D E F G H | Replace CPU PCA | | |
| Self diagnostics | Closed-loop diagnostics of the device interface PCAs | A data pattern is sent and read on each port (a test connector should be plugged on each device I/O port) | 0 0 1 0 0 1 0 1 0 select code* 8 7 6 5 4 3 2 1 (port(s)) | Replace device adapter PCA | Replace device interface PCA | |
| | Closed-loop diagnostics of Synchronous Network adapter slot A | The appropriate test connector should be plugged-in to test data, control and timing circuits | 0 0 1 0 0 1 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace Synchronous Network adapter PCA in slot A | Replace CPU PCA | Replace Network adapter backplane PCA |
| | Extended test on RAM | Data patterns are written and read from dynamic RAM on CPU PCA | 0 0 1 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | Replace CPU PCA | | |
| Terminal loopback | | The HP 2334A sends back data received from the terminals, a LED illuminates when corresponding device port is fitted with adapter PCA | 1 X X 0 0 A1 A2 A3 A4 B1 B2 B3 B4 C1 C2 C3 C4 D1 D2 D3 D4 | Check terminal connection | Check terminal operation | Check HP2334A configuration |
| Modem loopback | | A test pattern is transmitted and read on the Synchronous Network adapter | 0 0 1 1 0 1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 0 X X 1<br>0 0 1 1 0 1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 0 X 1 X<br>0 0 1 1 0 1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 0 1 X X<br>0 0 1 1 0 1 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | No level 1 configuration<br>No level 2 configuration<br>No level 3 configuration<br>Error on Sync. Net. adapter: Run diag. of Sync. Net. adapter with test connector plugged into modem cable | Configure Level I<br>Configure Level II<br>Configure Level III<br>Check Synchronous Network configuration | Check communication line and modem |

Table 14-1 Troubleshooting Test Sequence

(Continued. . .)

| TESTS | TEST SEQUENCE | DESCRIPTION | LED ERROR READOUT<br>a b c d e 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | SUGGESTED ACTION<br>1 | 2 | 3 |
|---|---|---|---|---|---|---|
| RUN mode | Synchronous Network configuration check | | 0 0 1 1 1 1 0 1 1 1 0 1 1 0 0 0 0 0 0 X X 1<br>0 0 1 1 1 1 0 1 1 1 0 1 1 0 0 0 0 0 0 X 1 X<br>0 0 1 1 1 1 0 1 1 1 0 1 1 0 0 0 0 0 0 1 X X<br>0 0 1 1 1 1 0 1 1 1 0 1 1 0 0 0 0 0 1 0 0 0 | No level I configuration<br>No level II configuration<br>No level III configuration<br>Bad configuration, too much PVC declared | | |
| RUN, CONFIGURATION and terminal loopback | Configuration | | 0 0 1 1 1 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 | Card missing in slot A for configuration | | |
| | RAM test | RAM test on each PCA | 0 0 1 1 1 0 1 1 1 select code* 0 0 0 0 0 0 0 0 | Replace PCA | | |
| | Port recognition | LEDs [1] to [16] light up when the corresponding port is fitted with an adapter PCA | 1 b b X X A1 A2 A3 A4 B1 B2 B3 B4 C1 C2 C3 C4 D1 D2 D3 D4<br>See note ** | | | |
| | Virtual circuit activity | LEDs [1] to [16] light up when the corresponding port is connected on a virtual circuit | 1 b b X X A1 A2 A3 A4 B1 B2 B3 B4 C1 C2 C3 C4 D1 D2 D3 D4<br>See note ** | | | |
| | Available free memory | The size of the empty memory is displayed on LEDs [1] to [16] | 1 b b X X (amount of memory available)<br>See note ** | | | |
| | Frame level activity | LED [1] to [8] shows N(R) and LEDs [9] to [16] shows N(S). i.e: LED [3] : N(R) = 2 | 1 b b X X X X X X X X X X X X X X X X<br>See note ** N(R) N(S) | | | |
| | Soft failure detection | | 0 1 0 0 1 X X X X X X X X X X X X X X X X | Record LED [1] to [16] display, and contact the nearest HP service office | | |

*Note:*
** The select code identifies where the error was encountered. The available settings are as follows:*

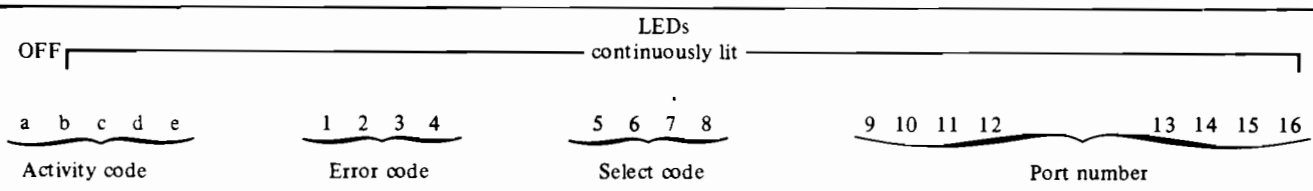
| *Description* | *LED 5 6 7 8* | *Description* | *LED 5 6 7 8* |
|---|---|---|---|
| *Device interface PCA A* | *0 0 0 1* | *Device adapter PCA A* | *1 0 0 1* |
| *Device interface PCA B* | *0 0 1 0* | *Device adapter PCA B* | *1 0 1 0* |
| *Device interface PCA C* | *0 0 1 1* | *Device adapter PCA C* | *1 0 1 1* |
| *Device interface PCA D* | *0 1 0 0* | *Device adapter PCA D* | *1 1 0 0* |
| *Undetermined device interface PCA* | *0 1 0 1* | *Undetermined device adapter PCA* | *1 1 0 1* |
| *Synchronous Network adapter PCA* | *0 1 1 0* | *CPU PCA* | *1 1 1 0* |
| *Undetermined Network adapter PCA* | *1 0 0 0* | *Undetermined* | *1 1 1 1* |

*Where: Device interface PCA = 4 Channel Serial Communications Processor PCA.*
*Device adapter PCA = 4 Channel RS-232-C Adapter Card.*

*** In RUN, MODE, LED [d] illuminates when signals DSR, CTS and DCD are received from the synchronous modem.*
*In RUN, MODE, LED [e] illuminate when level 2 is established.*

Table 14-1 Troubleshooting Test Sequence (continued)

## LED SETTING IF HP 2334A HALTED DUE TO AN ERROR




1 = ON, 0 = OFF, X = EITHER

Note: The possible errors that may occur when in the RUN or CONFIGURE mode are shown in an *italic* type face.

ACTIVITY CODE. Shows activity when error occured

| a | b | c | d | e | |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | Not applicable |
| 0 | 0 | 0 | 0 | 1 | CPU Card test |
| 0 | 0 | 0 | 1 | 0 | Internal bus test |
| 0 | 0 | 0 | 1 | 1 | Switches test |
| 0 | 0 | 1 | 0 | 0 | Diagnostic test |
| 1 | X | X | 0 | 0 | Terminal loopback test |
| 0 | 0 | 1 | 1 | 0 | Modem loopback test |
| *0* | *0* | *1* | *1* | *1* | *Error encountered in RUN or CONFIGURE mode* |
| 0 | 1 | 0 | 0 | 0 | Error due to illegal switch position |
| 0 | 1 | 0 | 0 | 1 | Soft failure |

ERROR CODE. Identifies type of error

| 1 | 2 | 3 | 4 | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | Not applicable |
| 0 | 0 | 0 | 1 | ROM 0 CRC |
| 0 | 0 | 1 | 0 | ROM 1 CRC |
| 0 | 0 | 1 | 1 | ROM 2 CRC |
| 0 | 1 | 0 | 0 | ROM 3 CRC |
| 0 | 1 | 0 | 1 | Incompatible ROM's |
| 0 | 1 | 1 | 0 | Microprocessor failure |
| *0* | *1* | *1* | *1* | *RAM failure* |
| 1 | 0 | 0 | 0 | DMA failure |
| 1 | 0 | 0 | 1 | Card missing |
| *1* | *0* | *1* | *0* | *Faulty card* |
| *1* | *0* | *1* | *1* | *Bad configuration* |
| 1 | 1 | 0 | 0 | Timer error |
| 1 | 1 | 1 | 0 | Write fail |
| 1 | 1 | 1 | 1 | Read fail |

SELECT CODE. Identifies where error was encountered.

| 5 | 6 | 7 | 8 | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | Not applicable |
| *0* | *0* | *0* | *1* | *Device interface card A* |
| *0* | *0* | *1* | *0* | *Device interface card B* |
| *0* | *0* | *1* | *1* | *Device interface card C* |
| *0* | *1* | *0* | *0* | *Device interface card D* |
| 0 | 1 | 0 | 1 | Undetermined device interface card |
| 0 | 1 | 1 | 0 | Synchronous Network adapter card |
| 1 | 0 | 0 | 0 | Undetermined Synchronous Network adapter card |
| 1 | 0 | 0 | 1 | Device adapter card A |
| 1 | 0 | 1 | 0 | Device adapter card B |
| 1 | 0 | 1 | 1 | Device adapter card C |
| 1 | 1 | 0 | 0 | Device adapter card D |
| 1 | 1 | 0 | 1 | Undetermined device adapter card |
| *1* | *1* | *1* | *0* | *CPU Card* |
| *1* | *1* | *1* | *1* | *Undetermined* |
| *0* | *1* | *1* | *1* | *Undetermined* |

PORT NUMBER. Identifies which device port had an error

LED 16 lit = Port 1
LED 15 lit = Port 2
LED 14 lit = Port 3
LED 13 lit = Port 4

Table 14-2 DIP Switch Setting And LED Interpretation

## ) AN ERROR

0 11 12 13 14 15 16

Port number

ı an *italic* type face.

Identifies where error was encountered.

Not applicable
*Device interface card A*
*Device interface card B*
*Device interface card C*
*Device interface card D*
Undetermined device interface card
Synchronous Network adapter card
Undetermined Synchronous Network adapter card
Device adapter card A
Device adapter card B
Device adapter card C
Device adapter card D
Undetermined device adapter card
*CPU Card*
*Undetermined*
*Undetermined*

t. Identifies which device port had an error

rt 1
rt 2
rt 3
rt 4

## DIP SWITCH SETTINGS

| SWITCHES 0 = Down 1 = UP X = 0 or 1<br>A B C D E F G H | MODE |
|---|---|
| X X X X 0 0 0 0 | RUN. Where switches ABC select information displayed on LEDs [1] to [16]. i.e: |
| 0 0 0 0 0 0 0 0 | Port recognition (ports A/B/C/D 1 to 4) |
| 0 1 0 0 0 0 0 0 | PVC + SVC circuits engaged (ports A/B/C/D 1 to 4) |
| 1 1 0 0 0 0 0 0 | % of available free memory |
| 1 1 1 0 0 0 0 0 | Frame level activity |
| X X X X 0 0 0 1 | CONFIGURE. Where switches ABC select information displayed on LEDs [1] to [16]. i.e: |
| 0 0 0 0 0 0 0 1 | Port recognition (ports A/B/C/D 1 to 4) |
| 1 1 0 0 0 0 0 1 | % of available free memory |
| Other combinations | Not used |
| X X X X X X X X | SELF TESTS.<br>Power-on test. Tests CPU Card internal bus and device interface cards each time the HP2334A is switched ON. |
| 0 0 0 0 0 0 1 1 | Switches test. Tests CPU Card switches |
| X X X X 0 1 0 0 | Diagnostic. Where switches ABCD select internal diagnostic routine. i.e: |
| 0 0 0 1 0 1 0 0 | Diagnostic of slot A (Device adapter/ interface card) Requires test plug |
| 0 0 1 0 0 1 0 0 | Diagnostic of slot B (Device adapter/ interface card) Requires test plug |
| 0 0 1 1 0 1 0 0 | Diagnostic of slot C (Device adapter/ interface card) Requires test plug |
| 0 1 0 0 0 1 0 0 | Diagnostic of slot D (Device adapter/ interface card) Requires test plug |
| 0 1 0 1 0 1 0 0 | Synchronous Network adapter card |
| 0 1 1 1 0 1 0 0 | Extended RAM test (memory) lasts 1 min. 45 sec. |
| 1 0 0 0 0 1 0 0 | All diagnostics routines (for plugged in PCAs) |
| X X X X 0 1 0 1 | Terminal loopback test. |
| 0 0 0 0 0 1 0 1 | Port recognition (ports A/B/C/D 1 to 4) |
| 1 1 0 0 0 1 0 1 | % of available free memory |
| 0 0 0 0 0 1 1 0 | Modem loopback test. |
| Other combinations | Not used |

*Note:
Switches EFGH only sensed at power-on or after reset. Switches ABCD sensed all time, except during diagnostic test when only checked at power-on or after reset.

