

**HP 2334A Plus  
X.25 MULTIPLEXER  
REFERENCE AND SERVICE MANUAL**



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First Edition ..... November 1986

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First Edition ..... November 1986

# SAFETY CONSIDERATIONS

**GENERAL** - This product and relation documentation must be reviewed for familiarization with safety markings and instructions before operation.

## SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal (sometimes used in manual to indicate circuit common connected to grounded chassis).

### WARNING

The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

### CAUTION

The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

### CAUTION

## STATIC SENSITIVE DEVICES

Some of the semiconductor devices used in this equipment are susceptible to damage by static discharge. Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity to a static charge. These charges are generated in numerous ways such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction. Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service the cards with these devices. In all instances, measures must be taken to prevent static charge buildup on work surfaces and persons handling the devices. Cautions are included through this manual where handling and maintenance involve static sensitive devices.

**SAFETY EARTH GROUND** - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

**BEFORE APPLYING POWER** - Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the main power source.

## SERVICING

### WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

### WARNING

### EYE HAZARD

Eye protection must be worn when removing or inserting integrated circuits held in place with retaining clips.

**READER COMMENT SHEET**

**HP2334A Plus  
X.25 MULTIPLEXER  
REFERENCE AND SERVICE MANUAL**

**02334-90013 - November 1986**

We welcome your evaluation of this manual. Your comments and suggestions help us to improve our publications. Please explain your answers under Comments, below, and use additional pages if necessary.

Is this manual technically accurate? YES      NO

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# PREFACE

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

The contents of this manual are arranged as follows:

**Chapter 1. INTRODUCTION** This chapter provides a general description of the HP2334A Plus, 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 Plus 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 Plus.

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

**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 Plus 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 Plus, make and clear a connection and provides user troubleshooting information.

**Chapter 8. USING THE TEST PORT** This chapter describes how to access the HP2334A Plus 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 Plus hardware, firmware and internal architecture.

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

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

**Chapter 12. POWER SUPPLY VOLTAGE & FUSE CHECKING** This chapter describes how to check the HP2334A Plus 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 in the HP2334A Plus.



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

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

**Appendix B. HELP FACILITY** This appendix is a printed version of the help screens provided in the HP2334A Plus.

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

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

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

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

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

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## 1.1 INTRODUCTION

The HP2334A Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus is concerned, the PSN is a "black box" and its internal operation can be ignored by the general user.

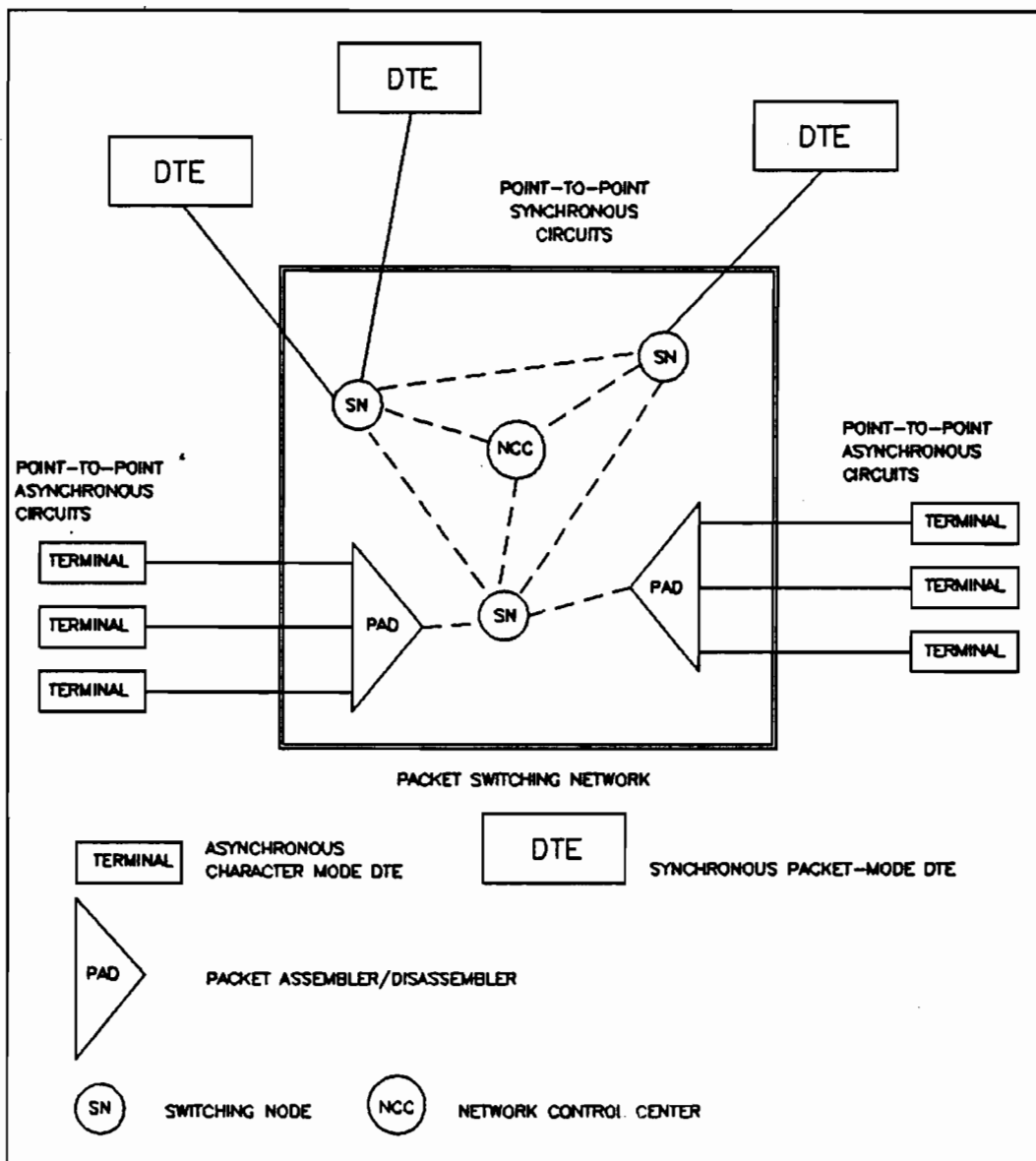


Figure 1-1 Packet Switching Network

## 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

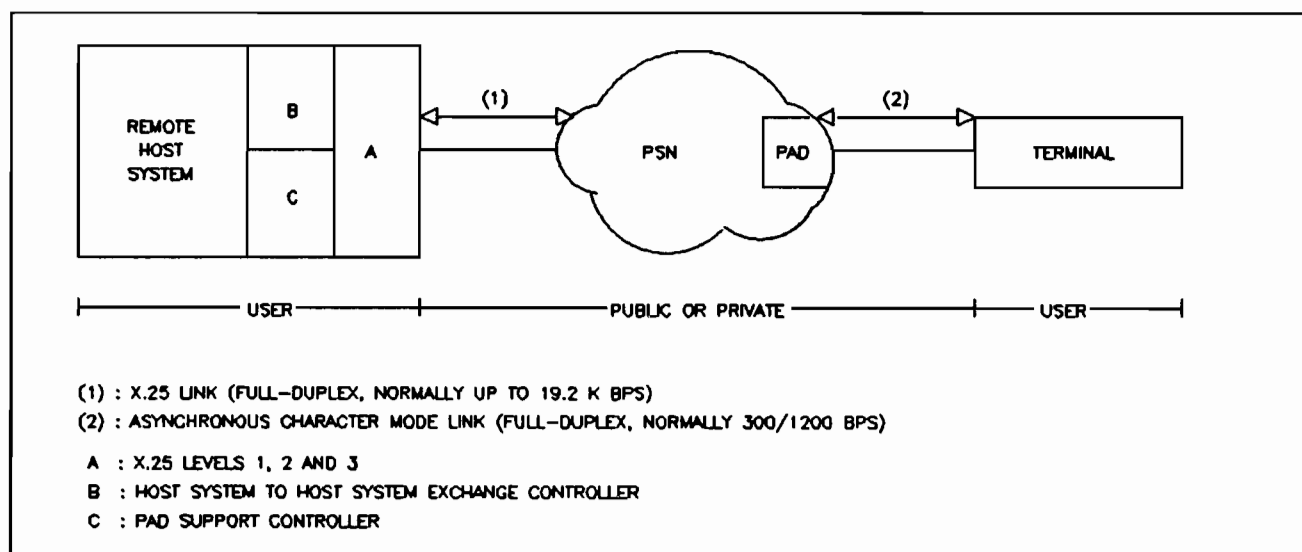


Figure 1-2 Public PAD Connection

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 19200 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).

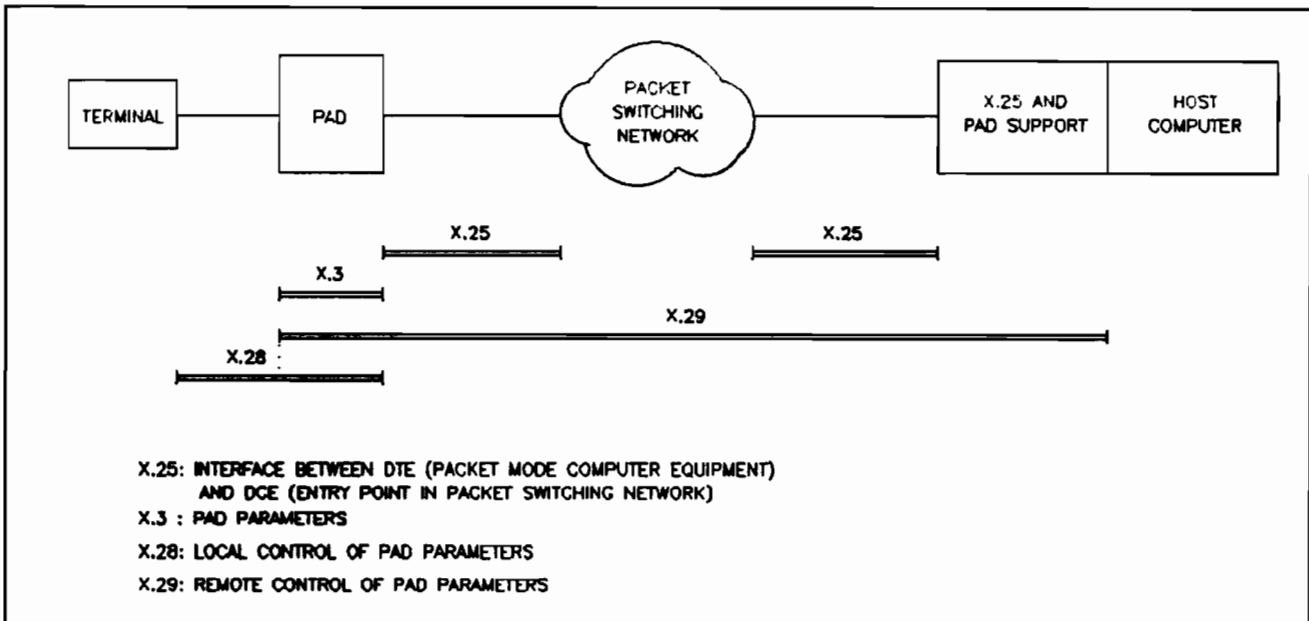


Figure 1-3 PAD Related CCITT Recommendations

## 1.4 STATISTICAL MULTIPLEXER DESCRIPTION

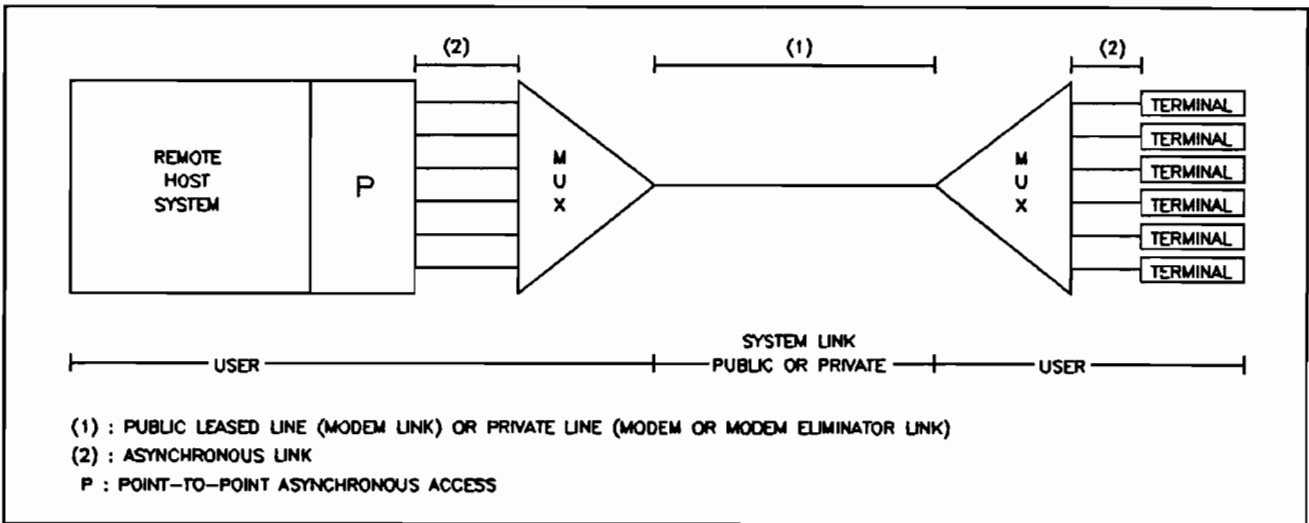


Figure 1-4 Statistical Multiplexer Connection

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.

## 1.5 THE HP2334A Plus SOLUTION

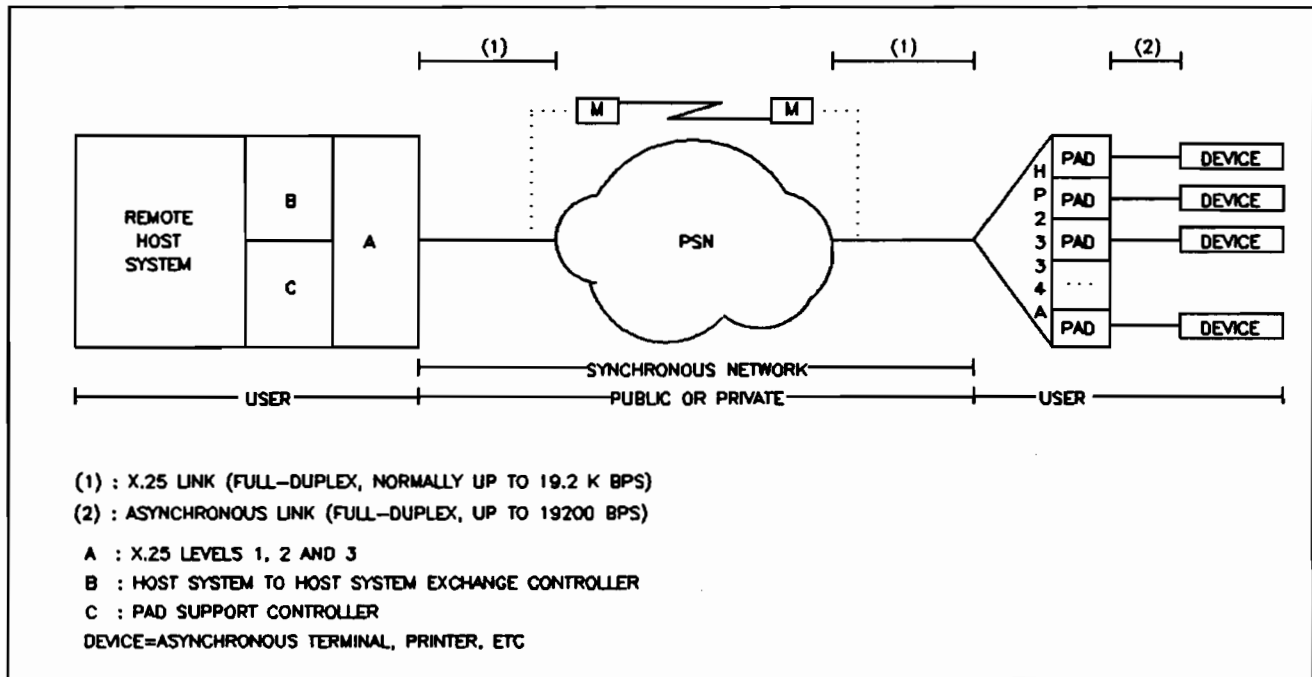


Figure 1-5 HP2334A Plus- X.25 Cluster Controller Configuration

For asynchronous devices (such as terminals and printers), the HP2334A Plus 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 Plus/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 Plus both increases the line speeds/data throughput (up to 19,200 bps on the X.25 line and the device lines) and reduces the connection cost for each device.

The HP2334A Plus 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

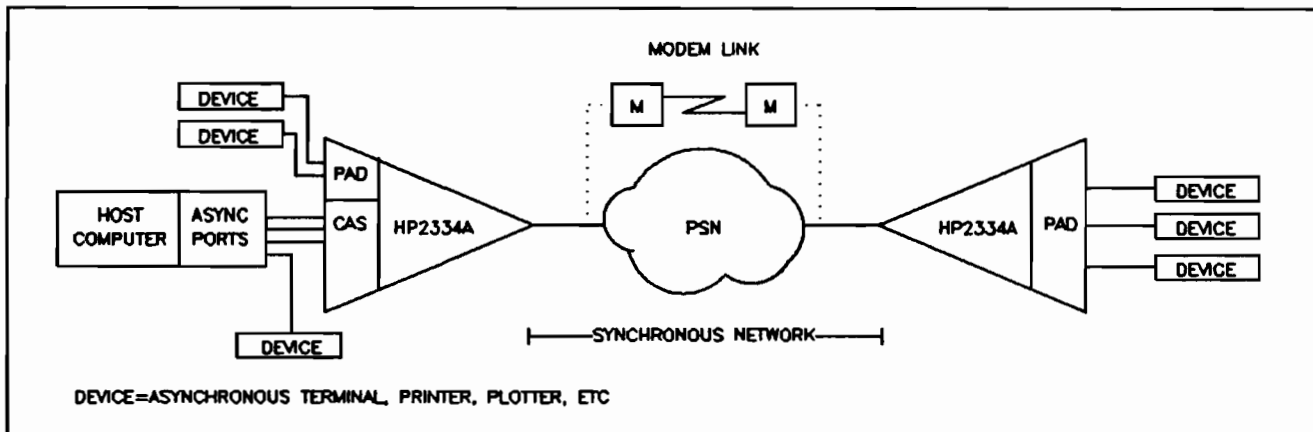


Figure 1-6 HP2334A Plus Computer Access Support

For computer systems which are not X.25-compatible, the HP2334A Plus offers a CAS (Computer Access Support) facility. For a PSN (synchronous network), the HP2334A Plus acts as an external PAD, communicating across the network using X.25 protocols. On the host computer side, the HP2334A Plus 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 Plus and PSN (synchronous network).

Figure 1-6 shows the HP2334A Plus capability to provide CAS in parallel with the PAD function. It must be noted that for the host computer to communicate with devices connected to the same HP2334A Plus the PSN must first be accessed, as local switching is not available.

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 Plus 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 Plus additional capabilities include:

- 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 HP2334A Plus GENERAL DESCRIPTION

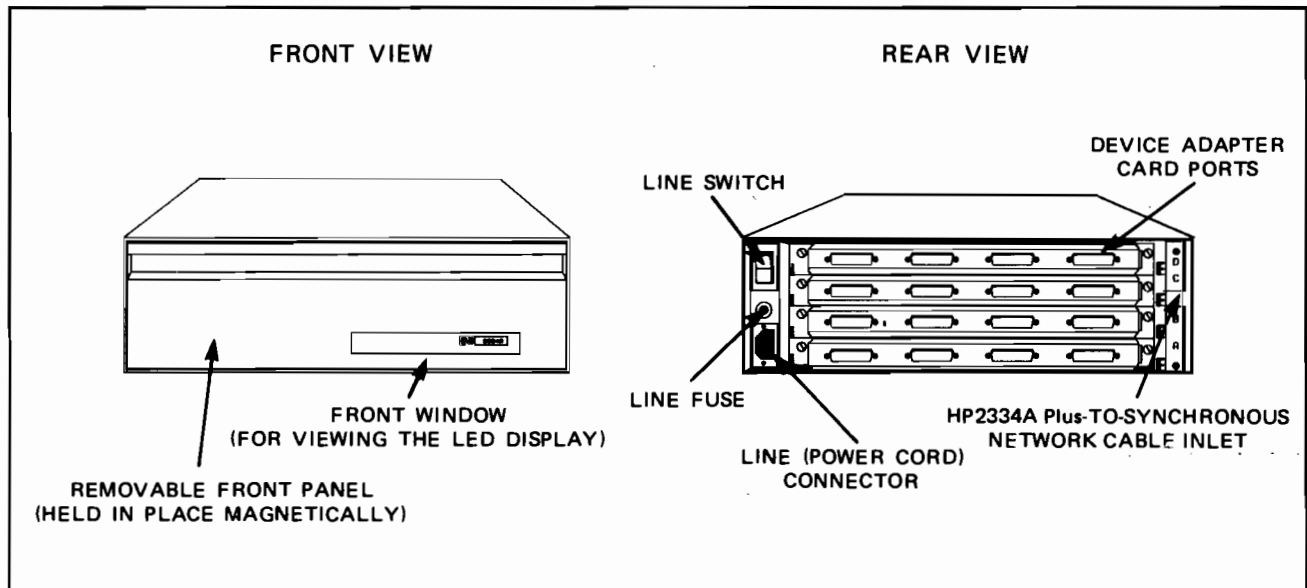


Figure 1-7 HP2334A Plus

The HP2334A Plus 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, default configurations 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 Plus 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 Plus-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).

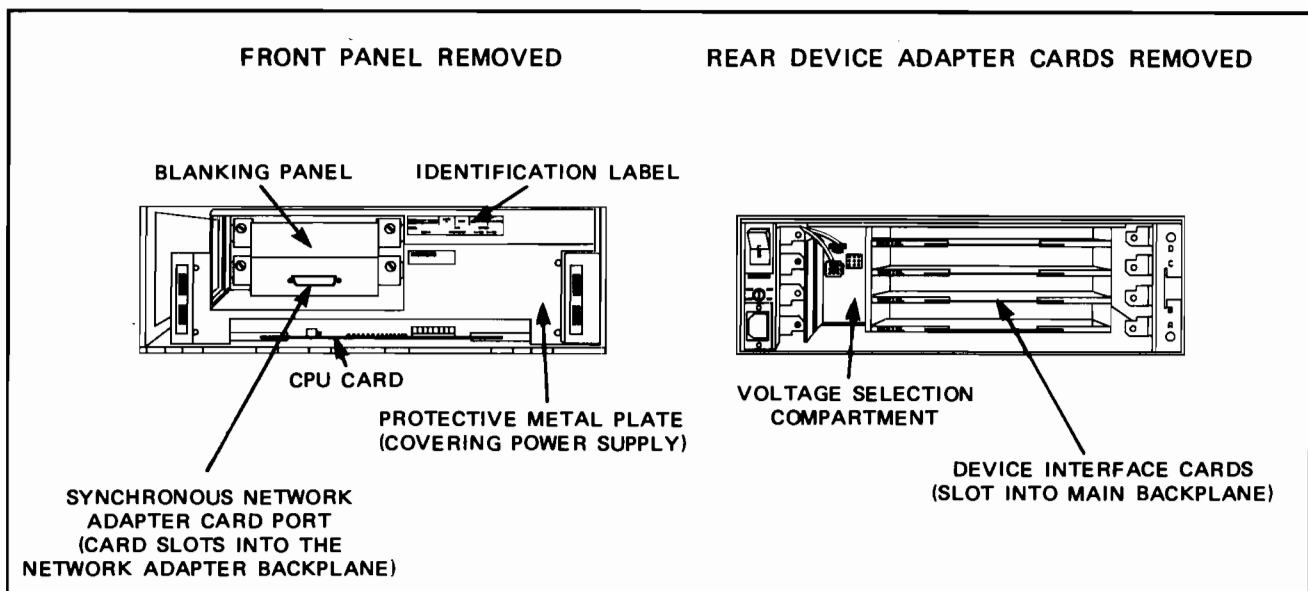


Figure 1-8 HP2334A Plus With Front Panel And Rear Cards/Panels Removed

## 1.6.1 Operation

The HP2334A Plus 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 Plus 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

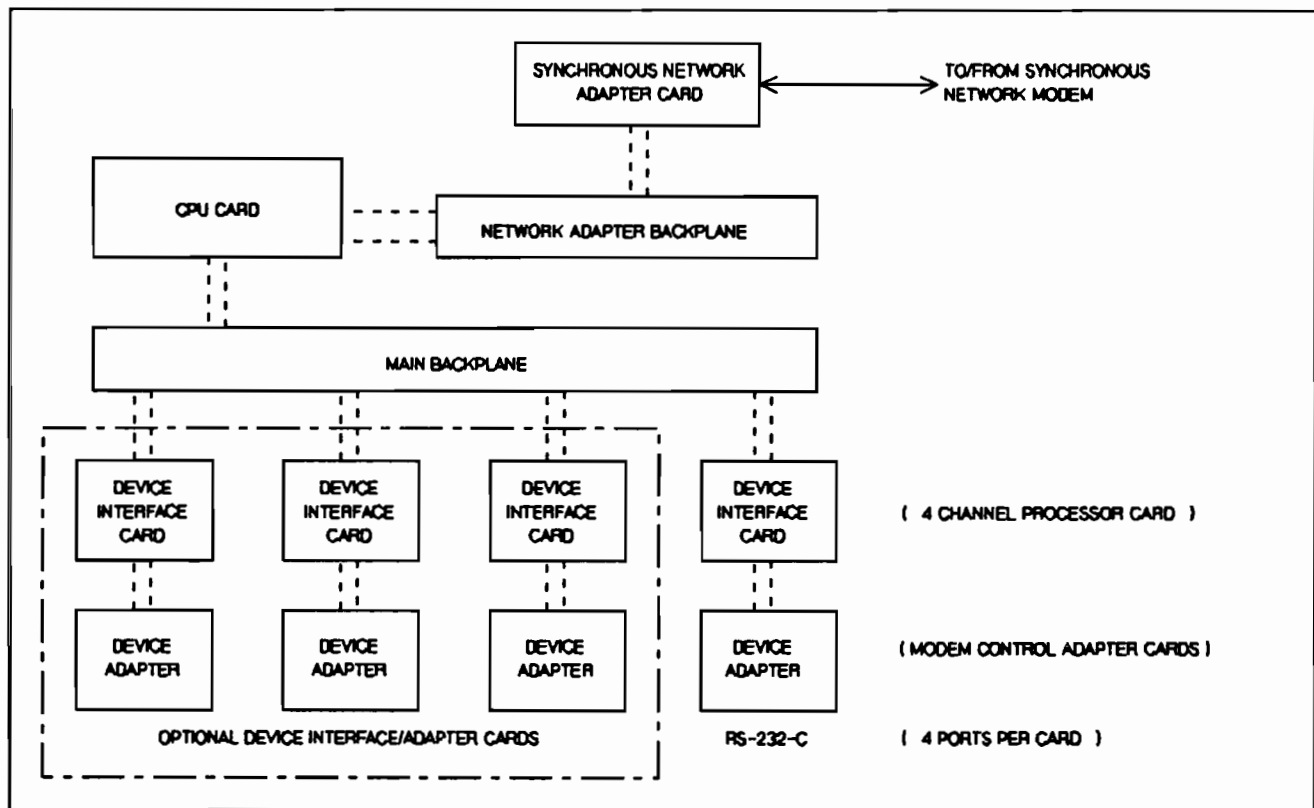


Figure 1-9 HP2334A Plus Internal Architecture

The HP2334A Plus 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.

**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 Plus. 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 Plus, 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 Plus operating mode (selected using the DIP switches) and simulate a power-on condition to initialize the HP2334A Plus.
- 21 LED indicators which provide status, self test and diagnostic information and which may also be used to monitor the HP2334A Plus data communication.
- 8 DIP switches that are used to select the HP2334A Plus default configurations, 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. 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 Plus.

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





## 1.7 TYPICAL CONNECTIONS

The HP2334A Plus 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 Plus 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 Plus. The HP2334A Plus-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 Plus 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 Plus synchronous connections refer to Chapter 2.

### ASYNCHRONOUS CONNECTIONS

The HP2334A Plus 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 Plus. For cabling information refer to Section 3.5.

The HP2334A Plus 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 Plus. Using the CAS (Computer Access Support) facility, the HP2334A Plus emulates a terminal for the host computer and provides the X.25 interface for the synchronous network.

In this case, the HP2334A Plus 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 Plus).

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

## 1.7.1 Device Adapter Cards

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 Plus (see Table 1-2). Refer to Chapter 13 for Device Interface and Adapter Card installation information.

Each Device Adapter Card is 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.

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 (RTS, CTS, DTR, DSR and DCD).

## 1.8 NETWORK COMPATIBILITY

The HP2334A Plus is compatible with most public PSNs. A list of PSNs for which the HP2334A Plus is certified is included in each relevant section of the *HP2334A Plus Configuration Guide* part number 02334-90018. HP provides a full product support service for the HP2334A Plus when used with any certified PSN. Contact your local HP representative for an up-to-date list of PSNs for which the HP2334A Plus has been certified.

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 Plus. For further details on configuring network parameters in the HP2334A Plus refer to Chapter 6, Configuration.

The HP2334A Plus may also be used in a private network of HP2334A Pluses, 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 Plus.

## 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 Plus with HP1000 or HP3000 computer systems:

*HP2334A Plus CONFIGURATION GUIDE* . . . . . part number 02334-90018.

*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 Plus product options and the main accessories are detailed in Tables 1-2 and 1-3. For ordering information and details of the HP2334A Plus 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	-	<p>Standard HP2334A Plus.</p> <p>1) Includes:</p> <ul style="list-style-type: none"> <li>a) Synchronous Network (PSN) Adapter Card and CPU Card.</li> <li>b) Setting for 115 V a.c. line supply (see option 015).</li> <li>c) Power cord.</li> <li>d) Synchronous Network Adapter Card-to-modem cable (part number 02333-60008), 5 m/16 ft.</li> <li>e) X.25: The PSN Connection (5958-3402).</li> <li>f) HP2334A Plus Configuration Guide (02334-90018).</li> <li>g) HP2334A Plus Reference and Service Manual (this manual).</li> </ul> <p>2) Does NOT include:</p> <ul style="list-style-type: none"> <li>a) Device Interface/Adapter Cards (see Option 123).</li> <li>b) Device cables (see Accessories, Table 1-3).</li> </ul>
	015	HP2334A Plus set for 230 V a.c. line supply.
	123	<p>Modem Control (RS-232-C) Processor Module</p> <p>1) Includes:</p> <ul style="list-style-type: none"> <li>a) One Device Interface (4 Channel Processor) Card.</li> <li>b) One Modem Control Adapter Card (provides four RS-232-C ports for asynchronous device connection).</li> </ul> <p>2) Does NOT include:</p> <ul style="list-style-type: none"> <li>a) Device cables (see Accessories, Table 1-3).</li> </ul> <p>NOTE: Up to four Option 123s may be supplied fitted in each HP2334A Plus, providing connections for up to 16 devices (or computer ports).</p>
HP40261A	-	Same as option 123, can be ordered as an add-on to an installed HP2334A Plus.

Table 1-1 HP2334A Plus Options

ACCESSORY	PART NUMBER	DESCRIPTION
Synchronous Network Card to modem cable	02333-60008	RS-232-C cable, length 5m (included with the HP2334A Plus).
Device Adapter Card to device cables; 1)for PAD Function:	5061-2409	To connect an HP264X terminal, use:
	02640-60131	HP13232M European modem cable (length 4.5m)
	02640-60218	HP13232N US modem cable (length 4.5m)
		HP13232Y EMP protect cable (length 4.5m) (for lightning induced transient protection)
	13222-60002	To connect an HP262X terminal, use:
	13222-60001	HP13222M European modem cable (length 5m)
	13222-60005	HP13222N US modem cable (length 5m)
		HP13222Y EMP protect cable (length 5m) (for lightning induced transient protection)
	40242-60004	To connect an HP2621B or HP2392A terminal: HP40242M modem(RFI filter) cable (length 5m)
	13242-60002	To connect an HP2382A terminal, use:
13242-60001	HP13242M European modem cable (length 5m)	
13242-60005	HP13242N US modem cable (length 5m)	
	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:	40221-60001	Use: HP40221A cable to connect the HP2334A Plus to a point-to-point computer port (25 pin, length 5m).
3)for CAS Function: (or asynchronous modem connection)	40220-60001	Use: HP40220A cable to connect the HP2334A Plus to an HP3000 ADCC port (printer support) 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 1-2 HP2334A Plus Accessories

ACCESSORY	PART NUMBER	DESCRIPTION
RS-232-C Extension Cables:		HP31391A 25 pin/M to 25 pin/F (length 5m). HP31391B 25 pin/M to 25 pin/F (length 10m). HP31391C 25 pin/M to 25 pin/F (length 15m).
Rack Mounting Accessories:	5061-0077 5061-0083 5061-0089	Rack mounting kit without front handles. Rack mounting kit with front handles. Front handles kit.

Table 1-2 (Continued) HP2334A Plus Accessories



## 2.1 INTRODUCTION

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

There are three principal methods of employing the HP2334A Plus; 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:

### STATISTICAL MULTIPLEXER CONFIGURATION

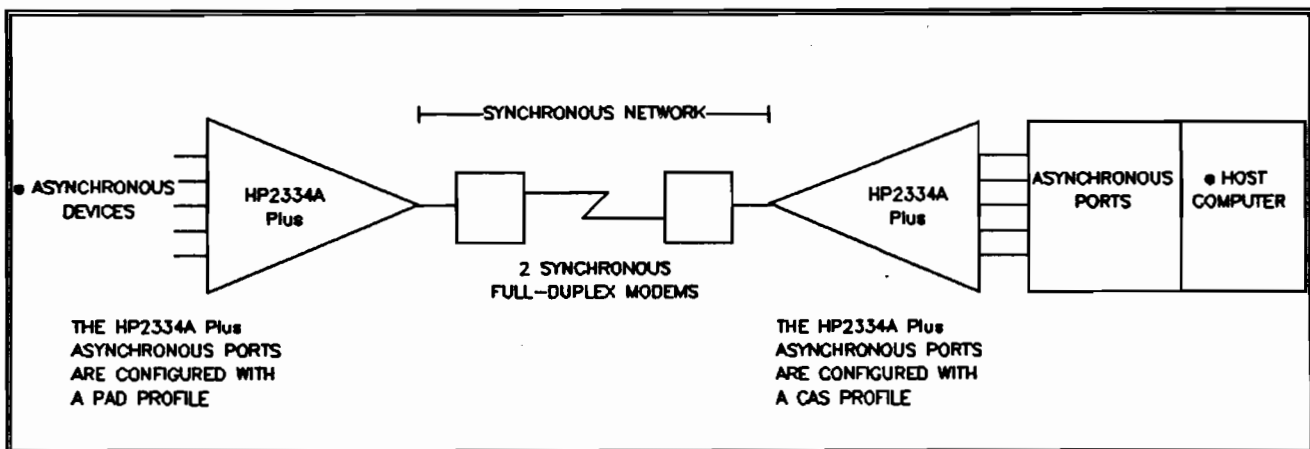
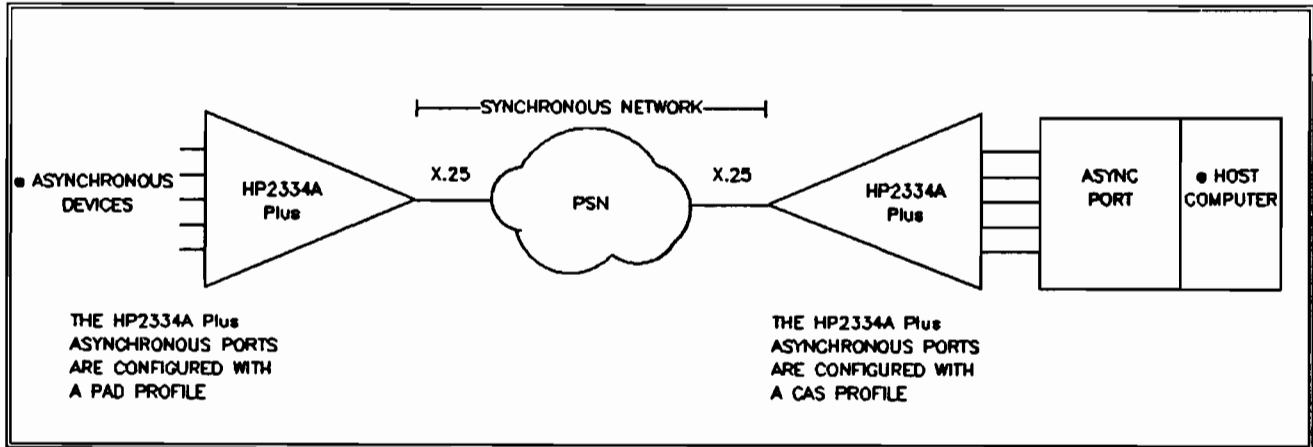


Figure 2-1 Statistical Multiplexer Configuration

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc. (must be supported by the Host Computer).
- Host Computer = HP3000 with 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.