## LED INTERPRETATION

| LEDs 1 = ON, 0 = OFF, b = blinking<br>a b c d e 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | MODE |
|---|---|
| a = ON | RUN. Where LED [a] is continuously lit, LEDs [b] and [c] blink alternatively, LED [d] illuminates when signal CF (Received Line Signal Detector) is received from synchronous modem LED [e] illuminates when communication has been establish with the Synchronous Network, and LEDs [1] to [16] display information specified by switches ABC. |
| 1 b b CF level 2 ← Port recognition → | |
| 1 b b CF level 2 ← PVC + SVC circuits engaged → | |
| 1 b b CF level 2 ← % of available free memory → | |
| 1 b b CF level 2 ← N (R) → ← N (S) → | |
| a = ON<br>1 b b 0 0 ← Port recognition or free memory → | CONFIGURE. Where LED [a] is continuously lit, LEDs [b] and [c] blink alternatively and LEDs [1] to [16] display information specified by switches ABC. |
| Blinking When ON a = OFF<br>0 0 0 0 1 ← Extinguished → | TEST CODE. Shows which diagnostic test is being performed.<br>CPU Card Test, Internal Bus/Device Interface Test } Self test performed at power-on or when reset push-button pressed |
| 0 0 0 1 0 ← Extinguished → | |
| 0 b b 1 1 ← Extinguished → ← Image of switches A to H → | Switches Test |
| Blinking Continuously lit | |
| X 0 1 0 0 ← Extinguished →<br>LED [a] illuminates for one second at the end of each test cycle and LED [c] is continuously lit.<br>In addition for the extended RAM test, LED [b], [d] and [e] blink continuously. | Internal diagnostic test. |
| 1 b b 0 0 ← Port recognition or free memory →<br>LED [a] is continuously lit. | Terminal loopback test. |
| X 0 1 1 0 ← Extinguished →<br>LED [a] illuminates for one second at the end of each test cycle. LEDs [c] and [d] are continuously lit. | Modem loopback test. If there is no Synchronous Network RS-232-C adapter fitted, this test is not perform performed and LED [a] is continuously lit. |
| Other combinations | See LED setting when HP2334A halted due to error. |

Note:
1) LED [a] is ON when the HP2334A is in the RUN mode, CONFIGURE mode or terminal loopback test.
It is OFF when power not on, or a test being performed, or the HP2334A is halted due to an error. It blinks once at the end of the diagnostic test cycle.
2) For port recognition, the LED illuminates when the corresponding port is ready.

# REMOVAL & REPLACEMENT PROCEDURES

CHAPTER 15

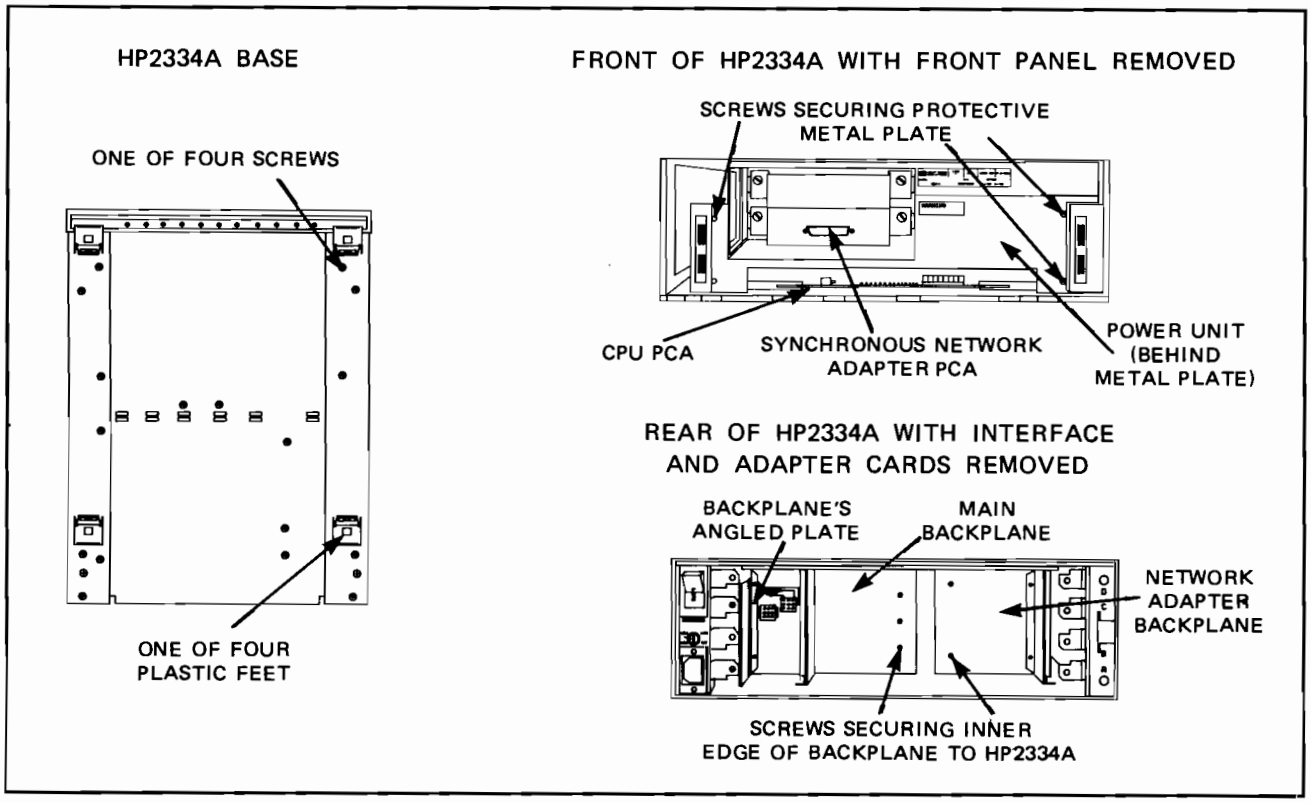



**Figure 15-1 The HP2334A Cabinet Assembly**

**WARNING**

THE HP2334A MUST BE DISMANTLED BY QUALIFIED PERSONNEL ONLY.

ENSURE THAT THE HP2334A IS DISCONNECTED FROM THE LINE (MAINS) POWER SUPPLY (BY REMOVING THE POWER CORD) BEFORE STARTING THE DISMANTLING PROCEDURE.

**CAUTION**

THE HP2334A CABINET, PCAs AND BACKPLANES MUST BE HANDLED WITH CARE AND SHOULD NOT BE KNOCKED OR ALLOWED TO BE CONTAMINATED BY DIRT OR LIQUIDS.

## 15.1 INTRODUCTION

The HP2334A's cabinet assembly comprises the following:

- Printed Circuit Assemblies (PCAs).
- A fan.
- Two backplane printed circuit boards as follows:
    - One Main Backplane used to connect the Power Supply PCA, the Device Interface (4 Channel Processor) PCAs and the CPU PCA.
    - One Network Adapter Backplane used to connect the CPU PCA and the Synchronous Network Adapter PCA.

This chapter provides information on how to dismantle the HP2334A by detailing the removal and replacement of the unit's PCAs, fan and backplanes. The part numbers for replacement parts, modules and assemblies are given in Chapter 16.

## 15.2 DISMANTLING THE HP2334A

**CAUTION**

USE ANTI-STATIC HANDLING PROCEDURES WHEN REMOVING OR INSTALLING ANY HP2334A PCA (CARD).

**NOTE:** The relative positions of the PCAs, the fan and the backplanes are shown in Figure 9-3. The PCAs are depicted in Figure 13-1.

Before dismantling the HP2334A, the rear panel LINE switch must be set to **OFF** and then the power cord and front panel must be removed. The PCAs (i.e. the Device Adapter PCAs and Device Interface PCAs, the Synchronous Network Adapter PCA, the CPU PCA and the Power Supply PCA) and the rear blanking panels may then be removed. The removal procedure is described in Section 15-3.

The HP2334A's protective cover should then be removed as described in Section 15-4, before dismantling the fan and the backplanes as described in Sections 15-5 and 15-6 respectively.

## 15.3 REMOVING/REPLACING THE PCAs

**CAUTION**

USE ANTI-STATIC HANDLING PROCEDURES WHEN REMOVING OR INSTALLING ANY HP2334A PCA (PLUG-IN CARD).

NOTE: Before removing the first Device Adapter PCA, it is recommended that a written record is made of the PCA and the device cable connector positions. This is required because each device sub-address corresponds to a specific HP2334A device port (see Section 4.10).

**Removal.** Remove the PCAs in the following order:

1) Device Adapter PCAs. Remove the device cable(s). Then release the locking screws on either side of the PCA and withdraw the PCA from the rear of the HP2334A.

2) Device Interface PCAs. With the Device Adapter PCA removed, open the Device Interface PCA's extractors and withdraw the PCA from the rear of the HP2334A.

3) Synchronous Network Adapter PCA. Remove the HP2334A's front panel. This panel is held in position by two magnets and may be removed by pulling the handle inset at the top of the panel. Remove the Synchronous Network Adapter PCA-to-modem cable from the PCA connector (port). Then release the locking screws on either side of the PCA and withdraw it from the front of th HP2334A.

4) CPU PCA. Remove the protective metal plate covering the CPU PCA and the Power Supply PCA. This plate is held in position by four cross-head screws (each 1 cm/0.4 in long) and it must be removed by sliding it out of the front of the HP2334A. Then open the CPU PCA's extractors and slide the PCA out of the front of HP2334A.

**NOTE**

THE HP2334A CONFIGURATION IS LOST WHEN THE CPU PCA IS REMOVED (REFER TO CHAPTER 6 FOR THE CONFIGURATION PROCEDURE).

5) Power Supply PCA. With the protective metal plate removed (see CPU PCA) withdraw the Power Supply PCA from the front of the HP2334A (the two holes in the front of the printed circuit board form a handle).

**Replacement.** The PCA replacement is a reversal of the removal procedure.

## 15.4 REMOVING/REPLACING THE ROMs AND DMA

**CAUTION**

USE ANTI-STATIC HANDLING PROCEDURES WHEN REMOVING OR INSTALLING ANY HP2334A PCA COMPONENT.

The HP2334A CPU Card and Device Interface Card(s) (minus the removable ROM and DMA components) are exchange modules which can be replaced or repaired under the HP "Board Exchange Program"; for further information refer to Section 16.2.

The exchange modules are as follows:

- CPU Card without the four firmware ROMs and the DMA chip - part number 02333-60021.
- Device Interface (4 Channel Processor) Card without the two firmware ROMs - part number 5061-3833.

If one of these cards is isolated as being defective during the main troubleshooting procedure (see Chapter 14) then the defective module can be exchanged for a replacement module from the HP Computer Support Division.

The components which should be removed, using a suitable extractor (e.g. HP extractor part number 8710-0585), from each card are as follows:

CPU Card:

```
CPU ROM 0 - part number 02334-80300
CPU ROM 1 - part number 02334-80312
CPU ROM 2 - part number 02334-80320
CPU ROM 3 - part number 02334-80330

CPU DMA   - part number  1820-2299
```

Device Interface Card:

```
SER ROM 0 - part number  5180-2058
SER ROM 1 - part number  5180-2059
```

The ROM and DMA positions on the CPU Card are shown in Figure 16-1 and the ROM positions on the Device Interface Card are shown in Figure 16-2. The part number is printed on each component. The components should be correctly stored in an anti-static envelope until they are refitted on the replacement board.

NOTE: When replacing a DMA or ROM integrated circuit chip ensure that the rounded slot cut-out at one end of the chip is at the same end as the rounded slot cut-out in the chip socket mounted on the printed circuit board (card).

## 15.5 REMOVING/REPLACING THE COVER

**Removal.** To gain access to the fan and the backplanes the HP2334A's gray protective cover must be removed. The removal procedure is as follows:

1) Remove all of the PCAs as described in Section 15.3.

2) Stand the HP2334A front face down on a clean, dry, solid bench so that its base is vertical (see Figure 15-1).

3) Remove the four plastic feet from the base of the HP2334A. Each foot may be removed by gently lifting the rear of the foot marked "TAB" and, at the same time, sliding the foot in the direction indicated by the embossed arrow.

4) On the base of the HP2334A, remove the four cross-head screws securing the gray protective cover to the steel card cage.

5) Holding the cover at both sides, slide it off over the rear of the HP2334A. The front edge of the cover mates with a recess in the HP2334A's front assembly and it may be necessary to separate them before sliding the cover off.

The fan and the backplanes may then be removed as described in Sections 15.5 and 15.6 respectively.

**Replacement.** With the HP2334A standing front face down, the protective cover should be replaced as follows:

1) Position the cover so that the end with the rounded edges faces the rear of the HP2334A, and the open side faces the HP2334A's base.