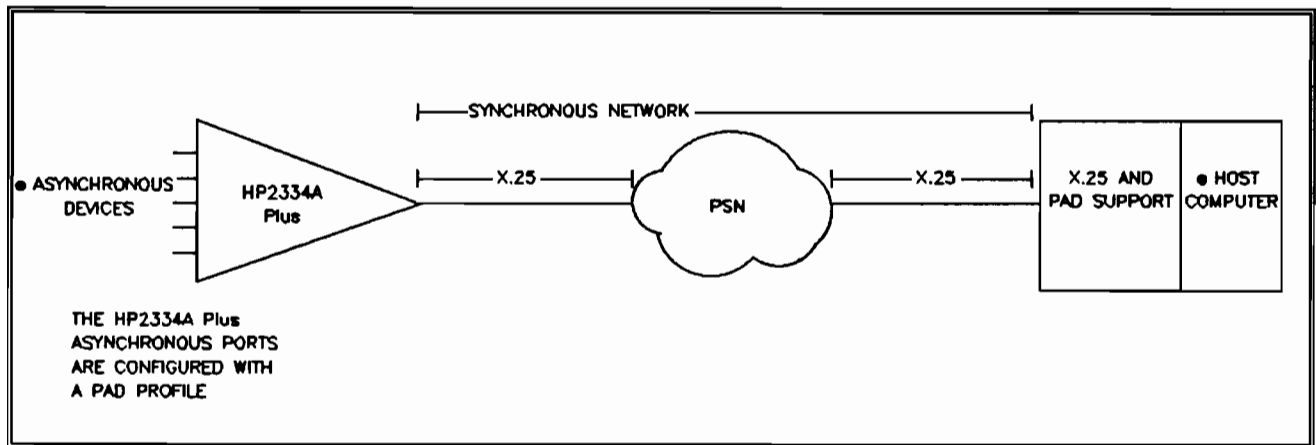
**X.25 STATISTICAL MULTIPLEXER CONFIGURATION**



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

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc. (must be supported by the Host Computer).
- Host Computer = HP3000 with 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.

**X.25 CLUSTER CONTROLLER CONFIGURATION**



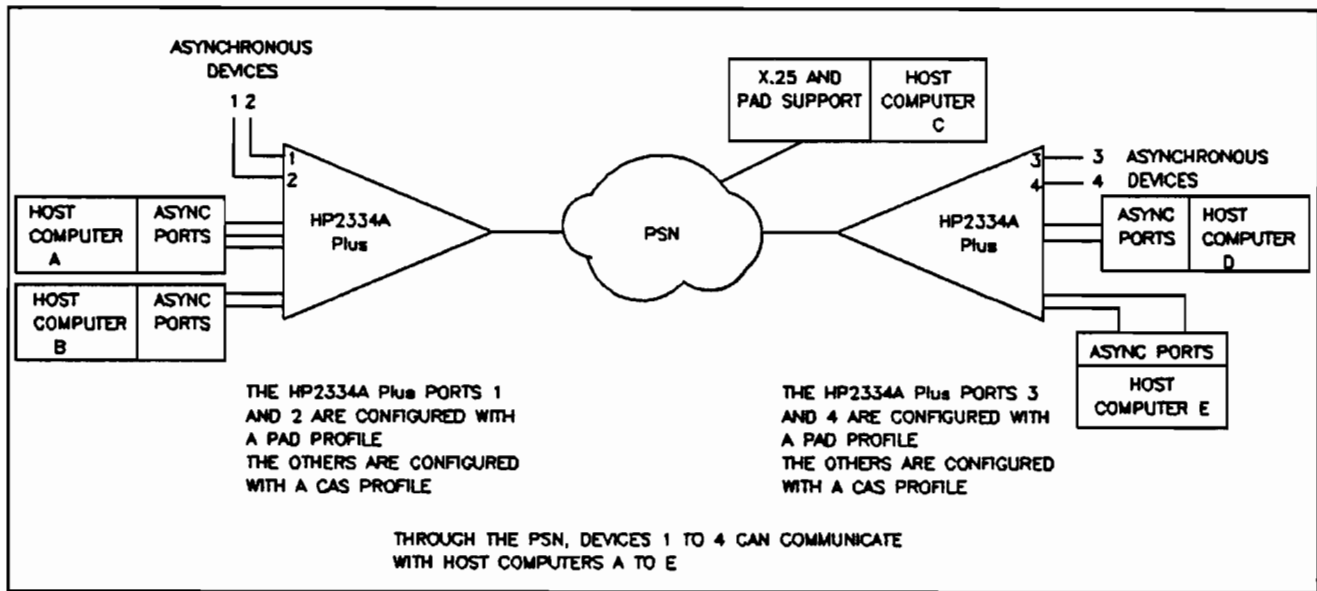
**Figure 2-3 X.25 Cluster Controller Configuration**

- Asynchronous Devices = Terminals, personal computers, printers, plotters, etc. (must be supported by the Host Computer).
- 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.

**COMBINATION EXAMPLE**



**Figure 2-4 Combination Configuration Example**

The example shown in Figure 2-4 is a combination of the X.25 Statistical Multiplexer Configuration (see Fig. 2-2) and the X.25 Cluster Controller Configuration (see Fig. 2-3).