2) Carefully slide the cover over the HP2334A. In order to align the screw holes correctly it is necessary to mate the front edge of the cover with the recess in the HP2334A's front assembly.

3) Replace and tighten the four cross-head screws. Then replace the four plastic feet. Each foot is replaced by placing its three securing "legs" into the three holes on the HP2334A's base at each foot location and then lifting the "TAB" and sliding the foot in the opposite direction to the embossed arrow.

## 15.6 REMOVING/REPLACING THE FAN

**WARNING**

DO NOT CONNECT THE HP2334A TO AN ELECTRIC POWER SUPPLY WHEN THE COVER IS REMOVED.

The fan is mounted at the right hand side of the HP2334A (front view). It cools the PCAs by blowing air at room temperature across them.

**Removal.** The fan may be removed as follows:

1) Remove the PCAs and protective cover as described in Sections 15.3 and 15.4.

2) Disconnect the fan's power cable from the rectangular socket mounted at the top of the Main Backplane. This should be done by squeezing the plastic tabs on either side of the fan cable's male connector while gently pulling the connector.

3) Unscrew and remove the three cross-head screws securing the fan to the HP2334A card cage. Ensure that the screws and washers are kept safely for re-assembly. This should be done using a cross-head posidrive screwdriver with a maximum diameter of 4 mm (e.g. HP screwdriver part number 8710-0978). Then lift the fan clear of the HP2334A.

**Replacement.** Replace the fan as follows:

1) Position the fan so that its power cable is at the top right hand corner and the airflow direction is into the HP2334A. The direction of airflow and fan rotation direction are indicated by two arrows embossed on the fan housing next to the cable. The arrow indicating the airflow direction should point towards the center of the HP2334A and other arrow (direction of rotation) should point towards the front of the HP2334A.

2) Replace the three cross-head screws securing the fan to the HP2334A card cage.

3) Replace the fan's power cable male connector in the rectangular socket at the top of the Main Backplane. The shape of the connector's pins ensures that it can only be mated with the socket when correctly aligned.

Replace the HP2334A's protective cover and the PCAs as required (see 15.4 and 15.3 respectively).

## 15.7 REMOVING/REPLACING THE BACKPLANES

The HP2334A is equipped with two backplanes; the Main Backplane which is mounted vertically behind the Power Supply PCA and the Network Adapter Backplane which is mounted behind the Synchronous Network Adapter PCA. Both backplanes are removed in the same way except that the fan must be removed in order to remove the Main Backplane.

**Removal.** The backplanes may be removed as follows:

1) Remove the PCAs and the HP2334A cover as described in Sections 15.3 and 15.4.

2) For the Main Backplane:
Remove the fan as described in Section 15.5, then detach the square male voltage selection connector from the square socket on the Main Backplane. This should be done by squeezing the plastic tabs on either side of the male connector while gently pulling it.

3) For both backplanes:
Unscrew and remove the cross-head screws securing the inner edge of the backplane to the HP2334A card cage (see Figure 15-1). There are three screws on the inner edge of the Main Backplane and two on the inner edge of the Network Adapter Backplane.

4) The outside edge of each backplane is held in position by an angled metal plate (see Figure 15-1). For the Main Backplane, the angled metal plate is secured to the HP2334A card cage by two of the screws used to secure the fan. Thus once the fan is removed, the main backplane is then free to be removed. For the Network Adapter Backplane, the angled metal plate is secured in position by two cross-head screws. The two screws must be removed before the backplane is free to be removed.

5) Carefully slide the backplane out of the side of the HP2334A card cage. Remove the angled metal plate from the side of the backplane as required.

**Replacement.** The backplane(s) should be replaced as follows:

1) Fit the angled metal plate on the side of the backplane. Ensure that it is correctly orientated on the backplane, so that the backplane can be correctly fitted into the HP2334A card cage.

2) Hold the backplane vertical (so that its part number is the correct way up) with the signal connectors on the backplane facing the front of the HP2334A. Then carefully slide the backplane into HP2334A card cage. The Main Backplane has connectors on both sides and it should be fitted so that the side with two signal connectors faces the front of the HP2334A.

3) Replace the screws securing the inner edge of the backplane to the HP2334A. Then on the Network Adapter Backplane, replace the screws securing the angled metal plate to the side of the HP2334A card cage. Note that for the Main Backplane, the fan's screws secure the angled metal plate to the HP2334A card cage.

4) On the Main Backplane, replace the square male voltage connector in the correct square voltage selection socket; the lower left-hand socket is for a 230V supply and the upper right-hand socket is for a 115V supply (see Figure 12-1). The shape of the connector's pins ensures that it can only be mated when correctly aligned with the socket.

Replace the fan, protective cover and PCAs as required.

# REPLACEMENT PARTS & MODULES

CHAPTER 16

## 16.1 ORDERING PARTS

To order parts (components, modules, options and accessories) for the HP2334A Multimux, address the order to your local Hewlett Packard office (HP Sales and Service offices are listed at the end of this manual). The following information should be included with the order:

- The Multimux model number (including options and accessories) and full serial number as shown on the product identification label (see Section 4. 3).
- The HP part number of the replaceable parts required as provided in the parts lists (see Figures 16-3 to 16-8) or tables.
- A complete part description, as provided in the parts lists or tables.

| COMPONENT | PART NUMBER |
|---|---|
| Synchronous Network Adapter Card | 02333-60005 |
| Direct Connect Adapter Card | 40250-60001 |
| Modem Control Adapter Card | 40261-60001 |
| Power Supply PCA | 0950-1717 |
| Fuse 250 V / 3 A | 2110-0029 |
| Fuse 250 V / 1.5 A | 2110-0059 |
| Fan | 02333-60051 |
| Rear Blanking Panel | 02333-00006 |
| Front Blanking Panel (covers unused slot) | 02333-00028 |
| Mounting Foot (one) | 5040-7201 |
| Test Connector (asynchronous device ports) | 02620-60062 |
| Test Connector (synchronous network adpt.) | 02333-60006 |
| Configuration Record Card | 02334-90010 |
| DIP Switch/LED Display Label | 02334-80002 |

**Table 16-1 Replaceable Components**

## 16.2 EXCHANGE MODULES

Exchange modules are replacement modules, minus some removable components. Table 16-2 lists the available exchange modules and the components that must be removed before a module is sent to Hewlett-Packard's Customer Service Division (CSD). Refer to Section 15.4 for the component removal and replacement procedure and Figures 16-1 and 16-2 for the component locations.

These exchange modules are available from CSD under the "Board Exchange Program". The Hewlett-Packard Customer Service Engineer can exchange a defective module for a replacement module at the prevailing exchange rate. Contact your local HP Sales and Service Office for details.

| PART NUMBER | | DESCRIPTION |
|---|---|---|
| EXCHANGE | NEW | |
| 02333-69021 | 02333-60021 | CPU PCA, less components: ROM 0, ROM 1, ROM 2 and ROM 3 and the DMA. |
| 5061-3835 | 5061-3833 | Device Interface (4 Channel Processor) PCA less components: ROM 0 and ROM 1. |

Table 16-2 Exchange Modules

## 16.3 PROGRAM ROMs & DMA

| COMPONENT | PART NUMBER |
|---|---|
| CPU PCA: ROM 0 | 02334-80300 |
| ROM 1 | 02334-80312 |
| ROM 2 | 02334-80320 |
| ROM 3 | 02334-80330 |
| DMA | 1820-2299 |
| LOCATION: Refer to Figure 16-1. | |

Table 16-3 CPU PCA Program ROMs and DMA

| COMPONENT | PART NUMBER |
|---|---|
| DEVICE INTERFACE CARD: | |
| ROM 0 | 5180-2058 |
| ROM 1 | 5180-2059 |
| LOCATION: Refer to Figure 16-2. | |

Table 16-4 Device Interface (4 Channel Processor) PCA ROMs

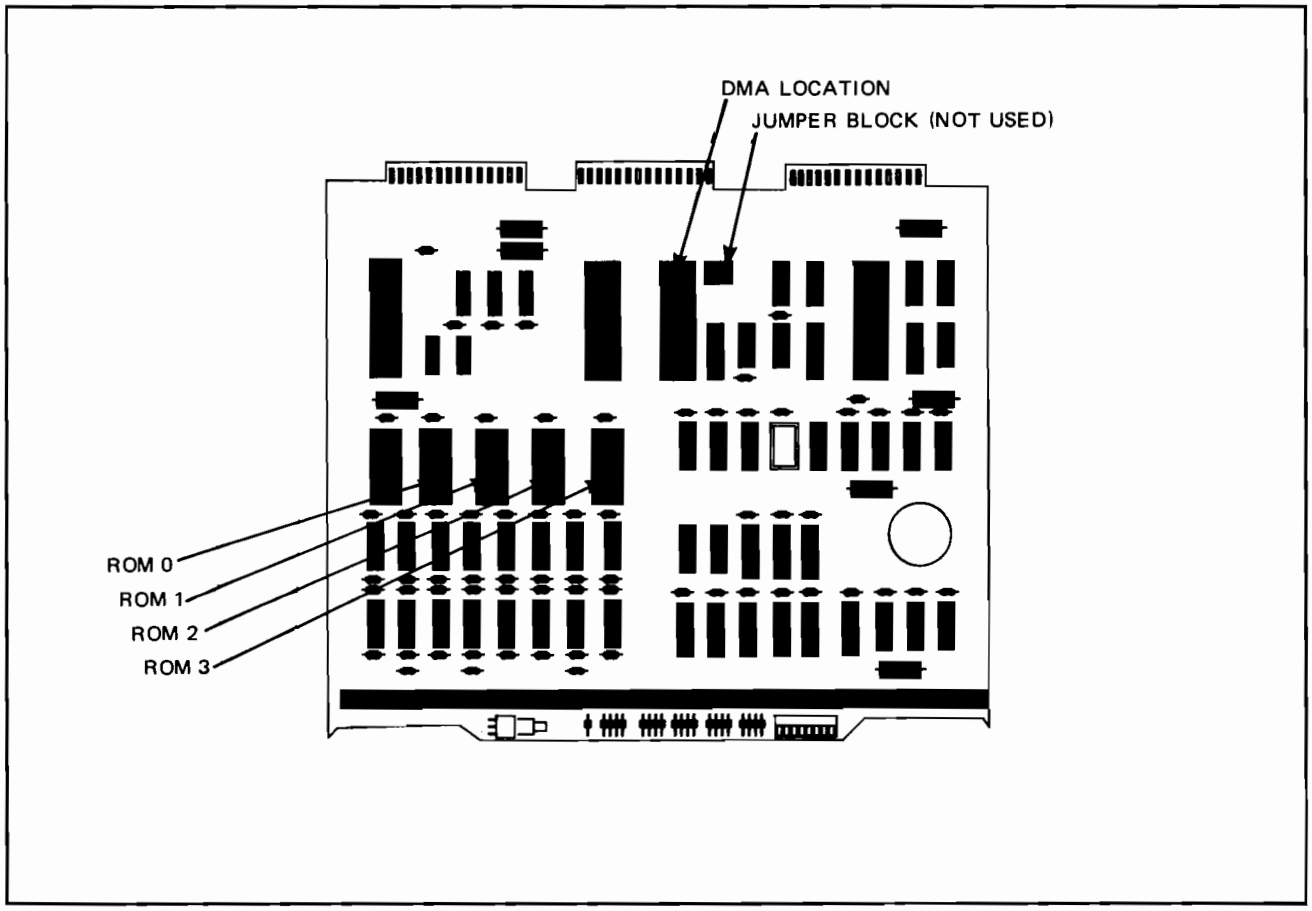



Figure 16-1 CPU PCA

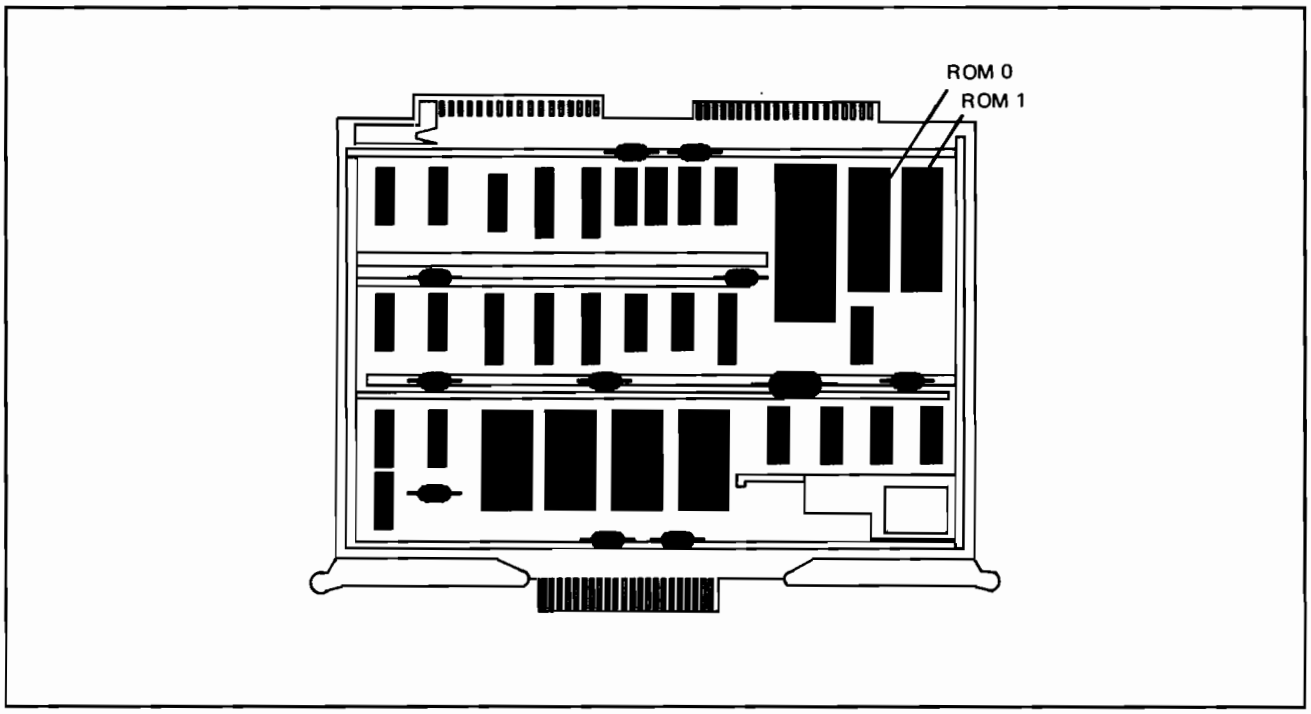
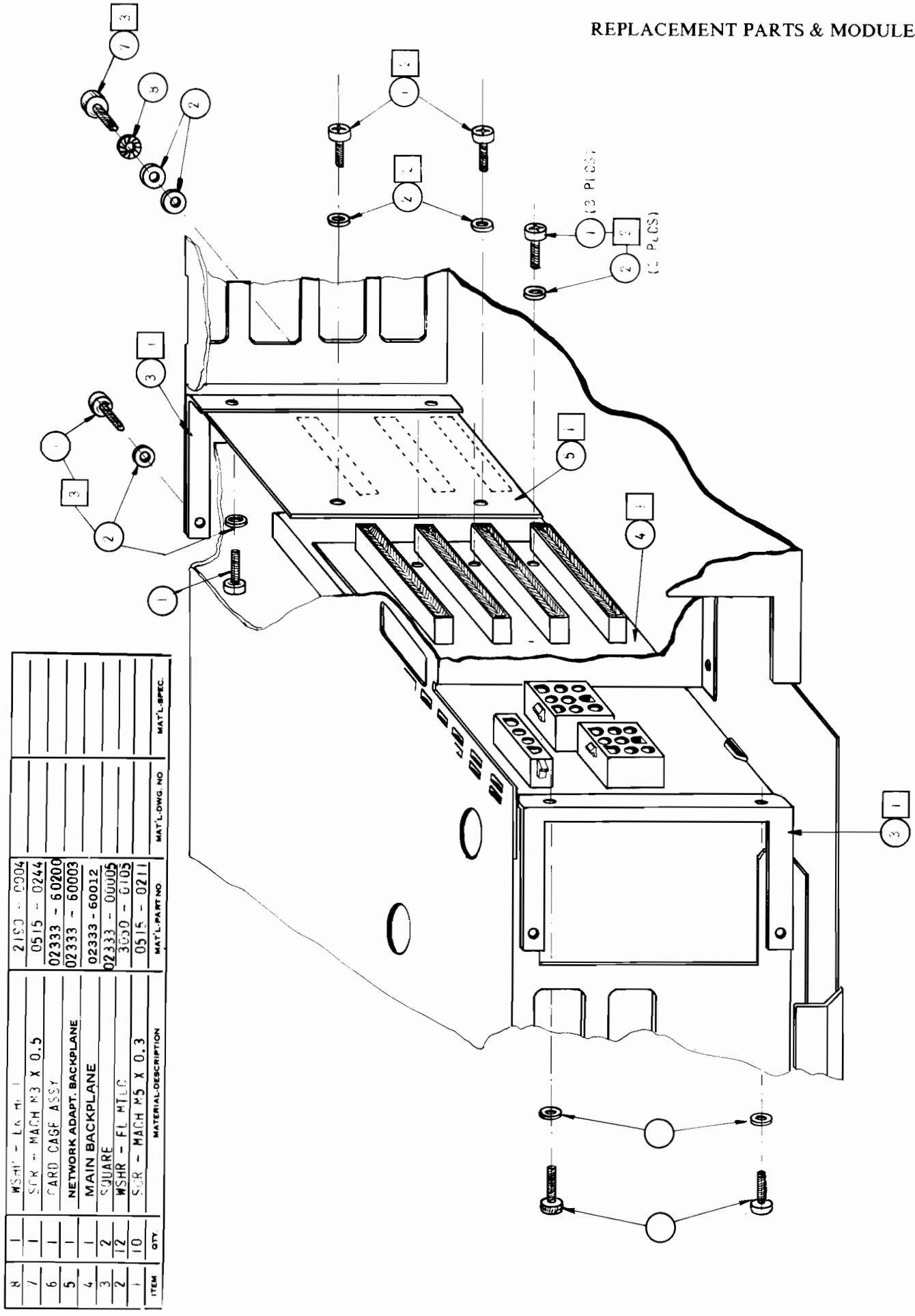
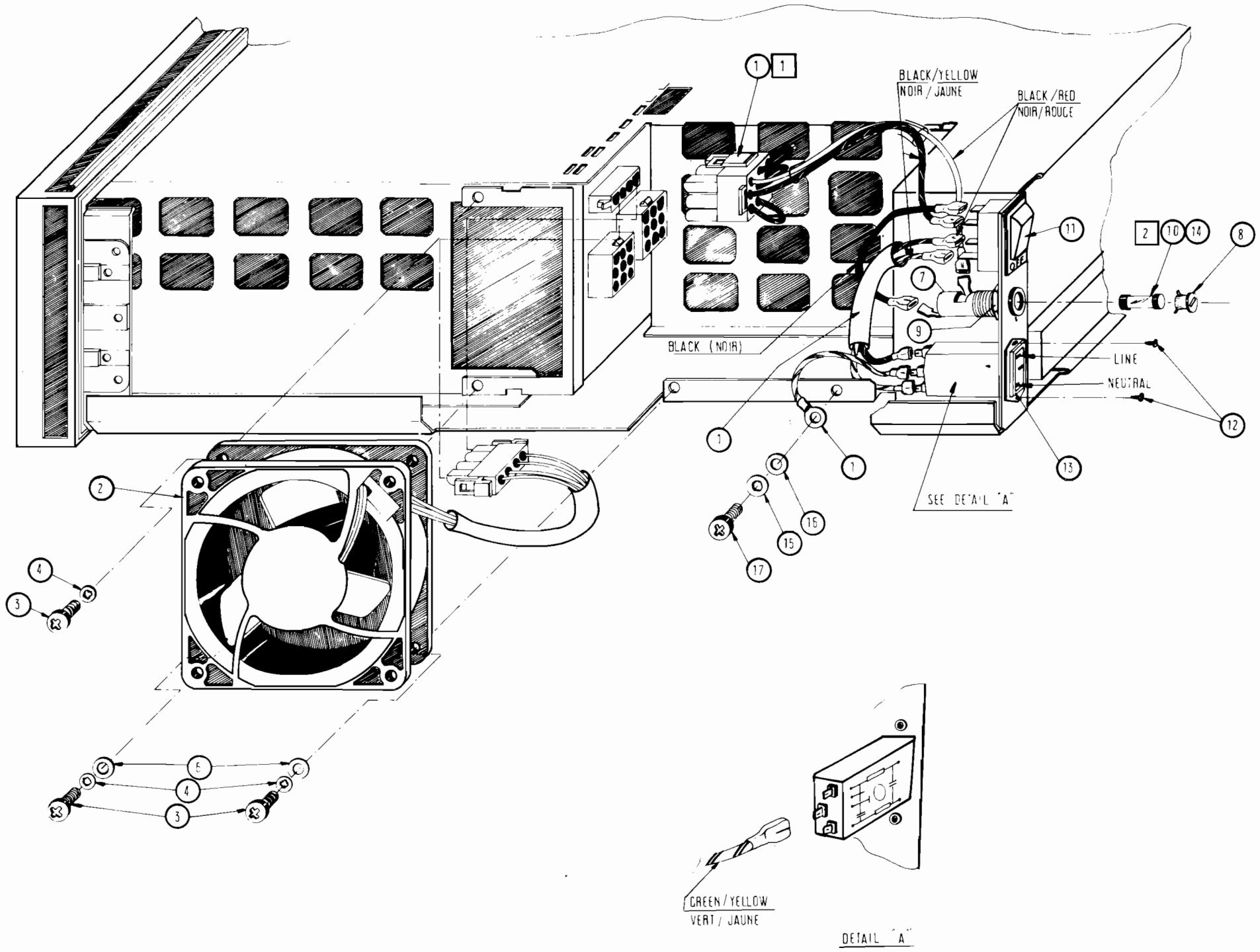



Figure 16-2 Device Interface (4 Channel Processor) PCA




| ITEM | QTY | MATERIAL-DESCRIPTION | MAT'L-PART NO | MAT'L-DWG. NO | MAT'L-SPEC. |
|---|---|---|---|---|---|
| 8 | 1 | WSHR - LK INT | 2150 - 0004 | | |
| 7 | 1 | SCR - MACH M3 X 0.5 | 0515 - 0244 | | |
| 6 | 1 | CARD CAGE ASSY | 02333 - 60200 | | |
| 5 | 1 | NETWORK ADAPT. BACKPLANE | 02333 - 60003 | | |
| 4 | 1 | MAIN BACKPLANE | 02333 - 60012 | | |
| 3 | 2 | SQUARE | 02333 - 00005 | | |
| 2 | 12 | WSHR - FL MTLC | 3030 - 0105 | | |
| 1 | 10 | SCR - MACH M5 X 0.3 | 0515 - 0211 | | |

Figure 16-3 Backplane Assemblies




NOTES.

[1] INSTALL (1) IN POSITION 115 FOR STD
220 FOR OPT. 015

[2] USE FUSE (10) FOR STD
(14) FOR OPT. 015

CAUTION: VERIFY THAT ALL TERM LUGS ARE WELL INSERTED.

| ITEM | QTY. | MATERIAL-DESCRIPTION | MAT'L-PART NO. | MAT'L-DWG NO. | MAT'L-SPEC. |
|---|---|---|---|---|---|
| 17 | 1 | SCR-MACH M4x0.7 | 0515-0210 | | |
| 16 | 1 | WSHR-FL-MTLC | 3050-0226 | | |
| 15 | 1 | WSHR-LK-INTL-T | 2190-0009 | | |
| 14 | 1 | FUSE 1.5A 250V | 2110-0059 | | |
| 13 | 1 | CONN-AC POWER | PPNA19714 | | |
| 12 | 2 | SCR-MACH M3x0.5 | 0515-0145 | | |
| 11 | 1 | SW-RKR DPST | 3101-0452 | | |
| 10 | 1 | FUSE 3A 250V | 2110-0029 | | |
| 9 | 1 | NUT FUSEHOLDER | 2110-0569 | | |
| 8 | 1 | FUSEHOLDER CAP | 2110-0565 | | |
| 7 | 1 | FUHLR-EXTR POST | 2110-0622 | | |
| 6 | 3 | WSHR-FL MTLC | 3050-0105 | | |
| 5 | 4 | SCR-MACH M3x0.5 | 0515-0211 | | |
| 4 | 5 | WSHR-LK INTL T | 2190-0004 | | |
| 3 | 3 | SCR-MACH M3x0.5 | 0515-0054 | | |
| 2 | 1 | FAN ASSY | 02333-60051 | | |
| 1 | 1 | FILTER ASSY | 02333-60050 | | |