## 2.2 HP2334A Plus ASYNCHRONOUS CONNECTIONS

### 2.2.1 Connection Of Asynchronous Devices

#### DIRECT CONNECTION

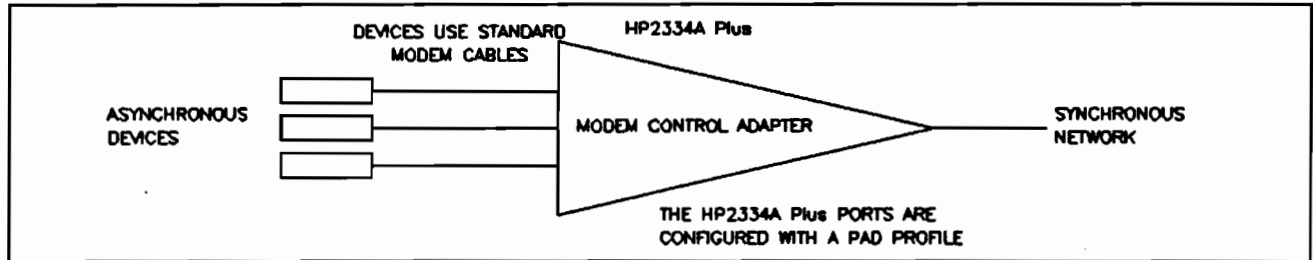


Figure 2-5 Direct Connection of Asynchronous Devices

#### MODEM CONNECTION

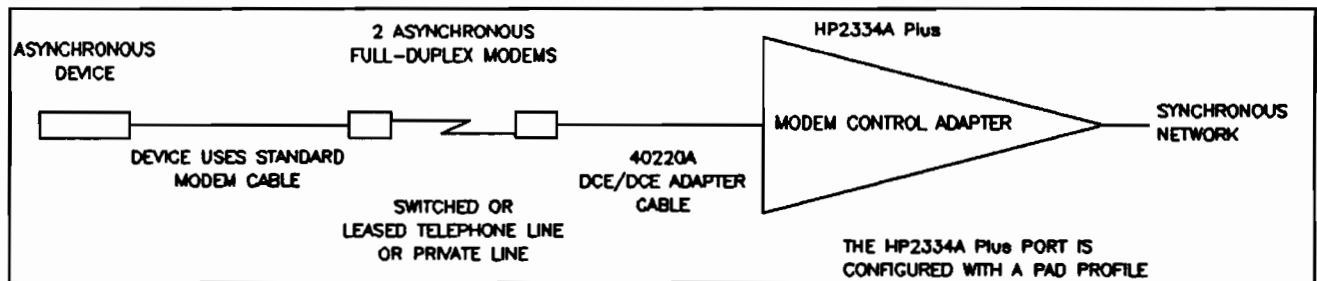


Figure 2-6 Modem Connection of Asynchronous Devices

#### PBX CONNECTION METHOD

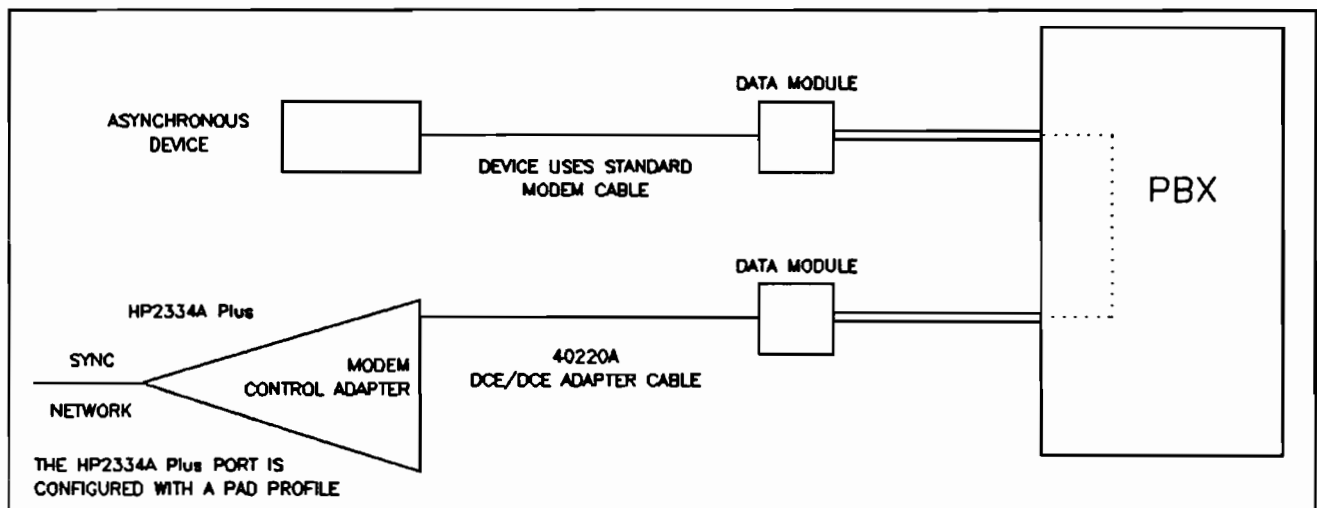


Figure 2-7 PBX Connection of Asynchronous Devices

## 2.2.2 Connection Of Asynchronous Computer Ports

**NOTE**

FOR THE HP3000 AND MOST OTHER COMPUTER SYSTEMS THE 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

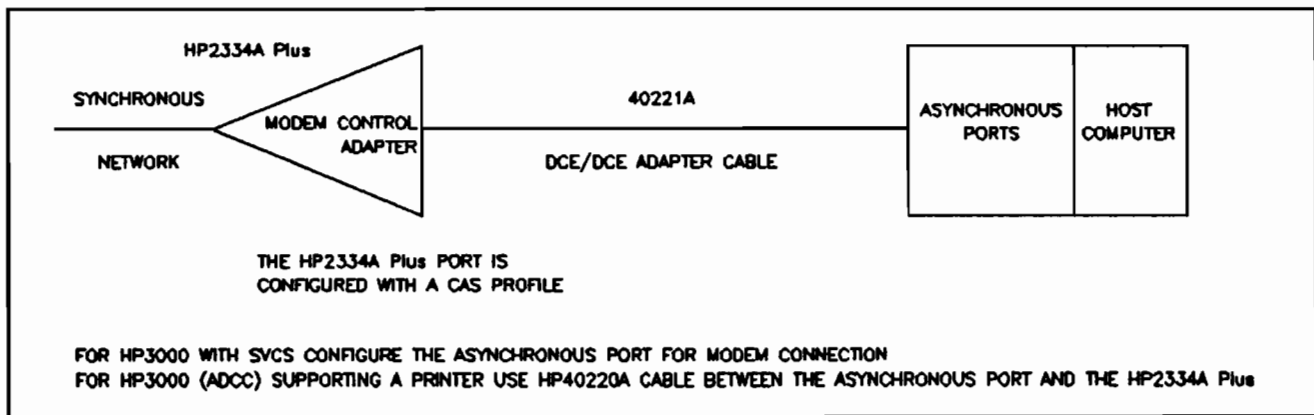


Figure 2-8 Direct Connection of Asynchronous Computer Ports

### MODEM CONNECTION

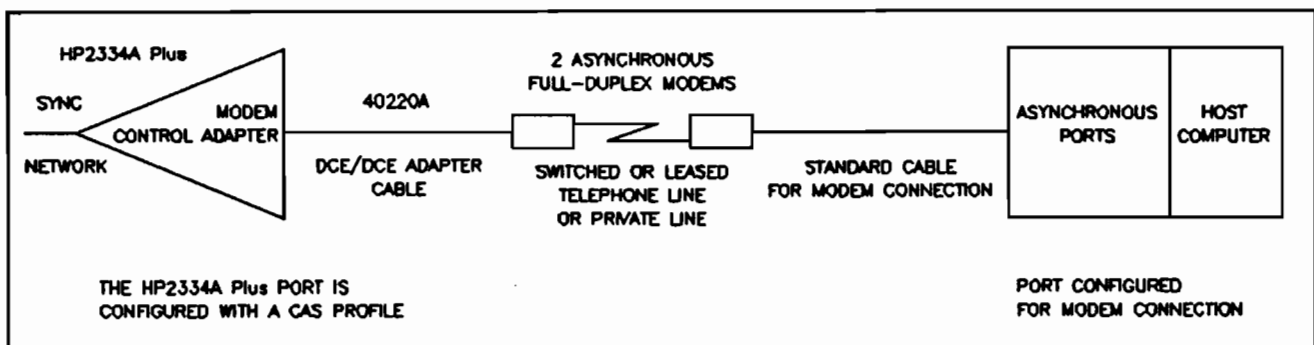


Figure 2-9 Modem Connection of Asynchronous Computer Ports

PBX CONNECTION

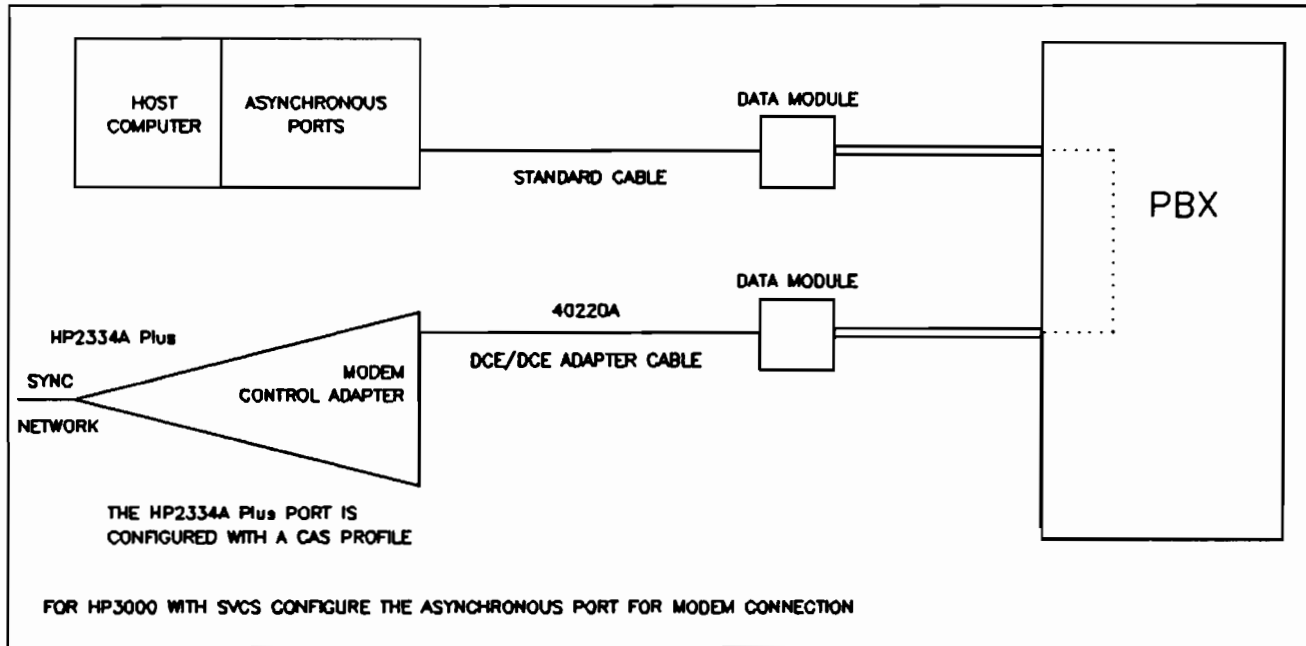


Figure 2-10 PBX Connection of Asynchronous Computer Ports

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

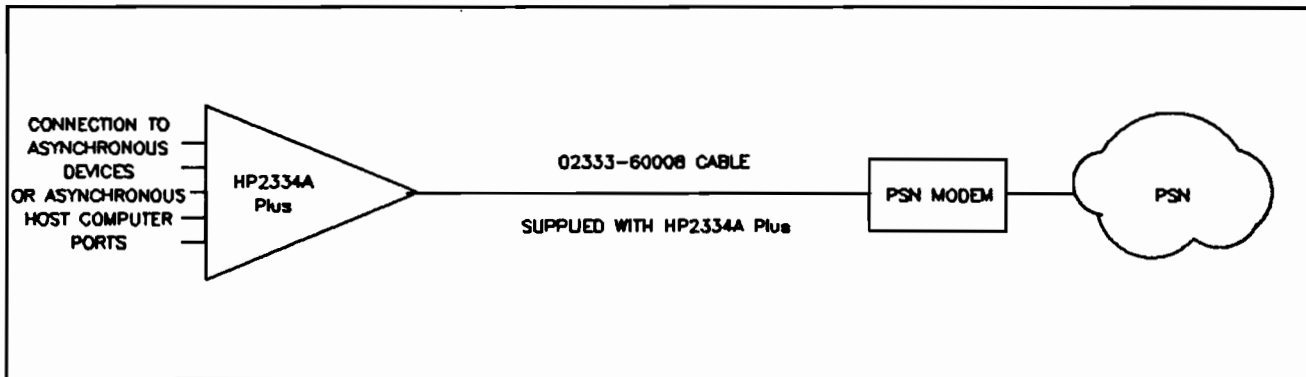
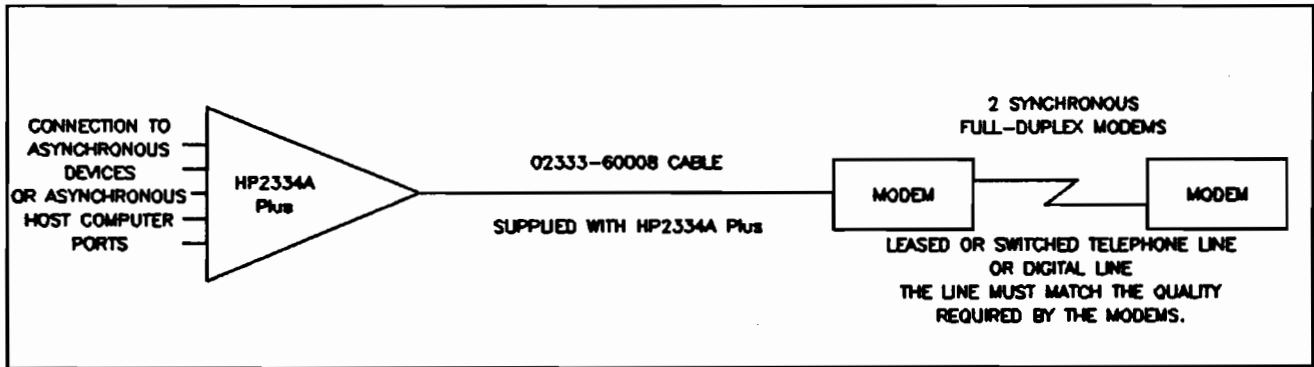


Figure 2-11 HP2334A Plus to PSN Connection

**SYNCHRONOUS MODEM LINK CONNECTION**



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



## 3.1 INTRODUCTION

This chapter provides information on preparing the site prior to installing the HP2334A Plus(s). The HP2334A Plus 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 Plus. Alternatively a clean, dry rack of adequate size and strength to support each rack mounted HP2334A Plus. Section 3.2 details the weight and physical dimensions of the HP2334A Plus.
- 2) The electrical power cabling plus the site line connectors (i.e. connectors (i.e. electric power sockets). Section 3.4 details the HP2334A Plus power requirements.
- 3) All the data cabling for communications with:
  - a) The device(s) - device cables are NOT supplied with the HP2334A Plus; refer to Section 3-5 for cable information.
  - b) The synchronous network - an HP2334A Plus-to-synchronous network modem cable is supplied with the HP2334A Plus; refer to Section 3-5 for cable information.

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

### NOTE

THE HP2334A Plus 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 Plus 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 Plus Main Physical Specifications**

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

### 3.3 ENVIRONMENTAL CONDITIONS

The HP2334A Plus 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 Plus 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 Plus Main Environmental Specifications**

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

## 3.4 POWER REQUIREMENTS

The HP2334A Plus 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, 115V - standard 230V - Option 015	86 to 127 Volts 195 to 253 Volts

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

**NOTE:** For detailed HP2334A Plus 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 Plus for connection to 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 Plus to the site power outlet.

<b>NOTE</b>
-------------

**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 Plus(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 Plus line (mains) voltage setting is detailed in Section 4.4.

## 3.5 CABLING INFORMATION

### 3.5.1 HP2334A Plus to Synchronous Network Cabling

<b>NOTE</b>
-------------

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

The HP2334A Plus 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 Plus. The HP2334A Plus-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 Plus 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 Plus with each device using a discrete cable. For a list of supported devices refer to Section 2.5. The cables should be the same as those used to connect the device to a modem, as the HP2334A Plus 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 Modem Control Adapter Card, which is equipped with 25 pin FEMALE RS-232-C connectors (ports). The HP2334A Plus-to-device signals for this adapter card are detailed in Section 4.10.

### 3.5.3 HP2334A Plus to Asynchronous Modem Cabling

When fitted with the Modem Control Adapter Card(s) (HP40261A or Option 123), the HP2334A Plus 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 Plus 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 Plus is to be connected to asynchronous computer ports via a pair of modems, the **HP40220A** cable should be used between the HP2334A Plus 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:
	02640-60131	HP13232M European modem cable (length 4.5m)
	02640-60218	HP13232N US modem cable (length 4.5m)
		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)
	40242-60004	To connect an HP2621B or HP2392A terminal: HP40242M modem(RFI filter) cable (length 5m)
	13242-60002	To connect an HP2382A terminal, use:
	13242-60001	HP13242M European modem cable (length 5m)
	13242-60005	HP13242N US modem cable (length 5m)
		HP13242Y EMP protect cable (length 5m) (for lightning induced transient protection)
	13242-60002	To connect HP260X, HP263X, HP268X or HP293X printers use:
	13242-60001	HP13242M European modem cable (length 5m)
	13242-60005	HP13242N US modem cable (length 5m)
	02631-60065	HP13242Y EMP protect cable (length 5m) Standard HP263X cable (length 3.8m)
2)for CAS Function:	40221-60001	Use HP40221A cable to connect HP2334A Plus to a point-to-point computer port (25 pin, length 5m).
3)for CAS Function: (or asynchronous modem connection)	40220-60001	Use HP40220A cable to connect HP2334A Plus to an HP3000 ADCC port (printer support) 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 Plus Device Cables

### 3.5.4 HP2334A Plus to Asynchronous Computer Port Cabling

The Modem Control Card allows direct connection between the HP2334A Plus and a computer asynchronous port using the HP40221A cable (part number: 40221-60001). 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 Plus CTS and DCD modem signals fall (OFF) and using the HP40221A 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.

When the HP2334A Plus is connected to an HP3000 ADCC port, and the cable is to be used for printer support, the HP40220A cable should be used.

## 4.1 INTRODUCTION

### CAUTION

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

The HP2334A Plus 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 HP40261A Modem Control 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 Plus on a previously prepared site. The site preparations are detailed in Chapter 3.

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

- 1) Unpack and inspect the HP2334A Plus 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 Plus as described in Section 4.5.
- 5) Connect the HP2334A Plus 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 Plus 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 Plus-to-device and HP2334A Plus-to-synchronous network communication parameters as described in Chapter 6.
- 9) Initialize and operate (on-line) the HP2334A Plus 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 Plus 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 Plus Storage and Shipping Conditions

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

### UNPACKING AND INSPECTION

**NOTE**

IF UPON RECEIPT THE HP2334A Plus 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 Plus 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 Plus for damage (scratches, dents, broken parts, etc.).

If the HP2334A Plus 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 Plus without waiting for the settlement of any claims against the carrier.

In any correspondence, refer to the HP2334A Plus by its model number (i.e. HP2334A Plus) and quote the

full serial number (e. g. 2651F00835) as detailed on the identification label (see Section 4.3).

<b>CAUTION</b>
----------------

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

### **PACKING**

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

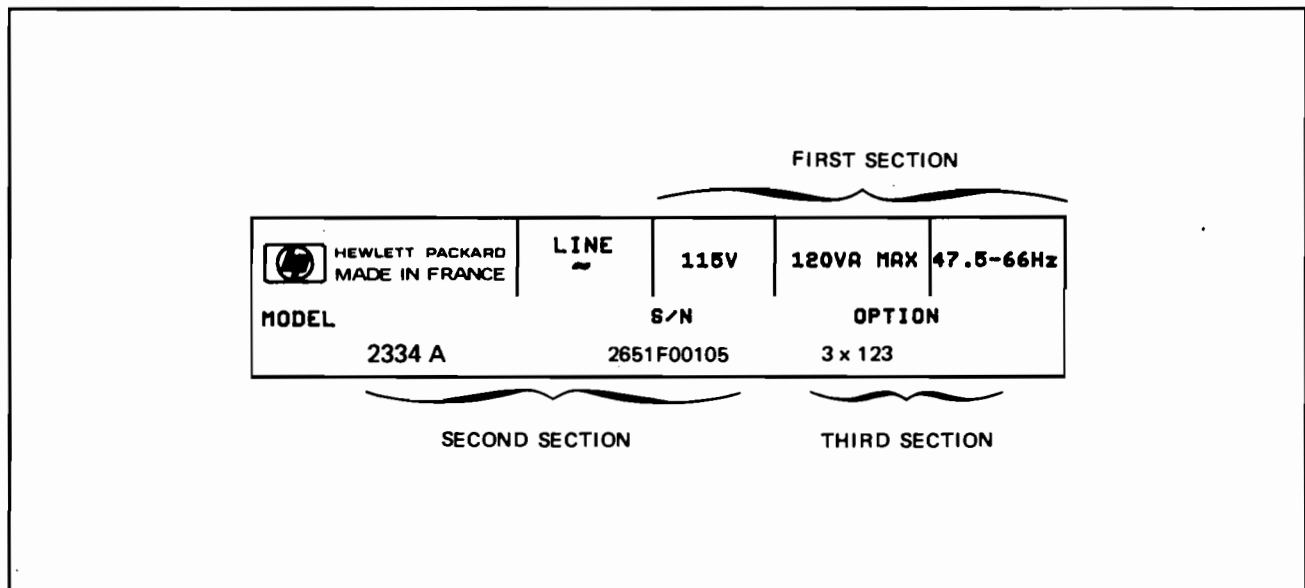
**Original packing.** If available, the original shipping carton should be used; with a tag attached indicating the type of service required, the model number, full serial number and return address. The carton should be marked **FRAGILE** to encourage careful handling.

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

- Wrap the HP2334A Plus 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 Plus 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 Plus Identification Label**

An identification label is located at the front of the HP2334A Plus, 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 Plus.

**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. 2651F) 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 123, the Modem Control Processor Module) are delivered installed in the HP2334A Plus. The options included in the HP2334A Plus 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

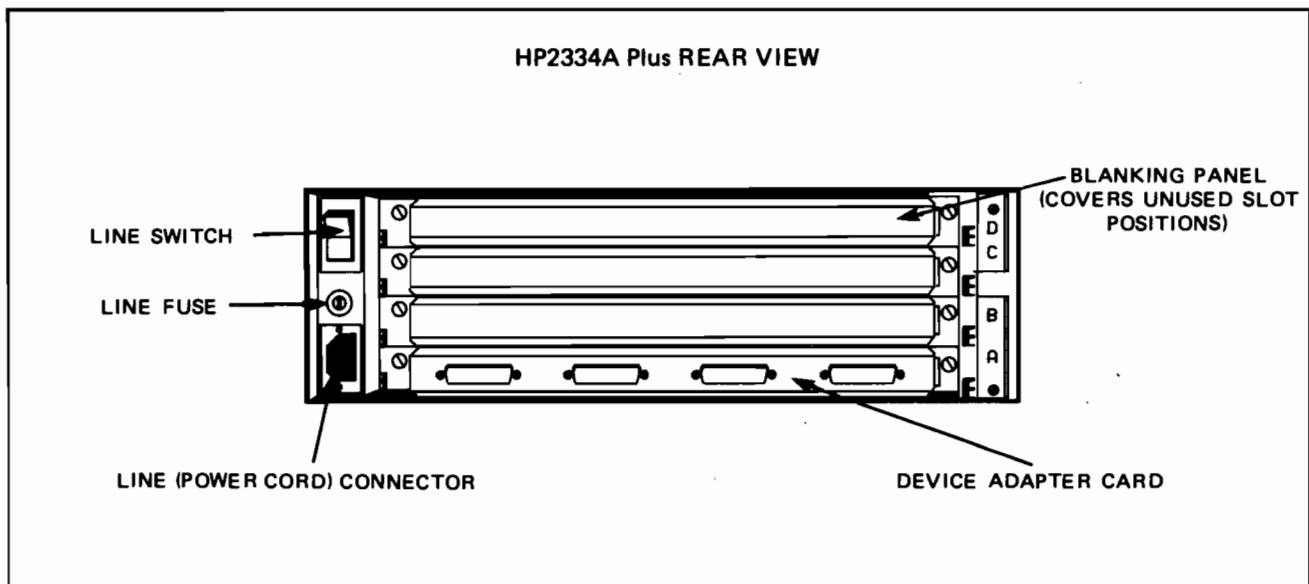


Figure 4-2 HP2334A Plus Line Connector, Switch and Fuse

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

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

**Voltage Checking.** The HP2334A Plus 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 Plus 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 Plus and connecting it to the site power outlet.

**WARNING**

IF THE HP2334A Plus 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 Plus 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 Plus 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

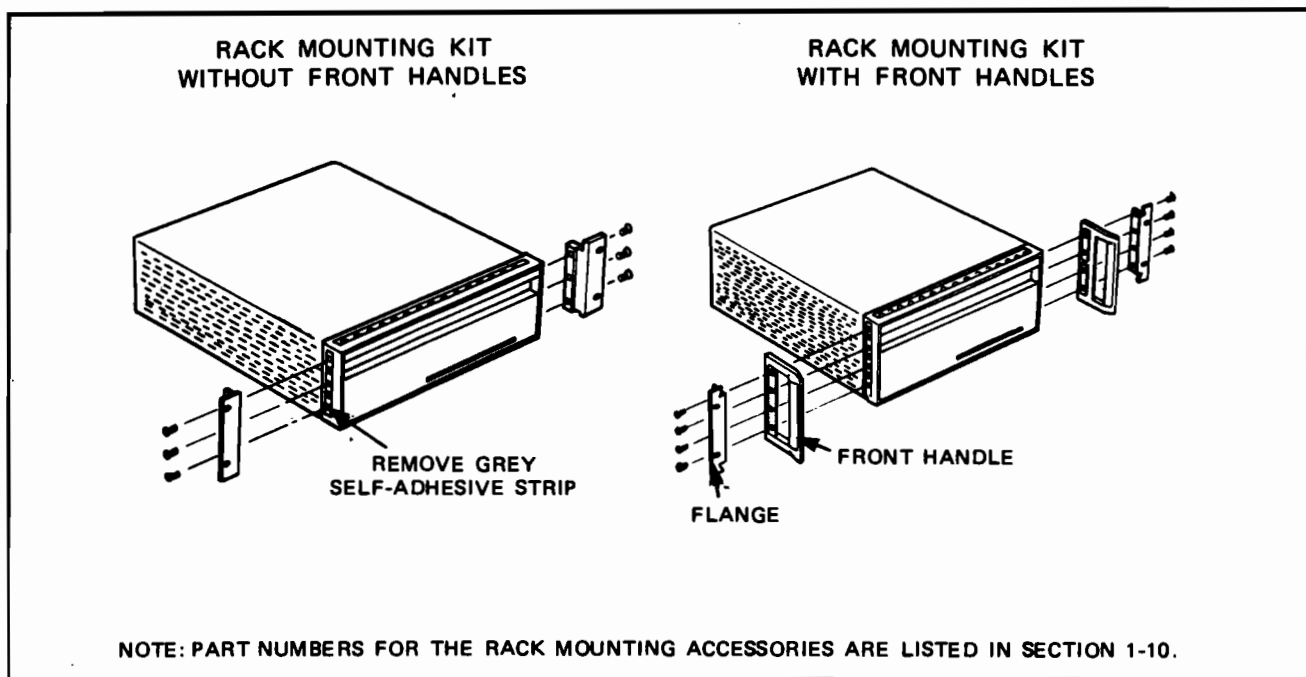


Figure 4-3 HP2334A Plus Rack Mounting Accessories

### CAUTION

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

The HP2334A Plus 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 Plus on the site table (see CAUTION note above).

**Rack Mounting.** In order to mount the HP2334A Plus 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 Plus to be mounted in a standard 19 inch wide computer rack. It is 5.25 inches (i.e. three Us) high.

Before the HP2334A Plus 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 Plus may then be mounted in the rack as follows:

- 1) At the front right-hand and left-hand sides of the HP2334A Plus 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.

## INSTALLATION

- 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 Plus 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 Plus into the computer rack. Then secure the HP2334A Plus in position by screwing the side flanges to the rack.