Figure 16-4 Power Assembly

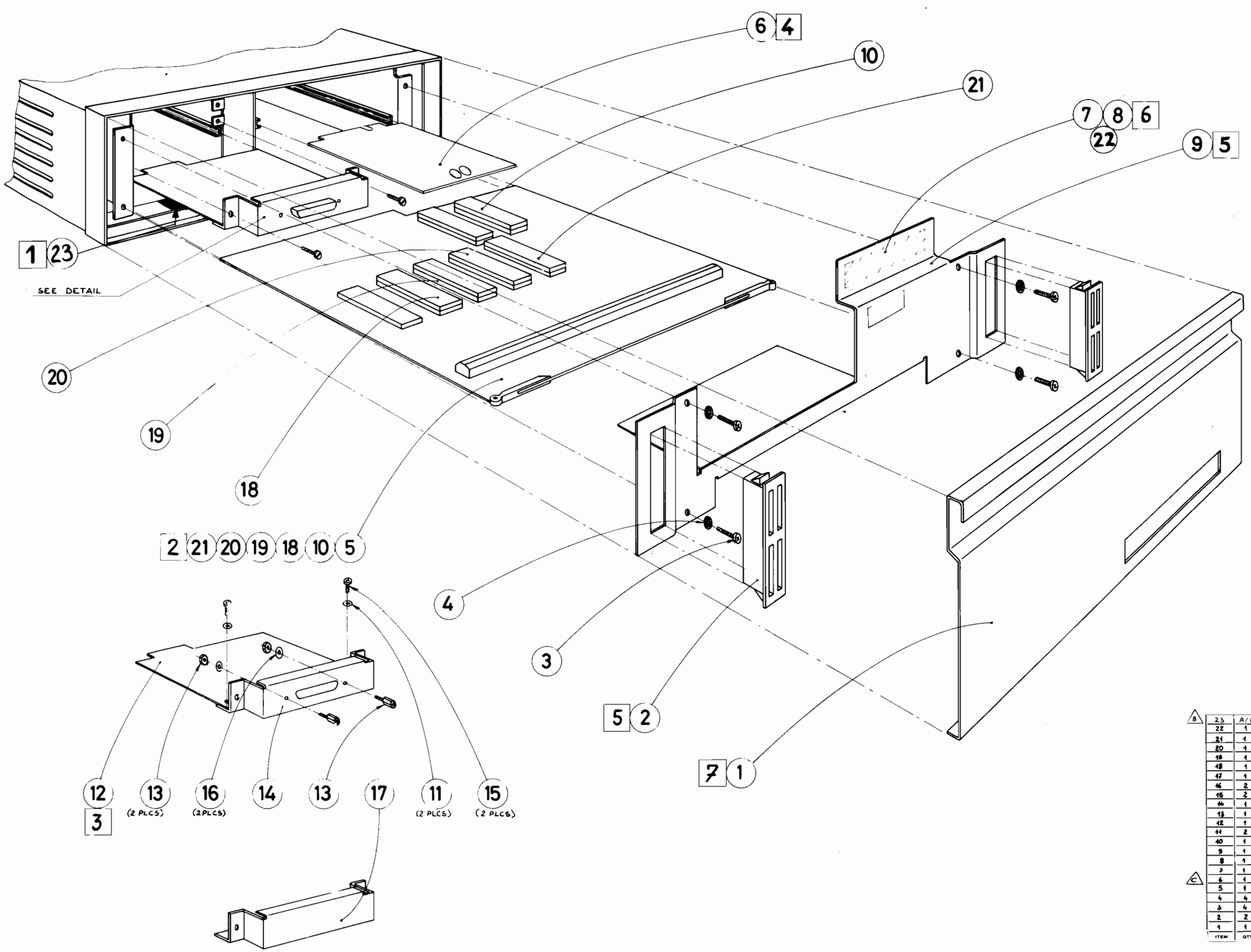



Figure 16-5 Front Panel And Cards Assembly

## NOTES

(8) [1] STICK THE INSULATOR 0460-1258 ON THE FRONT FRAME OF 02333-60200

[2] ON (5) PLUG ROMS (18)(19)(20)(21), DMA (10) AND INSTALL THE BOARD.

[3] INSTALL ITEM (12) MOUNTED WITH (14) IN THE LOWER SLOT OF CARD CAGE. ABOVE INSTALL ITEM (17)

[4] INSTALL POWER SUPPLY (6)

[5] INSERT ITEMS (2) ON (5) THEN FIX (9)

[6] FOR STD STICK SERIAL NUMBER LABEL (7)
FOR OPT. 045 USE LABEL (8) STICK (22)

[7] INSTALL FRONT PANEL (1)

| | ITEM | QTY | MATERIAL-DESCRIPTION | MAT'L PART NO | MAT'L DWG NO | MAT'L SPEC |
|---|---|---|---|---|---|---|
| (8) | 23 | A/R | TAPE - INDL | 0460-1258 | | |
| | 22 | 1 | LABEL | 7126-2527 | | |
| | 21 | 1 | ROM | 02334-80330 | | |
| | 20 | 1 | ROM | 02334-80320 | | |
| | 19 | 1 | ROM | 02334-80310 | | |
| | 18 | 1 | ROM | 02334-80300 | | |
| | 17 | 1 | PANEL FRONT MS | 02333-00028 | | |
| | 16 | 2 | W&NR - LK HLCL | 2190-0061 | | |
| | 15 | 2 | SCR - MATCH M3 x 0.5 | 0515-0411 | | |
| | 14 | 1 | PANEL FRONT RS 232 | 02333-00026 | | |
| | 13 | 1 | LOCK | 1251-1198 | | |
| | 12 | 1 | HI-S RS 232 C ADPT | 02333-60005 | | |
| | 11 | 2 | W&NR - FL MTLC | 3050-0106 | | |
| | 10 | 1 | Z 80 - DMA | 1820-2299 | | |
| | 9 | 1 | PANEL FRONT INTL | 02333-00022 | | |
| | 8 | 1 | LABEL | 9320-4998 | | |
| | 7 | 1 | LABEL | 9320-4997 | | |
| (E) | 6 | 1 | POWER SUPPLY | 0950-1717 | | |
| | 5 | 1 | CPU | 02333-60011 | | |
| | 4 | 4 | W&NR - LK INTL T | 2190-0004 | | |
| | 3 | 4 | SCR - MATCH M3 x 0.5 | 0515-0105 | | |
| | 2 | 2 | CATCH - MAGNETIC | 1390-0582 | | |
| | 1 | 1 | PANEL FRONT | 02334-00001 | | |

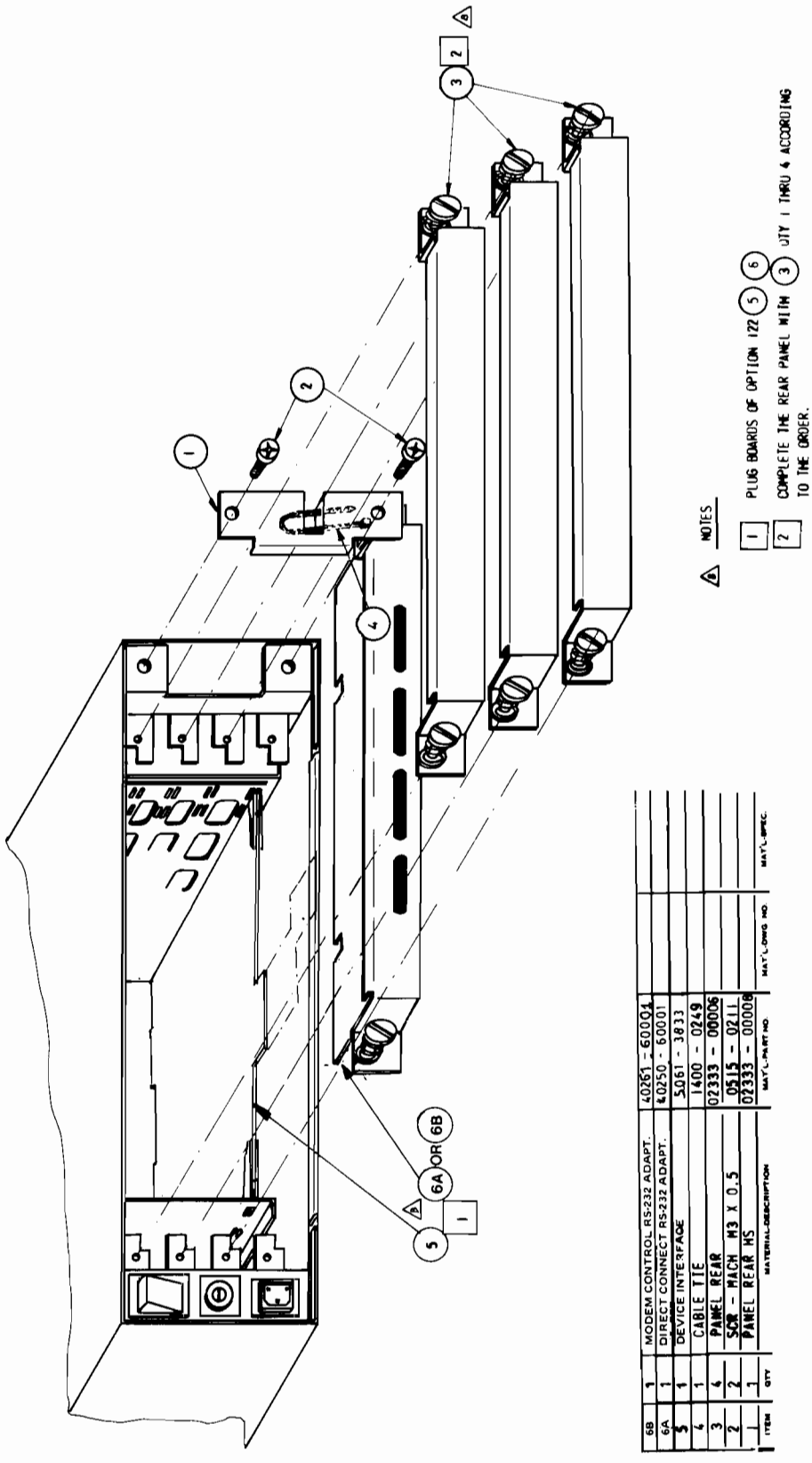
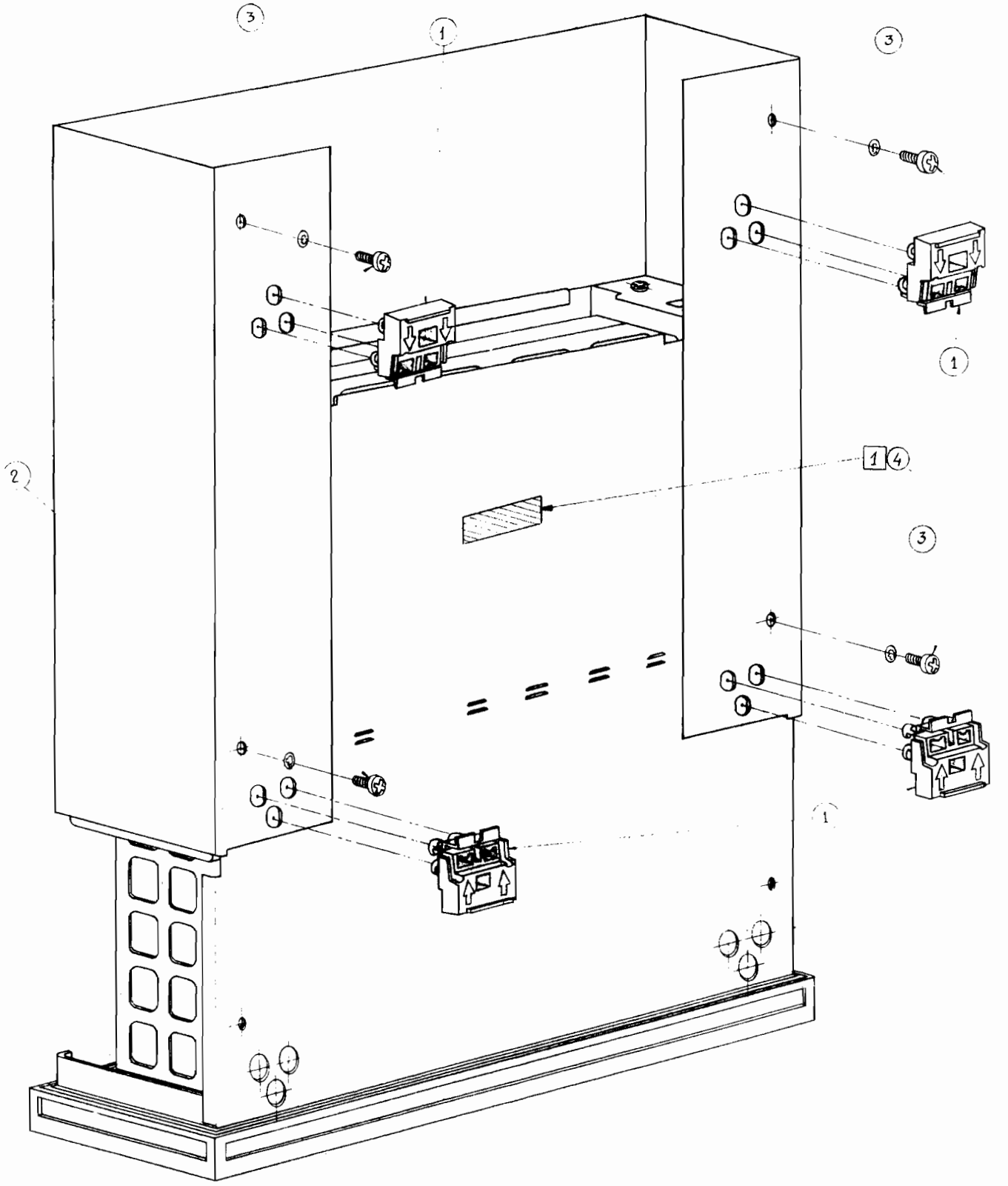
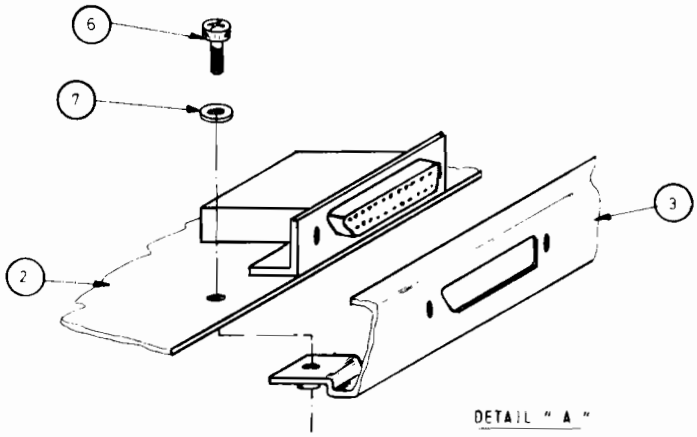


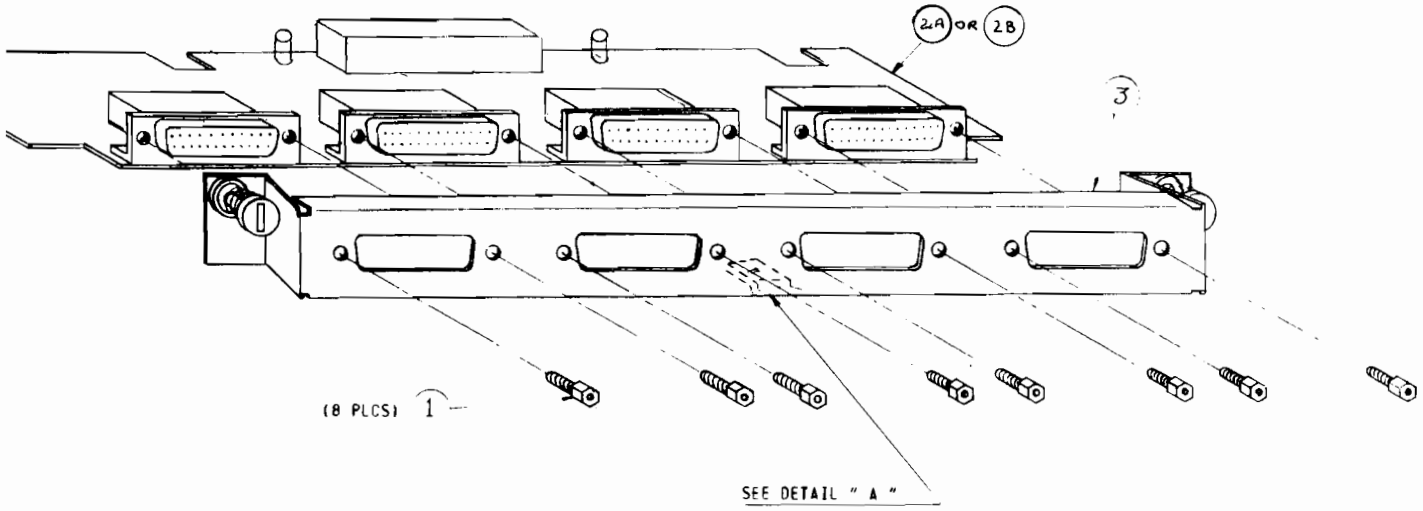

Figure 16-6 Rear Panels




| ITEM | QTY. | MATERIAL DESCRIPTION | |
|---|---|---|---|
| 4 | 1 | LABEL - INFO | 7121-2527 |
| 3 | 4 | WSHR-LK INTL T | 2190-0004 |
| 2 | 4 | SCR-MACH M | 0515-0211 |
| 1 | 4 | FOOT | 5040-7201 |

Figure 16-7 Cover Assembly




| ITEM | QTY | MATERIAL DESCRIPTION | MATL P/N | |
|---|---|---|---|---|
| 7 | 1 | WSHR - LK - HLCL | 2190 - 0004 | |
| 6 | 1 | SCR - MACH M3 X 0.5 | 0515 - 0211 | |
| | | | | |
| | | | | |
| 3 | 1 | PANEL REAR RS-232 | 40250-00016 | |
| 2A | 1 | DIRECT CONNECT RS-232 ADAPT. | 40250-60001 | |
| 2B | 1 | MODEM CONTROL RS-232 ADAPT. | 40261-60001 | |
| 1 | | LOCK | 1251 - 1198 | |

Figure 16-8 Direct Connect Adapter/Modem Control Adapter Assembly

# CONFIGURATION RECORD



APPENDIX A

**CONFIGURATION RECORD**

X.25 LEVEL 1
LINE SPEED

X.25 LEVEL 2
NTK TYPE
WINDOW SIZE
TIMER T1

X.25 LEVEL 3
LCL ADDRESS

| | | | |
|---|---|---|---|
| THRPUT IN | | THRPUT OUT | |
| WIND SZ IN | | WINDOW SZ OUT | |
| FST PVC | | LST PVC | |
| FST SVC IN | | LST SVC IN | |
| FST SVC 2W | | LST SVC 2W | |
| FST SVC OUT | | LST SVC OUT | |
| FST POOL PORT | | LST POOL PORT | |
| D-BIT | | | |

FAC SUPPORTED

ASS. PVC

**MSG**
PAD MSG HEADER
WELCOME MESSAGE

**LUG**
REMOTE ADDRESSES

**SRA**
SRA
REMOTE ASS ADDR

ASG

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D | | | | |
| C | | | | |
| B | | | | |
| A | | | | |

ADL

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D | | | | |
| C | | | | |
| B | | | | |
| A | | | | |

## USER DEFINED PROFILES

| | | NUMBER | BASE | MODIFIED PARAMETER NUMBER: VALUE X.3 | LOCAL |
|---|---|---|---|---|---|
| PAD PROFILES: | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| CAS/PAD PROFILES: | PAD PROF ASS. TO CAS: | | | | |
| | CAS PROF: | | | | |
| | PAD PROF ASS. TO CAS: | | | | |
| | CAS PROF: | | | | |
| | PAD PROF ASS. TO CAS: | | | | |
| | CAS PROF: | | | | |
| | PAD PROF ASS. TO CAS: | | | | |
| | CAS PROF: | | | | |
| | PAD PROF ASS. TO CAS: | | | | |
| | CAS PROF: | | | | |
| EXAMPLE: | PAD PROF ASS. TO CAS: | 144 | 141 | 2:1, 3:2, 4:0, 15:1, | 0:13, 4:30, 8:13, 14:1 |
| | CAS PROF: | 74 | 71 | | 0:13, 24:144 |

# HP2334A/CCITT X.25 COMPARISON

APPENDIX

B

The implementation of X.25 (Level 3) in the HP2334A closely follows the 1980 CCITT X.25 Recommendation. The Recommendation is contained in a document, known as the "yellow book". The document's full title is:

INTERNATIONAL TELECOMMUNICATION UNION
CCITT
VOLUME VIII - FASCICLE VIII.2
DATA COMMUNICATION NETWORKS, SERVICES AND FACILITIES,
TERMINAL EQUIPMENT AND INTERFACES
RECOMMENDATIONS X.1-X.29
Printed in Switzerland - ISBN 92-61-01161-6

This appendix lists the sections of the X.25 Recommendation where the HP2334A does not comply, and also the reason why. Only the sections in the yellow book describing X.25 (Level 3) are considered.

**Preliminary Notes**

- The term "we" in this appendix refers to the HP2334A, as described in this manual.
- We do not support DATAGRAMS.
- We may act as DCE (when connected to a private non-PSN network) and as DTE (when connected to a PSN or a private non-PSN network).

NOTE

SECTION and PARAGRAPH numbers indicated are those of the 1980 CCITT X.25 Recommendations. Paragraphs not listed here are implemented without any change.

**SECTION 3 Description of the Packet Level DTE/DCE Interface.**

NOTE: We require the data fields of packets to contain an integral number of octets.

**3.2 Basic structure of packets.** The HP2334A supports all packet types indicated in Table 5/X.25 except DCE/DTE DATAGRAM, DATAGRAM SERVICE SIGNAL and DTE REJ.

**3.4.1 Diagnostic packet.** Incoming diagnostic packets are ignored. The HP2334A does not send diagnostic packets.

**SECTION 4 Procedures for Virtual Circuit Services.**

**4.1.2 Call Request Packet.** The called and calling addresses are always inserted in the current network format.

**4.1.3 Incoming Call Packet.** Called and calling addresses are always inserted.

**4.1.6 Call Collision.** We follow the Recommendation when a Call Request and an Incoming Call are transmitted simultaneously on the SAME virtual circuit.

**4.1.11 Call Progress Signals.** We do not issue any Call Progress Signals.

**4.3.2 User Data Field Length of Data Packets.** We only support the maximum length 128. We support negotiation of maximum length on a per call basis, but we always respond with 128.

NOTE: The user data field MUST contain an integral number of octets.

**4.3.3 Delivery Confirmation Bit.** We accept Call Request/Incoming Call packets with the D-bit either set or not set. We have an option to indicate if we must issue Call Request/ Incoming Call packets with the D-bit set or not set.

**4.3.4 More Data Mark.**

a) Packets issued:

- We only set the M-bit to 1 in full data packets.
- We always set the M-bit to 0 in the last data packet (of a sequence).

b) Packets received:

- The M-bit must NOT be set in the last packet of a sequence.

NOTE: When acting as DCE, we do not have to do any packet recombination.

**4.3.6 Qualifier bit.** We support the qualifier bit, with the following restrictions:

a) In data packets received:

- At the most, 128 bytes of data.
- The M-bit must be set to 0 (i.e. one packet sequence only)

b) In data packets issued:

- At the most, 128 bytes of data.
- The M-bit will always be set to 0 (i.e. one packet sequence only).

**4.4.1.1 Numbering of Data Packets.** Modulo 8 sequence numbering is supported. Extended packet numbering (Modulo 128) is not yet supported.

**4.4.1.2 Window Description.** The standard window size is 2. We support other values between 1 and 7. A value other than the default may be selected for each Permanent Virtual Circuit (PVC). We support negotiation with default value as first value.

**4.4.1.3 Flow Control Principles.** A P(S) sequence error is regarded as a local procedure error which causes a resetting (with diagnostic = 1).

NOTE: The HP2334A does not send RNR packets.

**4.4.1.4 Delivery Confirmation.** Whatever the setting of the D-bit, we always send an immediate RR package for each data packet received.

**4.4.1.6 Receive Not Ready (RNR) Packets.** The HP2334A never sends RNR packets.

**SECTION 5 Procedures for Datagram Service.**

The HP2334A does not support Datagram service.

**SECTION 6 Packet Formats.**

**6.1.11 General Format Identifier.** The HP2334A does not support Modulo 128 Packet Numbering. Bits 6 and 5 of octet 1 must always be set to "01".

**6.2.1 Call Request and Incoming Call Packets.**

a) Issued by the HP2334A:

- Called and calling address are always inserted.
- The facility length field is always inserted (even if zero).
- The facility field is present if facilities are used.
- The HP2334A inserts 4 bytes containing 01H, 00H, 00H, 00H, then a maximum of 12 bytes (user dependant), as Call User Data field.

b) Received by the HP2334A:

- We display on the user's terminal a message with Calling Address, CUG and Reverse Charging, if received, and the Call User Data bytes (bytes 5 to 16 of data field).
- We ignore bytes 1 to 4 and the bytes after byte 16, but we accept the call even if the Call User Data field is too long.

**6.2.2 Call Accepted and Call Connected Packets.**

In Call Accepted/Call Connected packets issued by HP2334A:

- Calling and Called addresses are NOT inserted.
- The facility length is always inserted.