## 4.6 POWER SUPPLY CONNECTION





<p>MALE NEMA (MOLDED)</p> <p>USA</p>  <p>(N) WHITE (E) GREEN/YELLOW OR GREEN (L) BLACK</p> <p>HP PART NUMBER 8120-1378</p>	<p>AUSTRALIA, NEW ZEALAND</p>  <p>LIGHT BLUE OR BLACK (IN) GREEN/YELLOW (E) LIGHT BROWN OR RED (L)</p> <p>HP PART NUMBER 8120-1369</p>
<p>GREAT BRITAIN, CYPRUS, NIGERIA, RHODESIA, SINGAPORE</p>  <p>LIGHT BLUE (N) GREEN/YELLOW (E) LIGHT BROWN (L)</p> <p>HP PART NUMBER 8120-1351</p>	<p>EAST AND WEST EUROPE, SAUDI ARABIA UNITED ARAB REPUBLIC</p>  <p>MALE SCHUKO</p> <p>LIGHT BLUE (N) GREEN/YELLOW (E) BROWN (L)</p> <p>(FEMALE END IS RIGHT ANGLE) HP PART NUMBER 8120-1689</p>

Figure 4-4 HP2334A Plus Power Cords

### WARNING

THE HP2334A Plus 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 Plus 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 Plus 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 Plus to the site power supply as follows:

- 1) Ensure that the HP2334A Plus rear panel LINE switch is set to OFF (0).
- 2) Connect the power cord to the HP2334A Plus rear panel line connector (see Figure 4-2), then plug it into the site power outlet.
- 3) Switch ON the HP2334A Plus LINE switch when 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 Plus CONNECTION & TEST PROCEDURE

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

The HP2334A Plus 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 Plus is switched ON, or initialized using the Reset push-button. This test is performed irrespective of whether the HP2334A Plus 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.

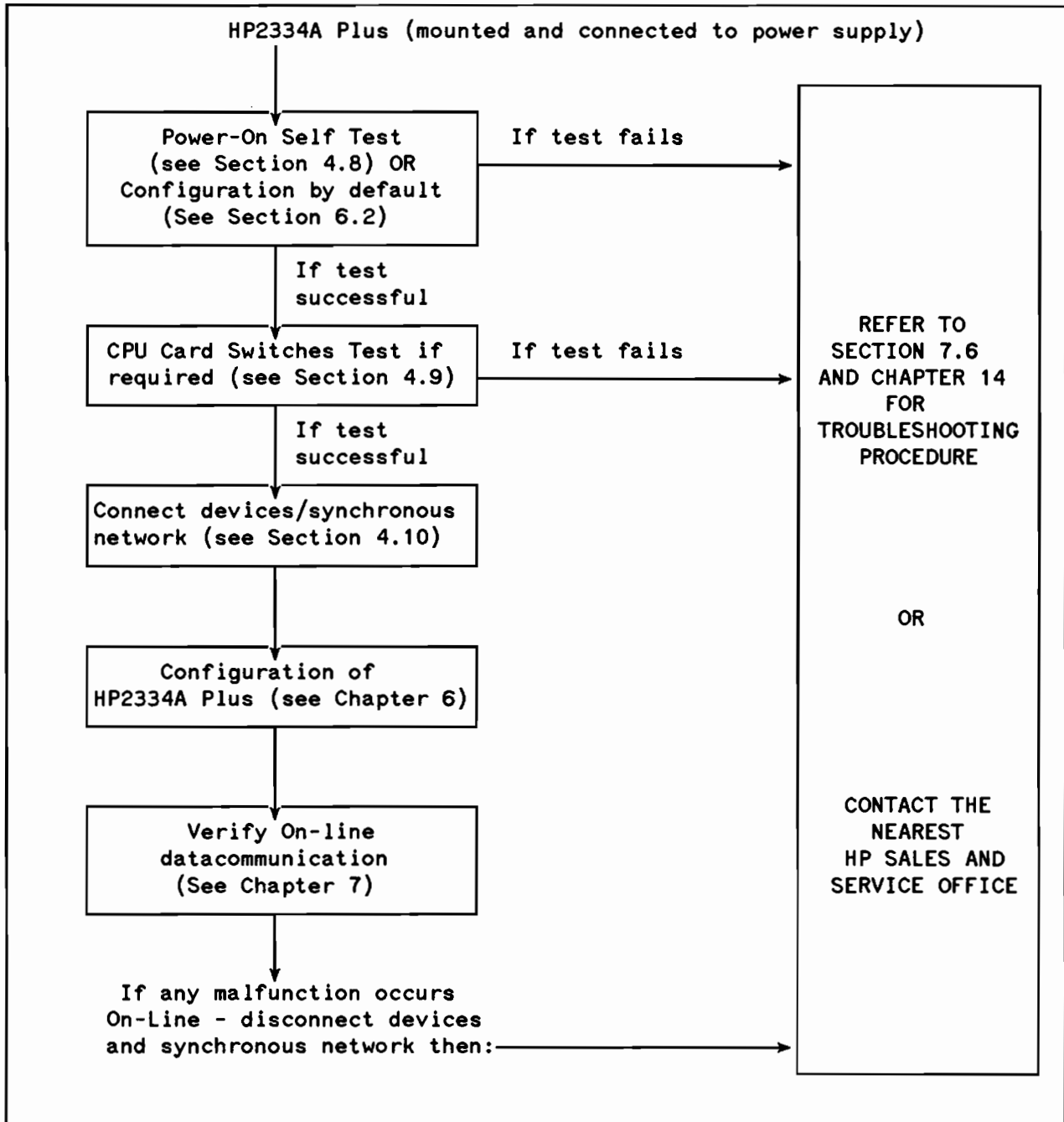


Figure 4-5 HP2334A Plus Connection and Test Procedure



## 4.8 POWER-ON SELF TEST

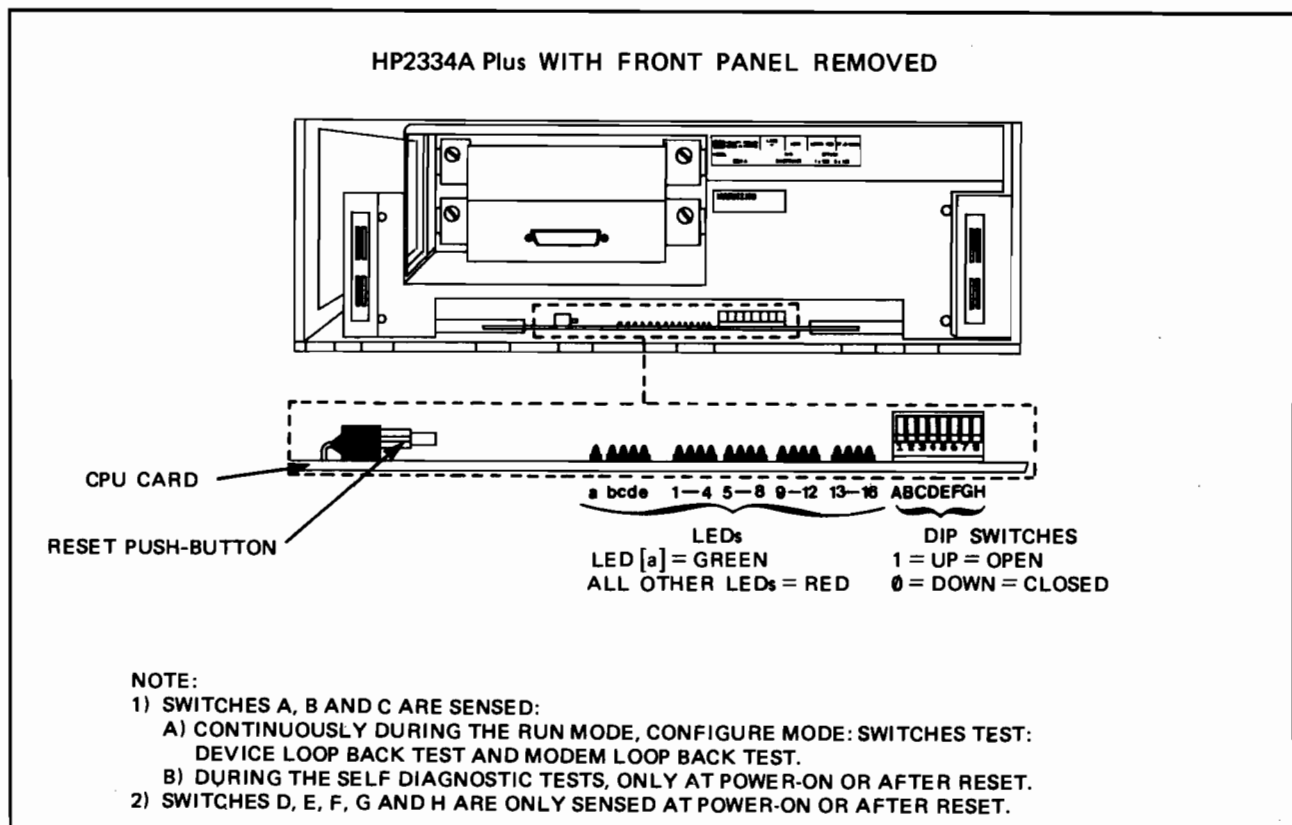


Figure 4-6 CPU Card LEDs and DIP Switches

### 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 Plus 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).

**WARNING**

If the HP2334A Plus is to be configured as a CAS (System side) and the on-line configuration facility is required (for both local and remote access to the configuration), **DO NOT** perform the Power-on self test or the switches test as detailed in 4.8 and 4.9 respectively. Instead, on completion of the installation, proceed directly to 6.2. "Selecting a Default Configuration". After configuring the HP2334A Plus as a CAS by default proceed directly to Chapter 7 "Operation" (sub-section LDIAG) and perform the local on-line configuration. On completion proceed directly to Chapter 8, "Using the Test Port" (sub-section RDIAG) and perform the remote on-line configuration of the second HP2334A Plus. Both of these operations should be performed with reference to Chapter 6, "Configuration".

**ALL OF THESE OPERATIONS MUST BE CARRIED OUT WITHOUT TURNING OFF THE HP2334A Plus OR PERFORMING A RESET, OTHERWISE ACCESS TO THE TEST PORT WILL NOT BE AVAILABLE.**

On completion of all on-line configuration the switch tests may be performed as detailed in 4.9., if required.

In all other cases proceed with the rest of this chapter.

**NOTE:** If after performing the power-on and switches test the HP2334A Plus requires reconfiguration as a CAS and on-line configuration access is required from the CAS side, the original configuration must be removed. To accomplish this the CPU card should be removed and replaced as detailed in 15.3. This will remove any configuration which has been saved in the CMOS RAM.

**Preparation.** In order to perform the power-on test the CPU card DIP switches must be set to one of three possible positions, depending on whether the connected devices are workstations or system ports. (for further explanation see 6. 2)

To ensure the correct default configuration will be implemented, remove the front panel and set the DIP switches (see Figure 4-6) in one of the following configurations:

If the connected devices are workstations (e.g. terminals, printers, etc), and the HP2334A Plus is to be used as a PAD, set the DIP switches as follows:

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

If the connected devices are system ports (e.g. HP3000 ATP ports), and the HP2334A Plus is to be used as a CAS, set the DIP switches as follows:

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

If the HP2334A Plus has been previously configured (as detailed in Chapter 6), set the DIP switches as follows:

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

**Procedure.** To perform the power-on test, simply switch ON the HP2334A Plus (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 following indication is given:

- LED [a] remains ON (illuminated).
- LEDs [b] and [c] blinking ON/OFF.

If the Power-On Test **FAILS** due to an error being detected, the HP2334A Plus 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 Plus 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 Plus 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

**Procedure.** To perform the CPU Card Switches Test, simply press the Reset push-button (if the HP2334A Plus is switched OFF, refer to Section 4.8). 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. 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 Plus 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 Plus 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 Plus 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 Plus 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 HP2334A Plus CONNECTION

### 4.10.1 HP2334A Plus to Device Connection

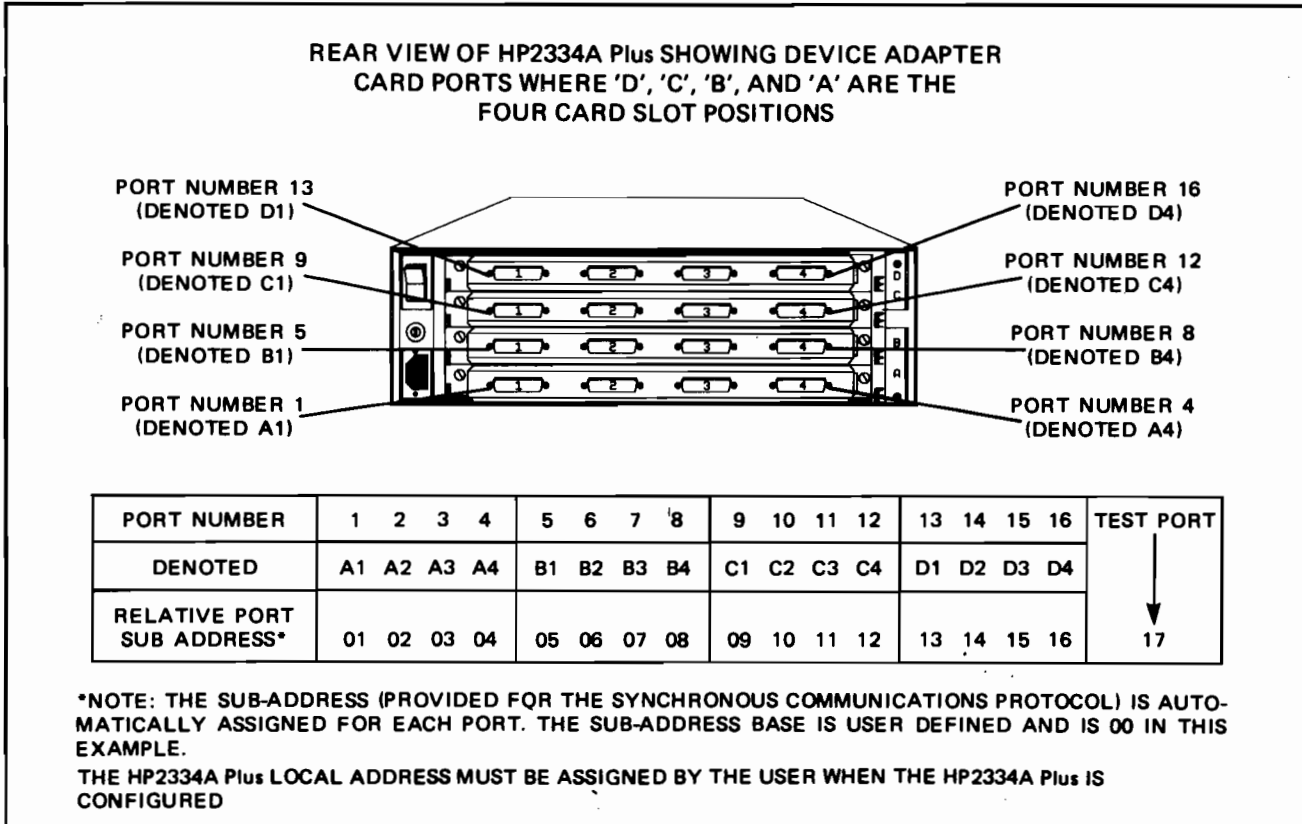


Figure 4-7 HP2334A Plus Device Adapter Card Port Sub-addresses

The Device Adapter Card installed in the HP2334A Plus is equipped with four 25-pin FEMALE connectors or ports (see Section 1-7). Cable information is provided in Section 3.5. and the available signals for the card are detailed in Table 4-2.

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 Plus has successfully passed the power-on and CPU Card DIP switch tests (if required) 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 Plus switched ON or OFF as required.

- When configuring the HP2334A Plus, 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 Plus-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 Plus device port identity. Then, if the cables are subsequently removed they can easily be replaced in the correct HP2334A Plus device port.

Once the asynchronous devices have been connected, the HP2334A Plus 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
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 4-2 Modem Control Adapter Card (Device Port) Signals**

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

## FUNCTION OF DEVICE ADAPTER CARD PORT SIGNALS

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

- 1) The DTR "ON" indicates to the HP2334A Plus that the DTE (device ) is "ON" and ready for dialogue.
- 2) The DSR signal indicates to the DTE (device) that the HP2334A Plus 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:** 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 Plus asynchronous port signals exhibit one of the three following types of behavior according to 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 Plus will drop these signals (OFF) for a period of 5 seconds to enable computer upper level software to terminate the session when the HP2334A Plus is used in a CAS configuration.

**Behavior 3:** For SVCs 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. For PVCs the DCD and CTS on the CAS/PAD side follow the modem signals of the device connected on the PAD side.

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

**NOTE:** The modem behavior can be suppressed on a port by setting Local Parameter #14 in the port profile accordingly (refer to 6. 8. 2).



## 4.10.2 HP2334A Plus to Synchronous Network Connection

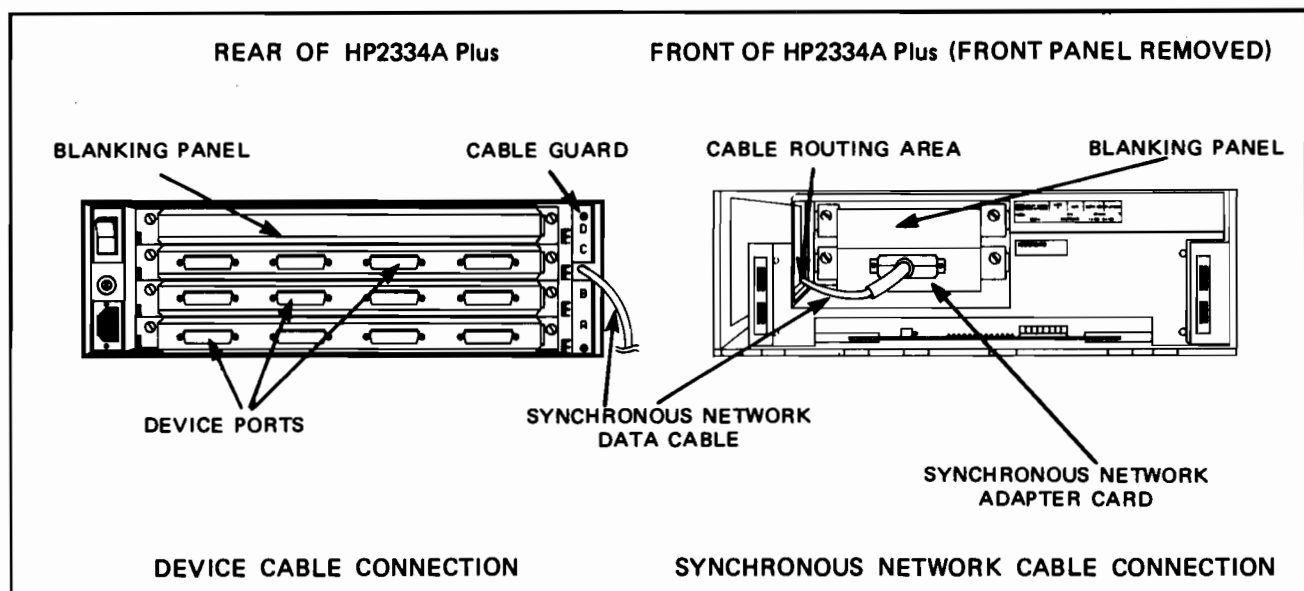


Figure 4-8 HP2334A Plus to Device and Synchronous Network Connection

The HP2334A Plus 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 4-3 on the next page.

When the HP2334A Plus has passed its power-on and switches tests (if required), it may be connected to the synchronous network. This is achieved by connecting the supplied HP2334A Plus-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 Plus is switched OFF, then disconnect the power cord.
- 2) Remove the HP2334A Plus front panel.
- 3) At the rear right-hand side of the HP2334A Plus, remove the cable guard (marked D, C, B, A and containing a slot) that is attached to the HP2334A Plus 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 Plus-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 Plus.
- 5) From the front of the HP2334A Plus, 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 Plus, 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 to the cable guard (this acts as cable clamp). Re-fit the cable guard at the rear right-hand side of the HP2334A Plus and tighten the two cross-head screws to secure it in position.
- 8) Replace the power cord and switch ON the HP2334A Plus as required.

The synchronous network (or PSN) modem should be connected and configured according to the manufacturer's instructions. The HP2334A Plus-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 4-3 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 HP2334A Plus CAN BE CONFIGURED TO ALLOW THE MODEM CONTROL SIGNALS TO FALL (OFF) FOR A PERIOD OF BETWEEN ONE AND TEN SECONDS WITHOUT AFFECTING OPERATION OF THE HP2334A Plus AT X.25 LEVEL 2.



## 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 Plus 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 6.5 with reference to configuration of the HP2334A Plus. For more detailed information refer to the HP publication: *X.25: THE PSN CONNECTION*, part number 5958-3402.

**WARNING: THE HP2334A Plus 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 Plus.**

## 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 Plus 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 (Supplied by the modem)
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		
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 Pools:	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 Plus Supported Facilities

### 5.2.1 Level 1 Parameters

**Line Speed.** The HP2334A Plus will support line speeds of up to 19200 bps, the timing signals being provided by the modem.

Some networks may offer a choice of physical link and in this case the X.21bis interface **MUST** be selected.

For further information on Level 1 parameters refer to 6. 5. 1.

### 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 1000 to 3000 milliseconds according to the line speed (see Timer T1 in 6. 5. 2).

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

For further information on Level 2 parameters refer to 6. 5. 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. 5. 3).

**Maximum Packet Size In/Out.** The HP2334A Plus 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. 5. 3.

**NOTE:** In order to have full access to the HP2334A Plus Remote 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. 5. 3.

**NOTE:** When the HP2334A Plus is to be used in X.25 Stat Mux Configuration, it is recommended that any printer-connected device ports are assigned PVCs or are configured with the ADL facility (on the CAS side) if SVCs are to be used (see Section 6. 9).

## 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 Plus 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 Plus 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 acknowledgment)

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 Plus default parameter value) the only recommended facility to subscribe for is the Reverse Charging Acceptance facility when this is required.





## 6.1 INTRODUCTION

The HP2334A Plus 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 are initially defined by using one of two available default configurations. After initial selection the chosen default configuration is saved automatically in non-volatile (permanent) memory so that the HP2334A Plus does not require reconfiguration each time it is powered-on.

Should the user require a configuration other than the default configurations, the modifications can be made either off-line (i.e. when not communicating with the synchronous network or devices), or by using the on-line diagnostic facility. Any modifications to the configuration are saved automatically in the non-volatile (permanent) memory.

The on-line modification of a default configuration is performed using one of the connected terminals, and using the on-line access to the configuration via the diagnostic mode.

The off-line modification of a default configuration (required to make changes to the X.25 parameters of the configuration) is normally performed using a terminal which is directly connected to the HP2334A Plus device port A1 (refer to 6.3.1, "Preparation"). Alternatively the off-line modification may be performed from a remote location by connecting the remote terminal to the HP2334A Plus device port A1 via a pair of asynchronous modems and a telephone line (see 6.3.3, "Remote Off-Line Configuration").

The HP2334A Plus may be physically connected to the synchronous network and the asynchronous devices as required during the off-line modification procedure except for the port A1.

For a description of how to enter CONFIGURE mode refer to Section 6.3. The synchronous network configuration is described in Section 6.4 and for details of the configuration levels refer to Sections 6.5 and 6.6. The asynchronous ports profile configuration is described in Section 6.7 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 6.8. The automatic dial (auto call) and port disable facilities are described in Section 6.9 and the LIST command in Section 6.10. Some configuration examples are given in Section 6.11.

For information on how to perform local on-line modification of the HP2334A Plus configuration refer to Chapter 7, "Operation". For remote on-line modification refer to Chapter 8, "Using the Test Port".

## 6.2 SELECTING A DEFAULT CONFIGURATION

### Procedure

The HP2334A Plus has two default configurations, which enable it to be put into operation very quickly. These default configurations are intended to be used in a Statistical Multiplexer Connection over a leased line, with little or no alteration. They can also be used as a basis for all other configurations, the additional information required being added without the need to re-enter all the existing information.

To use either of the two default configurations in the HP2334A Plus, they must be first selected by using the DIP switches. If the devices to be connected to the HP2334A Plus are asynchronous device ports (for example Terminals, Printers, etc.) then the default PAD configuration is required. However, if the devices to be connected to the HP2334A Plus are asynchronous system ports (for example ATP ports) then the default CAS configuration is required.

The default configuration of the HP2334A Plus may be selected by simply setting the DIP switches as given below and performing a power-on. This will result in the default configuration being down-loaded into the CMOS RAM. A listing of the default parameters (for both PAD and CAS) is given in 6.3.4.

<b>NOTE</b>
-------------

The default configuration will only be downloaded if NO OTHER user configuration already exists.

To set the HP2334A Plus default PAD configuration, the DIP switches must be set as follows and a power-on performed.

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

To set the HP2334A Plus default CAS configuration, the DIP switches must be set as follows and a power-on performed.

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

In both cases the HP2334A Plus performs the power-on test, and downloads the required configuration.

When the LED A is on set all switches down. The HP2334A Plus is now configured for use as a Statistical Multiplexer over a Leased Line.

If a configuration listing is required or the default configuration needs to be modified then refer to 6.3. onwards.

## 6.3 ENTERING CONFIGURATION MODE

### 6.3.1 Preparation

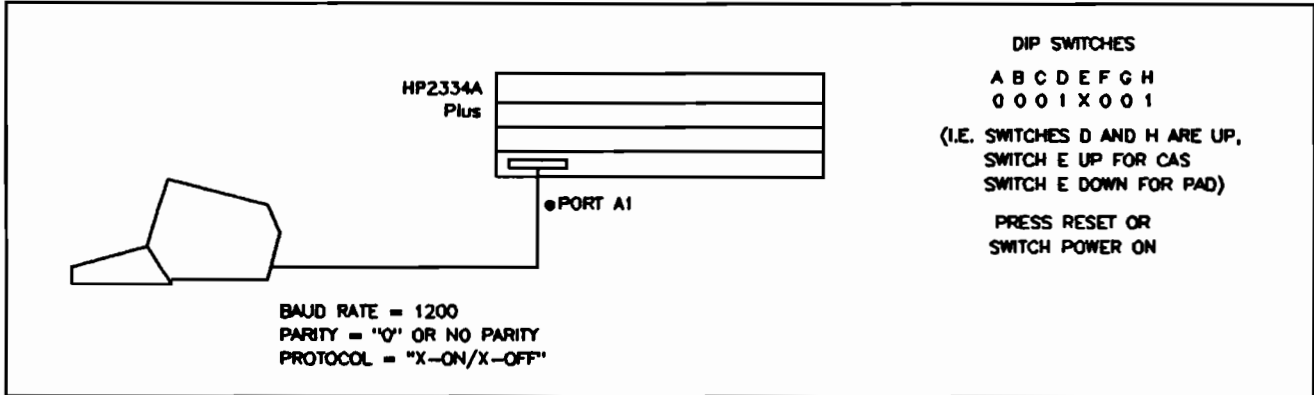


Figure 6-1 HP2334A Plus Local Off-Line Configuration

The HP2334A Plus 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) To modify the Default Configurations, set the CPU Card DIP switches as follows:

For PAD:

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

For CAS:

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

## CONFIGURATION

To reconfigure the HP2334A Plus (i.e. modify an existing configuration) the following steps must be taken:

- 4) Set the HP2334A Plus 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	0	0	0	0	1	Where: 0 = DOWN / OFF

1 = UP / ON  
X = ON or OFF

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

<b>NOTE</b>
-------------

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

### 6.3.2 Procedure

To enter CONFIGURE mode, simply press the CPU Card's reset push-button (or if the HP2334A Plus 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 Plus 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 Plus is being configured LED [1] will be ON (illuminated) as only port A1 is recognized while the HP2334A Plus is in CONFIGURE mode.

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

- 3) The HP2334A Plus automatically provides the initial off-line configuration listing as shown in 6.3.4. If the HP2334A Plus has previously been configured, then the off-line configuration listing provides the HP2334A Plus current configuration.

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

- The HP2334A Plus-to-Synchronous Network (X.25) configuration (see HSA).
- The HP2334A Plus-to-Device (X.3 parameters) configuration (see ASG). This shows the "profile" assigned to each port.
- The hardware installed in the HP2334A Plus. 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 Plus are identified as follows:

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

- 4) The HP2334A Plus then provides an asterisk (\*) prompt and waits for the user's configuration command. For a list of the configuration commands see 6.3.5.

### 6.3.3 Remote Off-Line Configuration

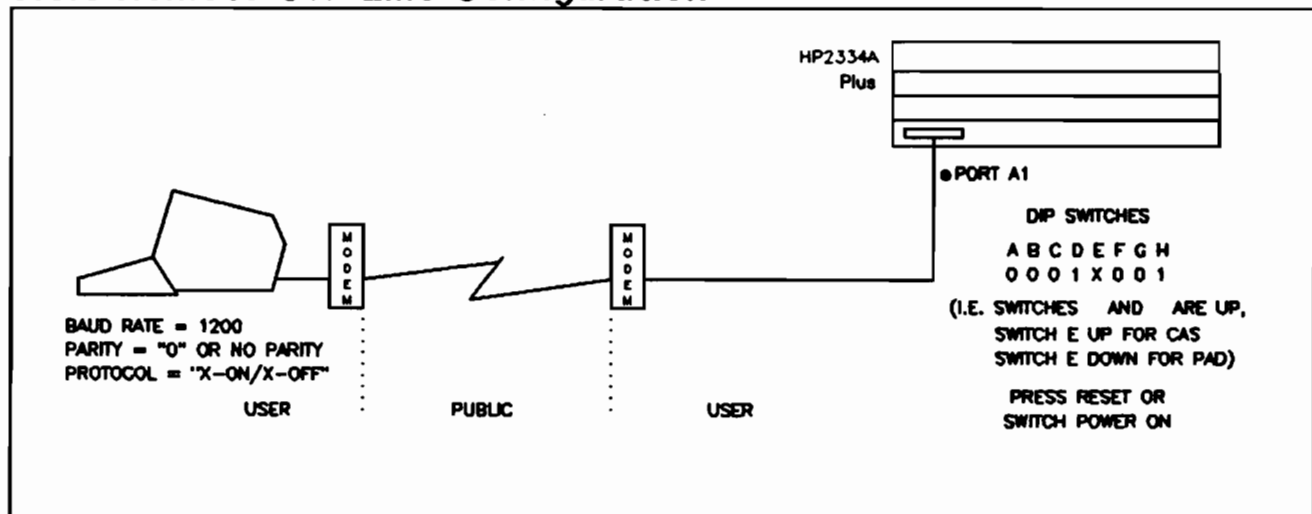


Figure 6-2 HP2334A Plus Remote Off-Line Configuration

The off-line configuration may be performed remotely by connecting a terminal to port A1 of the HP2334A Plus via a telephone line and two full duplex, asynchronous modems (at 1200 baud) as shown in Figure 6-2. An operator is required at the HP2334A Plus 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 any HP2334A Plus located at a remote site (branch offices) without leaving the company headquarters.

Once communication is established between the terminal and the HP2334A Plus, the preparation and configuration procedure is the same as when configuring the HP2334A Plus locally (see Section 6.2, 6.3.1 and 6.3.2).

### 6.3.4 Configuration Listing

#### HP2334A Plus INITIAL CONFIGURATION LISTING - EXAMPLE

HP2334A Rev 26.40 CONFIGURATION

-----

HSA

HP2334 CONFIGURATION X.25 LEVEL I

-----

-PHYS. LINK: X.21 bis DTE	-EXT. SPEED: 19200
-LINE SPEED: Supplied by the modem	-MOD. TIMER: 6000 ms

-----

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 OUT: 2
-WIND. SIZE IN : 2	-THROUGHPUT OUT: 19200
-THROUGHPUT IN : 19200	-PACK. SIZE OUT: 128
-PACK. SIZE IN : 128	-LAST PVC : 3
-FIRST PVC : 1	-LAST SVC IN :
-FIRST SVC IN :	-LAST 2W SVC : 17
-FIRST 2W SVC : 16	-LAST SVC OUT :
-FIRST SVC OUT :	
-D-BIT : NO	
-PKT. NUMBERING: 8	
-FAC. SUPPORTED:	
-PVC ASSOC. PRT: 1:A2, 2:A3, 3:A4	

-----

HP2334 CONFIGURATION X.25 LUG

-----

-REMOTE ADDRESS

-----



HP2334 CONFIGURATION X.25 SRA

```
-----
-REMOTE ADDRESS
-1) 01 <---REM_ADDR
-2) 17 <---RDIAG
-----
```

HP2334A CONFIGURATION: PORT POOLS

```
-----
-First port pool: From -- to --
-Second port pool: From -- to --
-Third port pool: From -- to --
-----
```

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      02334-80400 . 02334-80410 . 02334-80420 . 02334-80430
SC-D          .                   .
SC-C          .                   .
SC-B          .                   .
SC-A   5181-0514 . 5181-0515 . RS232MOD 4 ports
```

For more information, use the <HELP> command.

**NOTE:** If the default CAS profile has been selected, the differences that will be seen in the listing are given below:

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
-----
```

ASG

Assignment for each port

.	1	2	3	4
D	71	71	71	71
C	71	71	71	71
B	71	71	71	71
A	71	71	71	71



In the Configuration Listing Example one Synchronous Network Adapter Card, one Device Interface Card (4 Channel Processor Card) and one Device Adapter Card have been fitted. In the example:

- 1) HSA refers to the Synchronous Network Adapter Card fitted in slot "A" of the Network Adapter Backplane.
- 2) Certain parameters in X.25 Level 1 to Level 3 are pre-selected and cannot be changed by the user. Details of these parameters are given in Section 6.5.
- 3) The four part numbers listed adjacent to CPU refer to the four 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 Plus. The Modem Control Adapter Card is shown as: RS232MOD 4 ports.

**NOTE:** The default PAD configuration also includes one pre-defined Automatic Dial assignment (ADL), which is assigned to port A1. If the HP2334A Plus is used with a PSN this ADL assignment must be disabled, or the Symbolic Remote Address (SRA) modified. To do this refer to Sections 6.9 and 6.6 respectively.

### 6.3.5 Configuration Commands

In CONFIGURE mode the HP2334A Plus 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 <u>RETURN</u>	Configure Synchronous Network parameters.
*	ASG <u>RETURN</u>	Assign a profile for each port.
*	LIST <u>RETURN</u>	Lists the Synchronous Network configuration, the device port profile assignments and the hardware/firmware installed in the HP2334A Plus.
*	ADL <u>RETURN</u>	Assign automatic dial for each port.
*	UDP <u>RETURN</u>	Create a user defined profile.
*	DEF-PAD <u>RETURN</u>	Define the HP2334A Plus as a default PAD.
*	DEF-CAS <u>RETURN</u>	Define the HP2334A Plus as a default CAS.

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 6.4.2, 6.7.2, 6.9 and 6.7.5 respectively).

The Configuration Listing (see 6.3.4) 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 6.4.2.

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

### 6.3.6 Help Commands

A HELP facility is incorporated into the HP2334A Plus, and it can be accessed from anywhere within the interactive operation. In the configuration mode it is accessed by entering HELP RETURN in response to the configure asterisk (\*) prompt. The HELP facility takes the form of screens which give information on available commands, and the associated syntax. Details of these screens and the information they contain is given in Appendix B.

## 6.4 SYNCHRONOUS NETWORK CONFIGURATION

### 6.4.1 Introduction

The HP2334A Plus-to-synchronous network data communication parameters defined by default are intended for use in a statistical multiplexer configuration via a leased line. If the HP2334A Plus is to be used in any other configuration then the parameters must be modified to correspond to that configuration.