**6.2.3 Clear Request and Clear Indication Packets.**

a) Issued by the HP2334A:

- We always insert a diagnostic field (cf Annex 5).
- We always set the cause field to 0.

b) When received by the HP2334A:

- We always accept these packets even if they are too long or short.
- We list the cause and diagnostic received but do not process them.
- If omitted, the diagnostic is listed as 0.
- If omitted, the cause is listed as 0 (and we do not consider the packet as too short).

**6.2.4 DTE and DCE Clear Confirmation Packets.**

a) Issued by the HP2334A:

- Only three bytes; no user data inserted.

b) Received by the HP2334A:

- User data, if any, is ignored (i.e. the packet is accepted even if too long).

**6.4 Datagram and Datagram Service Signal Packets.** Not supported.

**6.5.2 DTE and DCE Receive Not Ready (RNR) Packets.** We do not issue RNR packets, but we accept them.

**6.5.3 Reset Request and Reset Indication Packets.**

a) Issued by the HP2334A:

- We always insert a cause and a diagnostic.
- We always set the cause to 0.

b) Received by the HP2334A:

- We accept them even if they are too long or too short.
- We list the cause and diagnostic received, but we do not process them.
- If omitted, the diagnostic is listed as 0.
- If omitted, the cause is listed as 0 (and we do not consider the packet as too short).

**6.5.4 DTE and DCE Reset Confirmation Packets.** We accept them even if they are too long (but we only process the first three bytes).

**6.6.1 Restart Request and Restart Indication Packets.**

a) Issued by the HP2334A:

- We always insert a cause and a diagnostic.
- We always set the cause to zero.

b) Received by the HP2334A:

- We always accept them even if they are too long or too short.
- We list the cause and diagnostic received, but we do not process them.
- If omitted, the diagnostic is listed as 0.
- If omitted, the cause is listed as 0 (and the packet is not considered as too short).

**6.6.2 DTE and DCE Restart Confirmation Packets.** We always accept them even if they are too short or too long.

**6.7 Diagnostic Packets.** We do NOT issue Diagnostic packets. We accept them, but they will be ignored.

**6.8 Packets Required for Optional User Facilities.**

**6.8.1 DTE Reject (REJ) Packet.** We do not issue Reject packet. If we receive one, we shall reset the Virtual Circuit (VC).

**6.8.2 Fast Select Facility.** We do not support the fast select facility. However, we accept the following packets even if they are too long: call accepted; incoming call; call request; call accepted.

**SECTION 7 Procedures and Formats for Optional User Facilities.**

**7.1.1 Extended Packet Sequence Numbering.** We do not support this facility.

**7.1.2 Nonstandard Default Window Sizes.** We support this facility.

**7.1.3 Default Throughput Classes.** We support this facility; different values may be selected for each direction of transmission.

**7.1.4 Packet Retransmission.** We do not support this facility.

**7.1.5 Incoming Calls Barred.** When we are connected to a public network, we have nothing special to do to support this facility. In a private network, the same effect can be obtained by using only one way logical channels outgoing.

**7.1.6 Outgoing Calls Barred.** Same as 7.1.5 (except use one-way logical channel incoming).

**7.1.7 One-way Logical Channel Outgoing.** We support this facility.

**7.1.8 One-way Logical Channel Incoming.** We support this facility.

**7.1.9 Closed User Group.** We support this facility. If a CUG number is coded in a received Call Request/Incoming Call packet, we simply display it for user information.

**7.1.10 Closed User Group with Outgoing Access.** We support this facility as a special case of 7.1.9.

**7.1.11 Closed User Group with Incoming Access.** We always support this, since we ignore CUG numbers in received Call Request/Incoming Call packets. (We just print it for user information).

**7.1.14 Bilateral Closed User Group.** We do not support this facility. (We shall ignore it in received Call Request/Incoming Call)

**7.1.15 Bilateral Closed User Group with Outgoing Access.** We do not support this facility.

**7.1.16 Reverse Charging Request.** Supported.

**7.1.17 Reverse Charging Acceptance.** Supported.

**7.1.18 RPOA Selection.** We do not support this facility. (We shall ignore it in received Call Request/Incoming Call)

**7.2.1 Non-standard Default Packet Sizes.** Supported.

**7.2.2 Flow Control Parameter Negotiation.** Supported (Note: we support different window and packet sizes for each direction of transmission.)

**7.2.3 Throughput Class Negotiation.** We support this facility. Note that we always accept the values indicated either in Call Request/Incoming Call or in Call Accepted/Call Connected packets.

**7.2.4 Fast Select.** Not supported. We simply ignore the Call User Data received.

**7.2.5 Fast Select Acceptance.** Not supported.

**7.2.6 D-Bit Modification.** Not applicable. We set the D-bit as requested by the configuration. We accept any value of the D-bit (where legal).

**7.3 Procedures only available with Datagram Service.** Not supported.

**7.4 Formats for Optional User Facility.**

**7.4.2.5.1 Coding for Packet Sizes.** We support value 7.

**7.4.2.5.2 Coding for Window Sizes.** We support values from 1 to 7. Values 8 to 127 are not supported.

**7.4.2.6 Coding of Throughput Class Negotiation Facility.** We support the indicated coding for values from 75 to 19200.

**7.4.2.7 Coding of Fast Select Facility.** Not supported

**7.4.2.8 Coding of Datagram Non-Delivery Indication.** Not supported

**7.4.2.9 Coding of Datagram Delivery Confirmation.** Not supported

**ANNEX A Range of Logical Channels.**

We support all logical channel numbers from 0 to 4095.

We support gaps between logical channel numbers assigned to the various groups of channels (i.e., PVCs, one-way incoming SVCs, etc...). However there must be no gaps in the range of numbers assigned to one particular group.

(Note 6) When acting as DTE, our search algorithm tries to select first a one-way outgoing channel (starting with the highest numbered one); if none is in the ready state, we then try to select a two-way channel (starting with the highest numbered one).

**ANNEX C Actions Taken on Receipt of Packets.**

Notes on Table C-3/X.25:

We do not detect all the error conditions listed in Note 4.

**ANNEX D Packet Level DCE Time-Outs and DTE Time-Limits.**

Whether acting as DCE or DTE, the HP2334A follows the recommendations defined in Table D-2/X.25 (DTE Time-Limits) and not by Table D-1/X.25 (DCE Time-Outs).

We do not implement retry counters. When we reach a time-out limit we retransmit the same packet.

**ANNEX E Diagnostic Codes.**

We do not use all the codes listed in this Annex. However, when we use a particular code it corresponds to the CCITT explanation.

# PSN INTERNATIONAL NUMBERING PLAN

APPENDIX C

The international numbering of the CCITT X.121 Recommendation permits the identification of a called country as well as a specific public network in the country. The number of digits used to describe this is the same for all countries. The national data number assigned to each DTE is unique within a particular network and is also unique on a worldwide basis.

The 10 digit numeric character set 0 to 9 is used.

A Data Network Identification Code ( DNIC ) is assigned to each network. It is composed of 4 digits: a Data Country Code ( DCC ) and a network digit to identify a specific data network or service in the country. The first digit of the DNIC (DCC) is limited to 2-7.

A DTE when called from another country must be the addressed by its international data number composed of DNIC or DCC plus the Network Terminal Number ( NTN ) or National Number ( NN ).

Thus the International Data Number IDN = DNIC + NTN or DCC + NN; where NTN is the number used to call a DTE within the network and NN is the number used to call a DTE within the country.

An International Data Number has a maximum size of 14 digits.

With a DNIC of 4 digits or a DCC of 3 digits the NTN is 10 digits maximum and the NN is 11 digits maximum.

In the case of international outgoing calls an additional prefix digit is required to signal the international access.

**Sub-Addressing.**

The HP2334A will provide the port corresponding sub-address (2 digits) in a call request packet when this facility is supported by the network.

The HP2334A will process the sub-address (2 digits) when this is provided (and supported by the network).

- **UNITED STATES:** DCC= 310 or 311

**TELENET:** DNIC= 3110

```
          NTN = aaayyyyy  8 digits: 3 for the area code.
                                    5 for the local address.

   Incoming call: 12 digit IDN for called address field
                  (Network type = TEL)
   Sub-address:   2 digits possible after IDN.

      e.g. 311040800333xx

   International outgoing call with: IDN
      e.g. 208038020333 for a call on Transpac.

   National outgoing call with:      IDN
      e.g. 3106054333 for a call on Tymnet.

   Internal outgoing call with:      IDN
      e.g. 311030300333 for a call within Telenet.
```

**TYMNET:** DNIC= 3106

```
          NTN = sxxxxx    6 digits: 1 for service (must be 0).
                                    5 for the host address.

   Incoming call: 10 digits IDN for called address field.
                  (Network type = NET,10)
   Sub-address: 0 to 4 digits after the IDN (2 accepted on the HP2334A).

      e.g. 3106054333xx

   International outgoing call with: IDN
      e.g. 208038020333 for a call on Transpac.

   National outgoing call with: IDN
      e.g. 311030300333 for a call on Telenet.

   Internal outgoing call with: IDN
      e.g. 3106054333 for a call within Tymnet.
```

- **FRANCE:**

**TRANSPAC:** DNIC= 2080

```
NTN = aayyyyyy  8 digits: 2 for the area code.
                          6 for local address.

Incoming call: no digits for called address field.
               (Network type = NET,0)
Sub-address: 2 digits possible in called address field.
i.e. "xx" (Transpac does not send the called address to called DTE).

International outgoing call with: Prefix= 0 + IDN
   e.g. 0311030300333 for a call on Telenet.

Internal outgoing call with:      Prefix= 1 + NTN
   e.g. 138020333 for a call within Transpac.
```

- **GERMANY:** DCC= 262

**DATEX-P:** DCC = 262

```
NN  = ssaaaayyyyy  11 digits: 2 for service code
                                (45 for standard X.25).
                              4 for the area code.
                              5 for local address.

Incoming call: 11 digits of NN for called address.
               (Network type = DTX)
Sub-address:   1 to 4 digits integrated in NN as follows:

   4yyyy or 9yyyy = no sub-address
   3yyyp or 8yyyp = 1 digit sub-address (10 max)
   2yypp or 7yypp = 2 digit sub-address (100 max)
   1yppp or 6yppp = 3 digit sub-address (1000 max)
   0xxxx or 5xxxx = reserved
```

**In an incoming call:** With 1 digit of sub-address the HP2334A acts as if there is no sub-address (first port free). With 3 digits of sub-address the HP2334A only considers the 2 last digits as the 2 digits sub-address.

**In an outgoing call:** The HP2334A provides the sub-address of the calling port with the format of either "p" for a 2 digit sub-address and "0pp" for a 3 digit sub-address, according to the local address defined during off-line configuration. It will provide the local address with no modification when there is no sub-address or a 1 digit sub-address.

```
International outgoing call with: Prefix= 1 + IDN
   e.g. 1208038020333 for a call in France on Transpac.

Internal outgoing call with:      no prefix + NN
   e.g. 45611000333 for a call within Datex-P.
```

**NOTE:** For all lines that were subscribed without sub-address before January 1985 and all new lines subscribed since this date use NET,XX (where XX = 9) for the local address without the sub-address. In both cases 2 digits (generally 00) must be added to the Level 3 configuration to define the sub-address base.

- **UNITED KINGDOM:** DCC= 234

  **PSS:** DNIC= 2342

  NTN = aaanyyyy 8 digits: 3 for area code
  1 for node in area
  4 for local address

  Incoming call: 12 digits of IDN for called address field
  (Network type = NET,12).
  Sub-address: 2 digits possible after IDN
  e.g. 234273700333xx
  International outgoing call with: IDN
  e.g. 208038020333

  Internal outgoing call with: IDN
  e.g. 234273417333

- **BELGIUM:** DCC= 206

  **DCS:** DCC= 206

  NN = saaayyy 7 digits: 1 for service
  3 for the area code
  3 for local address

  Incoming call: 7 digits of NN for called address field
  (Network type = NET,7)
  Sub-address: 2 digits possible after NN
  e.g. 2220333xx

  International outgoing call with: Prefix = 0 + IDN
  e.g. 0208038020333 for a call on Transpac.

  Internal outgoing call with: NN
  e.g. 2220333 for a call within DCS.