If any of the parameters need to be changed proceed as follows:

To modify the HP2334A Plus-to-synchronous network data communication parameters, the HP2334A Plus must be in CONFIGURE mode (\* prompt). Access to the configuration in off-line mode is detailed in 6.3.1 and 6.3.2. Access to the configuration in on-line mode is detailed in 7.4.1 (for local access) and 8.3 (for remote access).

The HP2334A Plus-to-synchronous network configuration can be modified using the HSA primary command. This command allows the user to modify 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), Local User Group (LUG) and Port Pool (POOL) 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 Plus then enters the synchronous network configuration definition mode and displays on the terminal the user prompt:

HSA:

The HSA secondary user commands detailed in 6.4.2 are then available for use.

## 6.4.2 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 <u>RETURN</u>	Configure X.25 Level 1 parameters
HSA: LEVEL2 <u>RETURN</u>	Configure X.25 Level 2 parameters
HSA: LEVEL3 <u>RETURN</u>	Configure X.25 Level 3 parameters
HSA: MSG <u>RETURN</u>	Configure internal messages
HSA: SRA <u>RETURN</u>	Define Symbolic Remote Address
HSA: LUG <u>RETURN</u>	Define Local User Group
HSA: POOL <u>RETURN</u>	Define Port Pools
HSA: LIST1 <u>RETURN</u>	List X.25 Level 1 parameter values
HSA: LIST2 <u>RETURN</u>	List X.25 Level 2 parameter values
HSA: LIST3 <u>RETURN</u>	List X.25 Level 3 parameter values
HSA: LISTMSG <u>RETURN</u>	List internal messages
HSA: LISTSRA <u>RETURN</u>	List Symbolic Remote Address definition
HSA: LISTLUG <u>RETURN</u>	List Local User Group
HSA: LISTPOOL <u>RETURN</u>	List Port Pools
HSA: <u>RETURN</u>	Exit (returns the CONFIGURE asterisk (*) prompt)

Note that the first seven of the above HSA secondary commands are used for parameter configuration/definition and the following seven 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 Plus then returns the CONFIGURE asterisk (\*) prompt.

## 6.4.3 Configuration Procedure

Once the HSA: prompt has been obtained as described in 6.4.1 the appropriate HSA secondary commands must be entered to configure the X.25 levels and facilities in the order shown in 6.4.4, "Configuration Dialogue Example". Certain configuration parameters (e.g. Packet Size) are preconfigured in the HP2334A Plus. The HP2334A Plus does not provide a prompt for these parameters and they cannot be changed by the user.

The HP2334A Plus 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 Plus responds with the following message: "Unknown command, type <HELP> for more information..."

If the HP2334A Plus is being configured for the first time the default PAD configuration will be the one being modified. (Unless the HP2334A Plus has already been defined as a default CAS, and is in CAS CONFIGURE mode). When modifications are being made, any parameter (except virtual circuits) that does not need to be changed can be kept by simply pressing the terminal's RETURN key which validates the

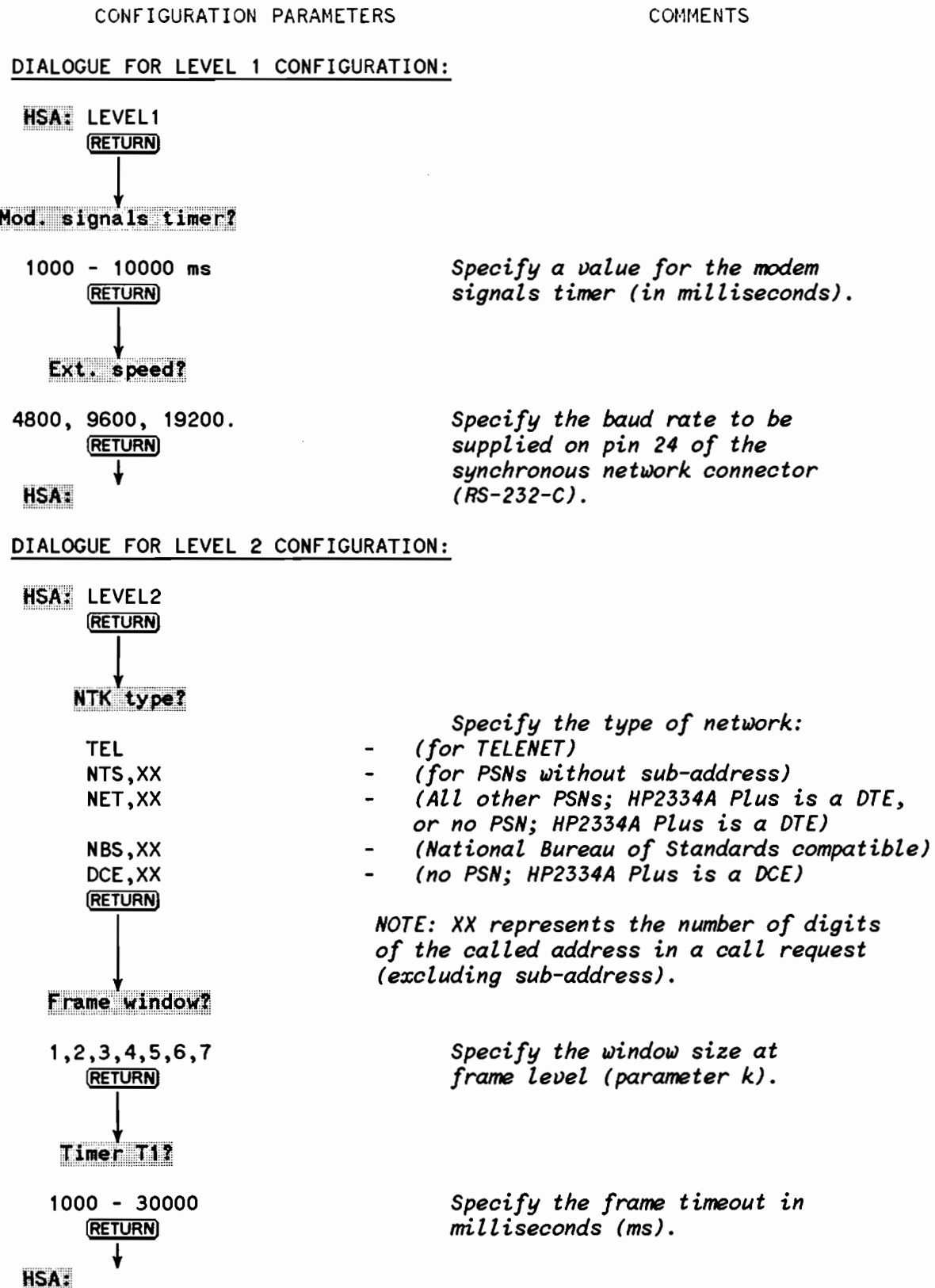
existing parameter value. When assigning virtual circuits, a carriage return (Cr) (generated by pressing RETURN) in response to a prompt (question) means that there are no virtual circuits of the defined type.

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 6.5. For details of the HP2334A Plus Messages (MSG), Symbolic Remote Address (SRA), Local User Group (LUG) and Port Pool (POOL) facilities refer to Section 6.6.

The values and responses selected when configuring the HP2334A Plus synchronous network communication parameters **MUST** match those defined at the remote location (e.g. the other HP2334A Plus 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 6.4.2.

### 6.4.4 Configuration Dialogue Example



CONFIGURATION PARAMETERS

COMMENTS

DIALOGUE FOR LEVEL 3 CONFIGURATION:

HSA: LEVEL3  
(RETURN)

Local Address?

(nnnnnnnnnnnnnss)  
(RETURN)

*Specify the local network address of the HP2334A Plus (up to 13 digits) + relative sub-address base (two 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 Plus.*

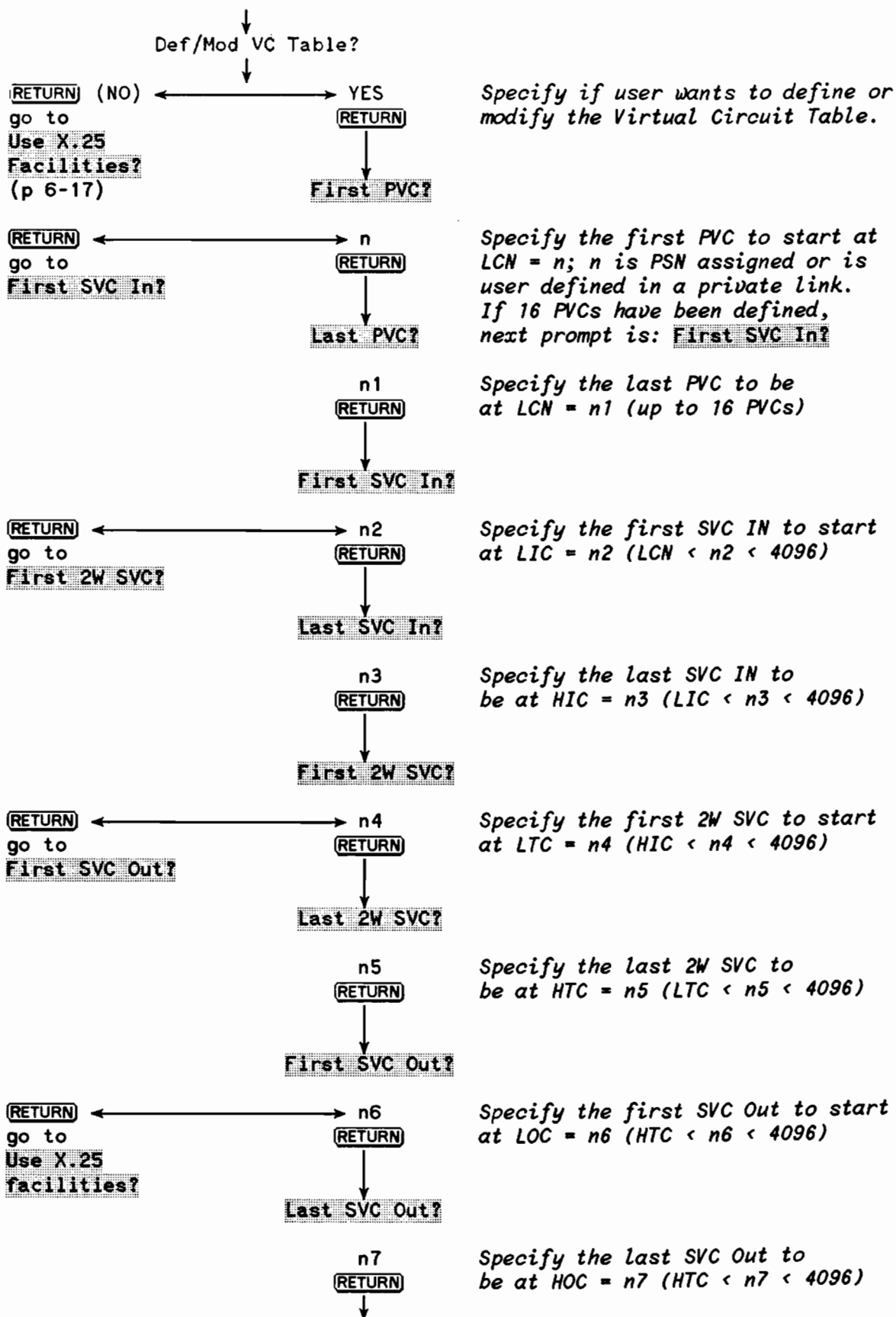
Window Size Out?

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

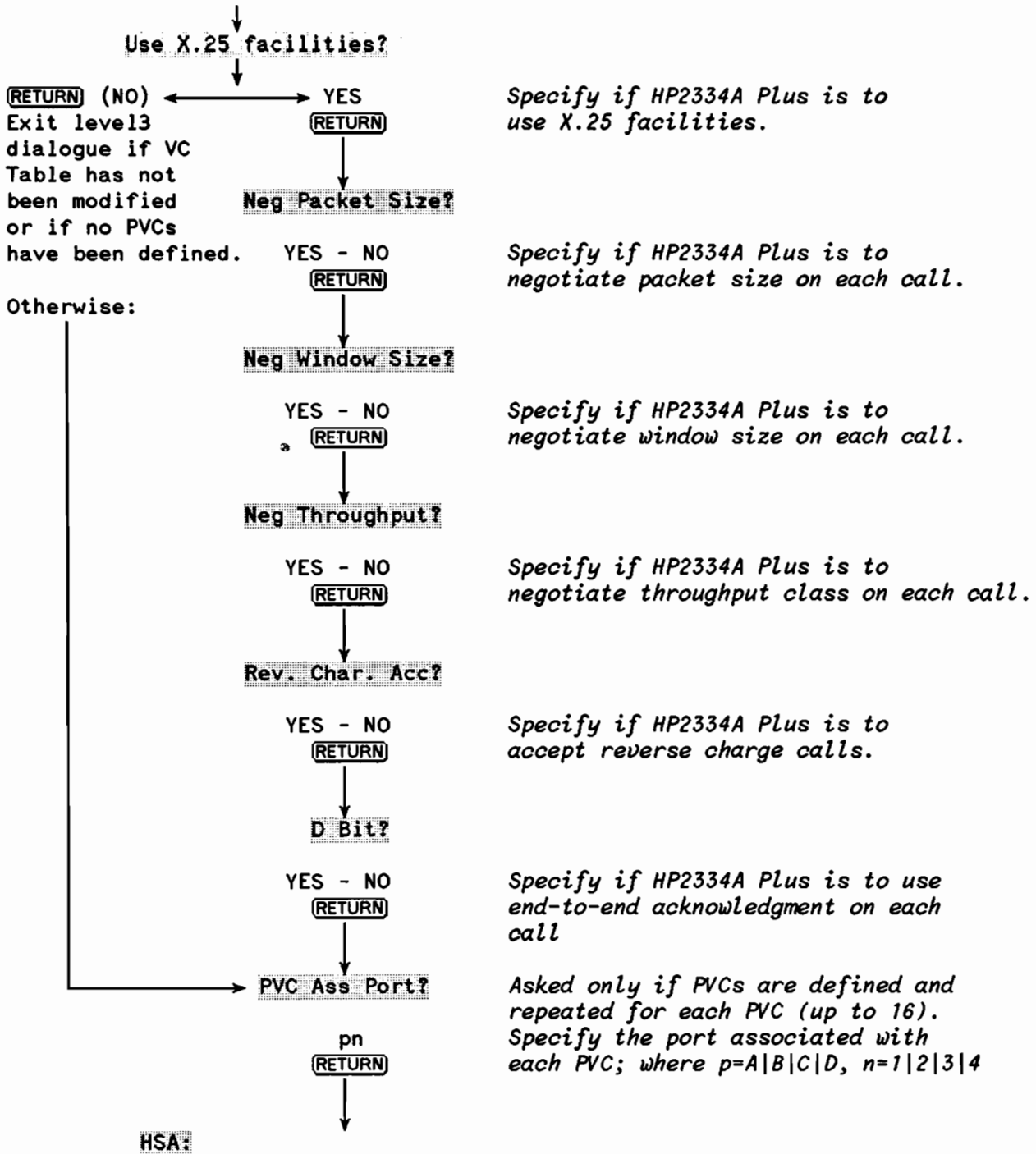
*Specify the window size from the HP2334A Plus to the network.*

continued on next page:





continued from previous page:



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 (CONTROL) W (RETURN) 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 (CONTROL) W (RETURN) if no message. Press (RETURN) to keep the existing message.

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

CONFIGURATION PARAMETERS

COMMENTS

DIALOGUE FOR SYMBOLIC REMOTE ADDRESS CONFIGURATION:

HSA: SRA

**RETURN**

**Call limited to SRA?**

Y or N

**RETURN**

**Add or Clear?**

AD or CL

**RETURN**

**SRA?**

"sssssss"

**RETURN**

**Remote Address Ass.?**

"nnnnnnnnnnnnnnnn"

**RETURN**

HSA:

*Specify if calls are to be limited to SRA.*

*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.*

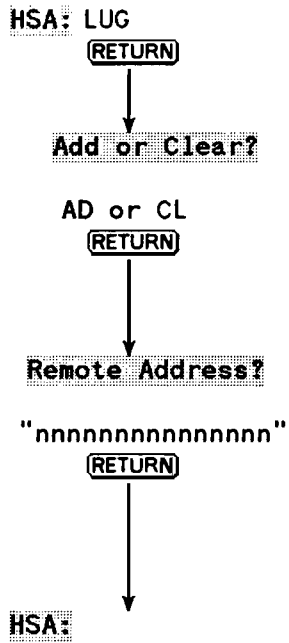
*Specify the remote DTE address which is associated to the symbolic name (up to 15 digits); n = 0 to 9. The SRA prompt is then repeated (up to 16 SRAs can be defined).*

**Warning:** If user answers "Y" to **Call limited to SRA?** question and does not define any SRAs, no outgoing calls will be allowed.