- **HOLLAND:** DCC= 204

  **DN1:** DCC = 204

  NN =saaayyy 7 digits: 1 for service identification
  (1 is X.25)
  3 for the area code
  3 for local address

  Incoming call: 7 digits of NN for called address field
  (Network type = NET,7)
  Sub-address: 2 digits possible after NN
  e.g. 1325333xx

  International outgoing call with: Prefix= 0 + IDN
  e.g. 0208038020333

  Internal outgoing call with: NN
  e.g. 1432333

- **SWITZERLAND:** DCC= 228

  **TELEPAC:** DCC= 228

  NN = saanyyyy 8 digits: 1 for service ( X.25 is 4 )
  2 for area code
  1 for node in area
  4 for local address

  Incoming call: 8 digits of NN for called address field
  (Network type = NET,8)
  Sub-address: 3 digits possible after NN (2 accepted on HP2334)
  e.g. 46811333xxx

  International outgoing call with: Prefix= 0 + IDN
  e.g. 0311030300333

  Internal outgoing call with: NN
  e.g. 47911333

# ASCII CHARACTER SET

APPENDIX

D


| | | | | | b7 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | b6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| | | | | | b5 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| b4 | b3 | b2 | b1 | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 | 0 | 0 | 0 | 0 | | NUL | (TC7) DLE | SP | 0 | @ | P | ` | p |
| 0 | 0 | 0 | 1 | 1 | | (TC1) SOH | DC1 | ! | 1 | A | Q | a | q |
| 0 | 0 | 1 | 0 | 2 | | (TC2) STX | DC2 | " | 2 | B | R | b | r |
| 0 | 0 | 1 | 1 | 3 | | (TC3) ETX | DC3 | # | 3 | C | S | c | s |
| 0 | 1 | 0 | 0 | 4 | | (TC4) EOT | DC4 | $ | 4 | D | T | d | t |
| 0 | 1 | 0 | 1 | 5 | | (TC5) ENQ | (TC8) NAK | % | 5 | E | U | e | u |
| 0 | 1 | 1 | 0 | 6 | | (TC6) ACK | (TC9) SYN | & | 6 | F | V | f | v |
| 0 | 1 | 1 | 1 | 7 | | BEL | (TC10) ETB | ' | 7 | G | W | g | w |
| 1 | 0 | 0 | 0 | 8 | | (FE0) BS | CAN | ( | 8 | H | X | h | x |
| 1 | 0 | 0 | 1 | 9 | | (FE1) HT | EM | ) | 9 | I | Y | i | y |
| 1 | 0 | 1 | 0 | 10 | | (FE2) LF | SUB | * | : | J | Z | j | z |
| 1 | 0 | 1 | 1 | 11 | | (FE3) VT | ESC | + | ; | K | [ | k | { |
| 1 | 1 | 0 | 0 | 12 | | (FE4) FF | FS | , | < | L | \ | l | \| |
| 1 | 1 | 0 | 1 | 13 | | (FE5) CR | GS | - | = | M | ] | m | } |
| 1 | 1 | 1 | 0 | 14 | | SO | RS | . | > | N | ^ | n | ~ |
| 1 | 1 | 1 | 1 | 15 | | SI | US | / | ? | O | _ | o | DEL |

Table A-1 ASCII Character Set/International Alphabet #5

# REFERENCE DOCUMENTATION

APPENDIX
E

For further details on the CCITT (Consultative Committee on International Telephone and Telegraph) X.3, X.25, X.28 and X.29 Recommendations refer to the *CCITT X.1 TO X.29 RECOMMENDATIONS*, available from:

Secretariat General,
Union Internationale des Telecommunications,
Place des Nations,
CH-1211 GENEVE 20.

For an introductory guide to data communications see the HP publication:

*TOURING DATACOMM* . . . . . part number 5957-4622.

For an explanatory guide to the CCITT X.25 Recommendation refer to the HP publication:

*X.25: THE PSN CONNECTION* . . . . . part number 5958-3402.

The following guides provide additional information when using the HP2334A with HP1000 or HP3000 computer systems:

*HP1000 DATA COMMUNICATION PRODUCT GUIDE* . . . . . part number 5953-7494.
*DSN/X.25/1000 REFERENCE MANUAL* . . . . . part number 91751-90002.
*DSN/X.25/1000 ADVANCED GUIDE* . . . . . part number 91751-90003.

*HP3000 DATA COMMUNICATION PRODUCT GUIDE* . . . . . part number 5953-7444.
*HP3000 COMMUNICATIONS HANDBOOK.* . . . . . part number 30000-90105.
*DSN/X.25/3000 REFERENCE MANUAL* . . . . . part number 32191-90001.

# GLOSSARY OF TERMS AND ABBREVIATIONS

APPENDIX F

## A

| | | |
|---|---|---|
| ADCC | - | ASYNCHRONOUS DATA COMMUNICATIONS CONTROLLER |
| ADL | - | AUTOMATIC DIAL ASSIGNMENT COMMAND |
| ASCII | - | AMERICAN INTERNATIONAL STANDARD CODE FOR INFORMATION INTERCHANGE |
| ASG | - | PAD PROFILE ASSIGNMENT COMMAND |
| ATC | - | ASYNCHRONOUS TERMINAL CONTROLLER |
| ATP | - | ADVANCED TERMINAL PROCESSOR |

## B

| | | |
|---|---|---|
| BDP | - | BASIC DEFINED PROFILE |
| BPS | - | BITS PER SECOND |

## C

| | | |
|---|---|---|
| CAS | - | COMPUTER ACCESS SUPPORT |
| CCITT | - | INTERNATIONAL CONSULTATIVE COMMITTEE FOR TELEGRAPHY & TELEPHONY |
| CLR | - | CLEAR |
| CMOS | - | COMPLIMENTARY METAL-OXIDE SEMICONDUCTOR |
| CONF | - | CONFERENCE |
| CPU | - | CENTRAL PROCESSING UNIT |
| CRC | - | CYCLIC REDUNDANCY CHECK |
| CRT | - | CATHODE RAY TUBE |
| CSA | - | CANADIAN SAFETY AGENCY |
| CTC | - | COUNTER/TIMER CIRCUIT |
| CTS | - | CLEAR TO SEND |
| CUG | - | CLOSED USER GROUP |
| Cr | - | CARRIAGE RETURN |

## D

| | | |
|---|---|---|
| D-BIT | - | DELIVERY CONFIRMATION BIT |
| DC1 | - | DEVICE CONTROL ONE |
| DC2 | - | DEVICE CONTROL TWO |
| DCC | - | DATA COUNTRY CODE |
| DCD | - | DATA CARRIER DETECT |
| DCE | - | DATA CIRCUIT-TERMINATING EQUIPMENT |
| DLE | - | DATA LINK ESCAPE |
| DMA | - | DIRECT MEMORY ACCESS |
| DNIC | - | DATA NETWORK IDENTIFICATION CODE |
| DSR | - | DATA SET READY |
| DTE | - | DATA TERMINAL EQUIPMENT |
| DTR | - | DATA TERMINAL READY |

# E

| | | |
|---|---|---|
| EIA | - | ELECTRONIC INDUSTRIES ASSOCIATION |
| EOR | - | END OF RECORD |
| ERR | - | ERROR |

# F

| | | |
|---|---|---|
| FCS | - | FRAME CHECK SEQUENCE |
| FTZ | - | FERMELDETECHNISCHES ZENTRALAMT |

# H

| | | |
|---|---|---|
| HIC | - | HIGHEST INCOMING CIRCUIT |
| HOC | - | HIGHEST OUTGOING CIRCUIT |
| HPC | - | HIGHEST PERMANENT CIRCUIT |
| HSA | - | HIGH-SPEED SYNCHRONOUS ADAPTER |
| HTC | - | HIGHEST TWO-WAY CIRCUIT |
| Hz | - | HERTZ (CYCLES PER SECOND) |

# I

| | | |
|---|---|---|
| I | - | INFORMATION FRAME |
| IA#5 | - | INTERNATIONAL ALPHABET #5 |
| IDN | - | INTERNATIONAL DATA NUMBER |
| IEC | - | INTERNATIONAL ELECTROTECHNICAL COMMISSION |
| INC | - | INCOMPATIBLE (DESTINATION ADDRESS) |
| INP | - | INTELLIGENT NETWORK PROCESSOR |
| INT | - | INTERRUPT (COMMAND) |
| INV | - | INVALID |
| I/O | - | INPUT/OUTPUT |
| ISO | - | INTERNATIONAL STANDARDS ORGANIZATION |
| ITI | - | INTERACTIVE TERMINAL INTERFACE |

# K

| | | |
|---|---|---|
| K (PARM) | - | FRAME WINDOW |

# L

| | | |
|---|---|---|
| LAP-B | - | LINK ACCESS PROCEDURE BALANCED |
| LCN | - | LOGICAL CHANNEL NUMBER |
| LED | - | LIGHT EMITTING DIODE |
| LIC | - | LOWEST INCOMING CIRCUIT |
| LOC | - | LOWEST OUTGOING CIRCUIT |
| LPC | - | LOWEST PERMANENT CIRCUIT |
| LPE | - | LOCAL PROCEDURE ERROR |
| LSB | - | LEAST SIGNIFICANT BYTE |
| LSI | - | LARGE SCALE INTEGRATED CIRCUIT |
| LTC | - | LOWEST TWO-WAY CIRCUIT |
| LUG | - | LOCAL USER GROUP |

# M

| | | |
|---|---|---|
| MODEM | - | MODULATOR/DEMODULATOR |
| MSB | - | MOST SIGNIFICANT BYTE |
| MSG | - | MESSAGE (COMMAND) |
| MUX | - | MULTIPLEX(ER) |

# N

| | | |
|---|---|---|
| N1 | - | MAXIMUM NUMBER OF BITS IN AN I-FRAME |
| N2 | - | RETRY COUNTER |
| NA | - | NO ACCESS |
| NC | - | NETWORK CONGESTION |
| NCC | - | NETWORK CONTROL CENTER |
| NN | - | NATIONAL NUMBER |
| NOP | - | NETWORK OPERATIONAL |
| NP | - | NOT PERMITTED (OBTAINABLE) |
| N(R) | - | FRAME RECEIVE SEQUENCE NUMBER |
| N(S) | - | FRAME SEND SEQUENCE NUMBER |
| NTN | - | NATIONAL TERMINAL NUMBER |

# O

| | | |
|---|---|---|
| OCC | - | OCCUPIED |
| OCTET | - | EIGHT BIT BYTE |

# P

| | | |
|---|---|---|
| P(R) | - | RECEIVE PACKET NUMBER |
| P(S) | - | SEND PACKET NUMBER |
| PAD | - | PACKET ASSEMBLER/DISASSEMBLER |
| PAR | - | PARAMETER (COMMAND) |
| PBX | - | PRIVATE BRANCH EXCHANGE |
| PCA | - | PRINTED CIRCUIT ASSEMBLY |
| PCB | - | PRINTED CIRCUIT BOARD |
| PDN | - | PUBLIC DATA NETWORK |
| PIO | - | PARALLEL INPUT/OUTPUT (CONTROLLER) |
| PROF | - | PROFILE (COMMAND) |
| PSN | - | PACKET SWITCHING NETWORK |
| PVC | - | PERMANENT VIRTUAL CIRCUIT |

# Q

| | | |
|---|---|---|
| Q-BIT | - | QUALIFIER BIT |

# R

| | | |
|---|---|---|
| RAM | - | RANDOM ACCESS MEMORY |
| RCA | - | REVERSE CHARGE ACCEPTANCE |
| RNR | - | RECEIVE NOT READY |
| ROM | - | READ-ONLY MEMORY |
| RPE | - | REMOTE PROCEDURE ERROR |
| RPO | - | RPOA OUT OF ORDER |
| RPOA | - | RECOGNIZED PRIVATE OPERATING AGENCY |
| RPROF | - | REMOTE PROFILE (COMMAND) |
| RR | - | RECEIVE READY |
| RS-232-C | - | EIA (SERIAL BINARY) INTERFACE STANDARD |
| RTS | - | REQUEST TO SEND |
| RX | - | RECEIVE |

# S

| | | |
|---|---|---|
| SER | - | SERIAL |
| SET | - | SET PARAMETER COMMAND |
| SIO | - | SERIAL INPUT/OUTPUT (CONTROLLER) |
| SN | - | SELECT NETWORK |
| SRA | - | SYMBOLIC REMOTE ADDRESS |
| STAT | - | STATUS (COMMAND) |
| SVC | - | SWITCHED VIRTUAL CIRCUIT |

# T

| | | |
|---|---|---|
| T1 | - | TIMER |
| TX | - | TRANSMIT |

# U

| | | |
|---|---|---|
| UART | - | UNIVERSAL ASYNCHRONOUS RECEIVER/TRANSMITTER |
| UDP | - | USER DEFINED PROFILE |
| UL | - | UNDERWRITERS' LABORATORIES |
| UV-EPROM | - | ULTRA-VIOLET ERASABLE PROGRAMMABLE READ-ONLY MEMORY |

# V

| | | |
|---|---|---|
| VAN | - | VALUE ADDED NETWORK |
| VC | - | VIRTUAL CIRCUIT |
| VCC | - | VIRTUAL CIRCUIT CONGESTION |
| VDE | - | VERBAND DEUTCHER ELEKTROTECNIKER |

# INDEX

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