CONFIGURATION PARAMETERS

COMMENTS

DIALOGUE FOR LOCAL USER GROUP CONFIGURATION:



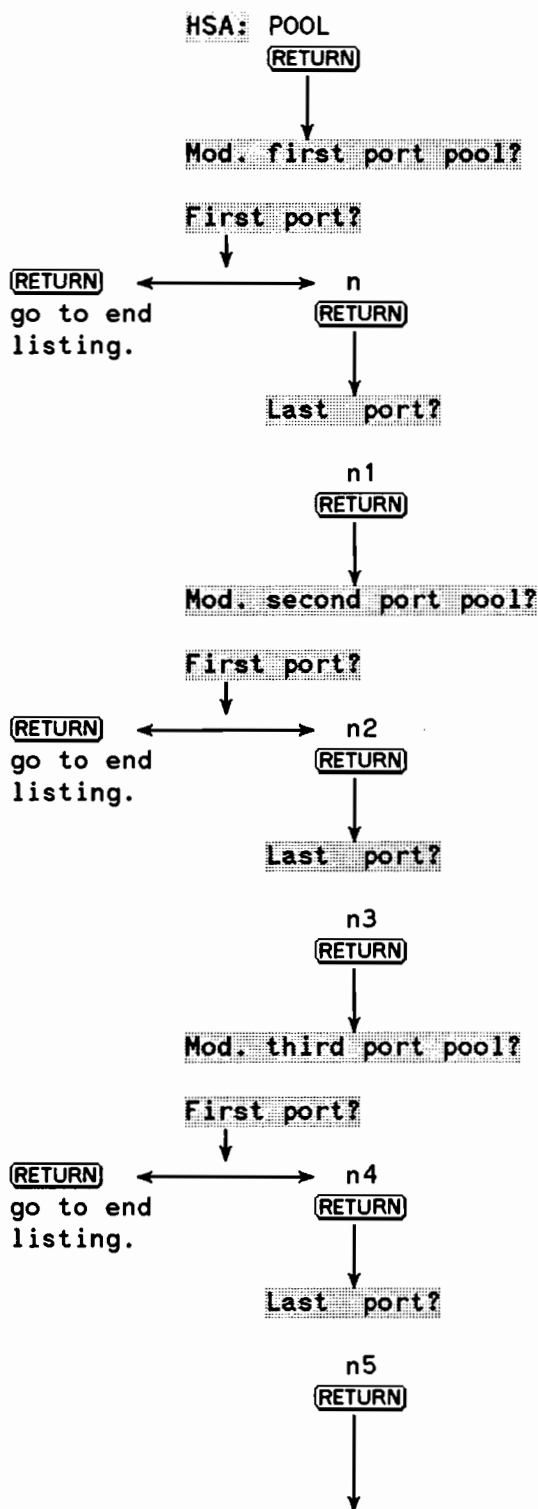
*Specify if user wants to add to or redefine the LUG list. AD = Adds, CL = Clears ALL and prompts for new inputs.*

*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 PORT POOL CONFIGURATION:



Specify the HP2334A Plus port number (eg: A1) for the first port in the first pool. Press (RETURN) to exit and clear all port pools.

Specify the HP2334A Plus port number for the last port in the first pool.

Specify the HP2334A Plus port number for the first port in the second pool. Note:  $n2 > n1$ . Press (RETURN) to exit and clear remaining port pools.

Specify the HP2334A Plus port number for the last port in the second pool.

Specify the HP2334A Plus port number for the first port in the third pool. Press (RETURN) to exit and clear remaining port pool.

Specify the HP2334A Plus port number for the last port in the third pool. On completion the dialogue is exited, and a port pool listing provided.

HP2334 CONFIGURATION: PORT POOLS

- 
- First port pool: From n to n1
  - Second port pool: From n2 to n3
  - Third port pool: From n4 to n5
- 

**HSA:**

## 6.5 X.25 CONFIGURATION LEVELS

### 6.5.1 X.25 Level 1

X.25 Level 1 defines the physical, electrical and handshake characteristics between the HP2334A Plus and the synchronous network. At Level 1 there are two user selectable parameters and two pre-selected parameters. These are as follows:

#### User Selectable Parameters (HSA: LEVEL1).

- **MODEM SIGNALS TIMER.** This parameter specifies the maximum time period that the HP2334A Plus waits after a synchronous line drop before considering that the line is down. The time that may be specified for the modem signals timer must be in the range of 1000 to 10000 milliseconds (smallest change = 10 milliseconds).
- **EXTERNAL SPEED.** This user selectable parameter value is for the external line speed. The following external line speeds are available:

4800 bps  
9600 bps  
19200 bps

When connected to a PSN or any synchronous modem, the HP2334A Plus will support any line speed up to 19200 bps as the timing signals are provided by the modem.

Where the HP2334A Plus is required to provide a timing signal, the internal clock (on pin 24) provides speeds according to the configured external speed value. An example of this situation could be a private X.25 network using direct (modem suppresser) cable connections.

#### Pre-selected Parameters.

- **PHYSICAL LINK.** The pre-selected parameter value for the physical link is always X.21bis DTE for the HP2334A Plus.
- **LINE SPEED.** The value for the line speed is provided by the synchronous modem. The HP2334A Plus supports all line speeds between 140 and 19200 bps.



## 6.5.2 X.25 Level 2

The HP2334A Plus 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 Plus 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 Plus is connected to. The synchronous network may be a PSN (see Section 1.8 for a list of PSNs that the HP2334A Plus is certified for use with) or a private X.25 network. When configuring the HP2334A Plus, the network types fall into five categories; these are as follows:
  - 1) TEL - TELENET (U.S.A.) only.
  - 2) NTS,XX - For all PSNs which do not support sub-address.
  - 3) NET,XX - For ALL other networks (PSNs or modem-link networks) where the HP2334A Plus is a DTE (see NOTE below).
  - 4) NBS,XX - For use with networks compatible with the National Bureau of Standards.
  - 5) DCE,XX - For non-PSN networks only; when the HP2334A Plus 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 Plus 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 2) must be specified.

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

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

**NOTE:** Certain PSNs do not want to receive any calling address in a call request packet. In this case XX must be configured with a value of "0". (e.g. TRANSPAC).

- **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 Plus 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 Plus 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 retransmission 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
4800 bps	3000 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 Plus automatically sets the value of N2 to 20.
- **EQUIPMENT TYPE.** When the HP2334A Plus (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 Plus equipment type is always LAP-B DTE (Link Access Protocol - Balanced, Data Terminal Equipment) when the HP2334A Plus is connected to a public PSN.

The only exception is when one HP2334A Plus is acting as a LAP-B DCE (the other HP2334A Plus 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 Plus to recognize that it is acting as a LAP-B DCE.

The HP2334A Plus 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 Plus 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 Plus does not support the Fast Select facility.

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

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

The HP2334A Plus sub-addressing feature enables a remote DTE calling the HP2334A Plus 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, then a virtual circuit will be established with the first available free port (i.e. a port not engaged on an SVC) in the first Callable Port Pool (if defined). 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 Plus 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 99) to the PSN assigned local address.

**WARNING:** If the sub-address is not specified then the HP2334A Plus 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:**

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

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 first 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 Plus 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 Plus statistical information (e.g. line quality).

By defining Callable Port Pools 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 Plus (local address) to only those remote DTEs defined in the LUG. The HP2334A Plus 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 dependent 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 Plus 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 Plus) and the window size out (from the HP2334A Plus 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 Plus 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 Plus and a remote host computer). The HP2334A Plus may be connected to up to 16 VCs at any time (one per device port); 17 if the Test Port of the HP2334A Plus is also 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 Plus 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 Plus.

**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 Plus.

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.

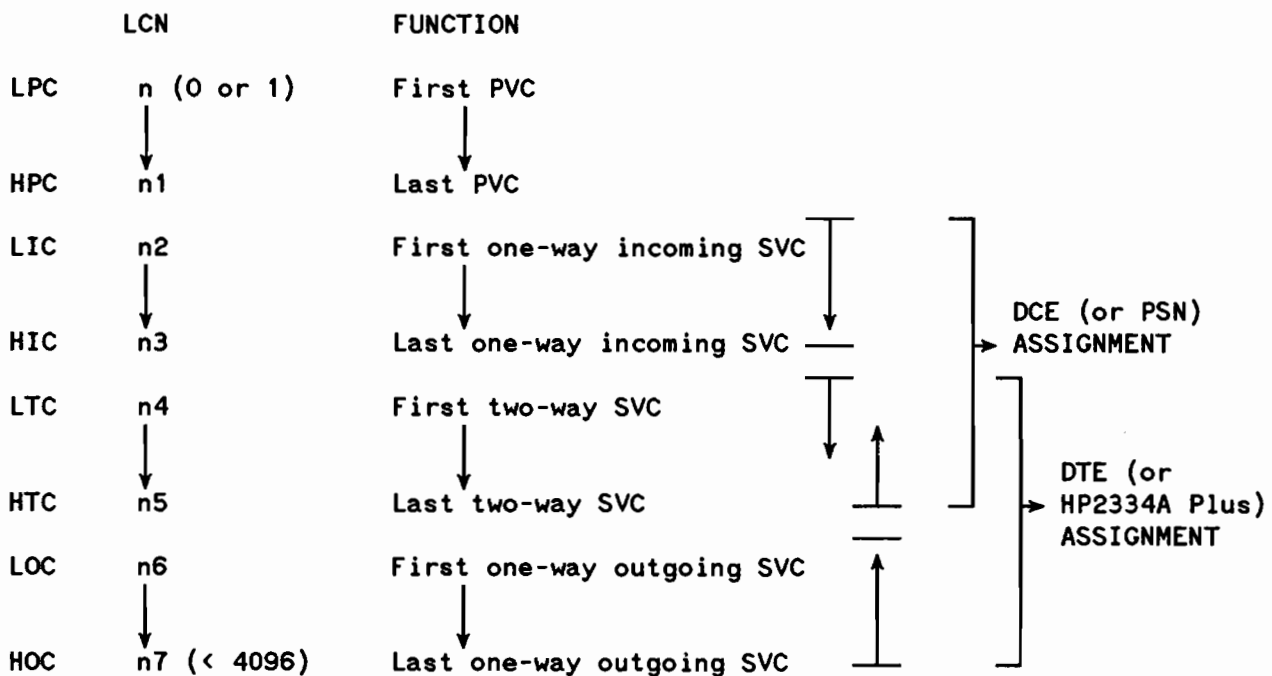


Figure 6-3 Virtual Circuit Assignment

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 Plus is to be used with a PSN only the VCs subscribed for must be configured in the HP2334A Plus. 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 Plus 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 Plus, 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 Plus 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 Plus 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 Plus is the DTE or the DCE.

**NOTE:** When the HP2334A Plus is to be used in a Stat Mux Configuration, it is recommended that any printer-connected device ports are either assigned PVCs or are configured with the ADL facility (see Section 6.9) if SVCs are to be used.

- **NEGOTIATE PACKET SIZE, WINDOW SIZE & THROUGHPUT CLASS.** These facilities enable the HP2334A Plus 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 Plus the negotiate facility for the relevant parameter(s) should be subscribed for with the PSN and configured in the HP2334A Plus.

While the HP2334A Plus 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 Plus 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 Plus configured value.

The capability of the HP2334A Plus to negotiate these parameters enables conflicting default parameter values (between the HP2334A Plus 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 Plus 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 Plus if reverse charge calls are to be accepted. It is identical to telephone "collect" calls in that the user at the HP2334A Plus local address is billed for received calls requesting reverse charge. This facility is only available when the HP2334A Plus is to be used with a PSN.

**NOTE:** A reverse charge request may be placed on a call from an HP2334A Plus 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 acknowledgment of data packets. If required, this facility must be subscribed for with the PSN and configured in the HP2334A Plus; it is then effective on all calls (SVCs and PVCs).

With local acknowledgment (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 acknowledgment (D-bit enabled), the PSN transfers a packet to its destination and the receiving device returns an acknowledgment (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 Plus 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 Plus 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).

## 6.6 MSG, SRA, LUG & POOL CONFIGURATION

Message Configuration (HSA: MSG). The HP2334A Plus 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 (RETURN)** 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 Plus is in RUN mode. If no message is required simply press **(CONTROL) W (RETURN)**. 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 Plus Test Port and to local on-line modification to the configuration using the LDIAG facility. 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 (RETURN)**. 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.

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

- **CALL LIMITED TO SRA? (YES - NO).** The call limited to SRA prompt allows the user to specify whether or not outgoing calls are limited to the remote addresses on the SRA list.
- **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 Plus 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 E) except " ", "+", and "Cr" (see configuration dialogue in 6.4.4.). 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 Plus will then prompt the user for the next SRA. To exit SRA definition simply press **(RETURN)** in response to the SRA prompt. When 16 SRAs have been defined the HP2334A Plus automatically exits the SRA definition dialogue.

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

**WARNING:** If the reply to the "CALL LIMITED TO SRA?" question is "YES", and no SRAs are defined, ALL outgoing calls will be cleared. The LISTSRA secondary command should be used to ensure that if calls have been limited to SRAs, SRAs do actually exist.

**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, an "ERR" error message is displayed on the terminal screen. To redefine other SRAs the user must clear and redefine the complete SRA list.

**Local User Group Configuration (HSA: LUG):** This is an optional HP2334A Plus facility that enables the HP2334A Plus 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. To exit the LUG definition simply press **(RETURN)** in response to the LUG prompt. When 16 LUGs have been defined the HP2334A Plus automatically exits the LUG definition mode.

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 HP2334A Plus 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 Plus 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 an "ERR" error message is displayed on the terminal screen. To redefine other LUG filters the user must clear and redefine the complete LUG list.

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

**Port Pool Configuration (HSA: POOL).** This is an optional HP2334A Plus facility which allows the creation of up to three groups of HP2334A Plus device ports which can be accessed by incoming calls. This feature is particularly important when output devices (e.g. printers) are connected to the HP2334A Plus and when the HP2334A Plus is used for Computer Access Support (CAS). If a call is received without sub-address (or with the relative sub-address base value), then a virtual circuit is established with the first free device port in the first port pool. Thus this can be used to prevent 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 First Callable Port Pool. If no port pool has been defined, or all of the ports are engaged the call, is rejected with CLR DTE 0.
- If an incoming call is received with the sub-address 18 (or the relative sub-address base value + 18), the call will be directed to the first free port in the second port pool. If all of these ports are engaged (or the pool has not been defined) the call is cleared.
- If an incoming call is received with the sub-address 19 (or the relative sub-address base value + 19), the call will be directed to the first free port in the third port pool. If all of these ports are engaged (or the pool has not been defined) the 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 Pools and if included in the ranges of port pools they are listed but are not considered part of any of the port pools. Thus the device port(s) which are specified by the user to be included in any of the port pools must not be assigned to PVCs.

**NOTE:** The HP2334A Plus does not include non-existent ports or ports assigned to PVCs in any of the port pools. Each callable port pool must be defined by the user. Each port pool must be independent, as a port cannot be used by more than one port pool.

## 6.7 ASYNCHRONOUS PORTS PROFILE CONFIGURATION

### 6.7.1 Introduction

The HP2334A Plus 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 Plus also supports 25 additional "local parameters" which provide greater control and more capabilities for the PAD and PAD Support functions. Note that 8 of the 25 local parameters are reserved and cannot be modified. The PAD parameters are detailed in Section 6.8.

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 9 pre-defined profiles (Basic Defined Profiles or BDPs) are available in the HP2334A Plus in order to meet the requirements standard device interfacing and for use as an initial standard profile set for creating User Defined Profiles (UDPs). A total of 5 pre-defined UDPs are also available, and these can be modified or even deleted (except profile #100 which can only be modified) by the user (see 6.7.5). Each device must be assigned a PAD profile in the HP2334A Plus by using the ASG user command (see 6.7.2 and 6.7.3). Note that when the asynchronous, point-to-point port(s) of a non-X.25 host computer are connected to the HP2334A Plus, the HP2334A Plus 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 Plus device ports.

For non-standard applications/device interfacing the user may create a "User Defined Profile" (UDP) or modify an existing UDP using the UDP command (see 6.7.5 and 6.7.6).

The HP2334A Plus 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 6.9) and each device may have one remote address (a Symbolic Remote Address) assigned to it.

The LIST command is detailed in Section 6.10 and typical configuration examples are given in Section 6.11.

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

## 6.7.2 ASG User Command

The ASG primary user command is used to assign PAD or CAS/PAD profiles to the HP2334A Plus 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 Plus to be prepared as described in 6.3.1 and to be in CONFIGURE mode as described in 6.3.2.

Using an interactive terminal connected to device port A1 (in off-line mode) or any connected terminal (in on-line mode) the port profile assignments may 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 Plus 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 6.7.3. The following secondary user commands are then also available for use:

PROMPT	COMMAND	ACTION
ASG:	LIST <b>RETURN</b>	List assignment values.
ASG:	<b>RETURN</b>	Exit assignment mode.

Note that if any secondary command not shown above is entered at the ASG level then it is rejected with an "Unknown command, type <HELP> for more information...". 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 6.7.3.

### 6.7.3 Profile Assignment Procedure

Once the ASG: prompt has been obtained as described in 6.7.2, the user may assign a PAD (or CAS/PAD) profile to each of the HP2334A Plus 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) and pre-defined User Defined Profiles (UDPs) are available in the HP2334A Plus as an initial standard profile set (see 6.7.4). 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 Plus. Refer to 6.7.5 for details of the UDP command and 6.7.6 for the UDP definition procedure.

Note that any profile which is assigned to a port must be defined in the HP2334A Plus. If a profile is specified which has not been defined then it is rejected with an "ERR" error message. The HP2334A Plus default configurations provide BDP #1 assigned to all ports (default PAD), or BDP #71 assigned to all ports (default CAS).

The selected profiles are assigned to the ports as follows:

SYNTAX	ACTION
ASG: pn[,pn[,...]]:<m> <b>RETURN</b>	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}.
	Example: ASG:A,B1:21 <b>RETURN</b> 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.

### 6.7.4 PAD Profiles

Several Basic Defined Profiles (BDPs) and pre-defined User Defined Profiles (UDPs) are available in the HP2334A Plus 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 Plus. 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 Plus. They have been tested and can be defined by using the UDP commands. In the following tables, pre-defined UDPs are denoted by (d). Refer to 6.7.5 for details of the UDP command and 6.7.6 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 Plus is to be used:

- HP2334A Plus 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 or UDP (defined)
Profile # 1	Std. PAD (CCITT 1980 X.3)	BDP
Profile #2	Std. PAD (No Modem Signals)	UDP (d)
Profile #21	Std. PRINTER	BDP
Profile #31	HP CRTs PAD	BDP

Table 6-1 PAD Profiles

BASIC PROFILE	UTILIZATION
Profile # 1	All the character mode and HP block mode applications supported by the HP2334A Plus working with terminals using X-ON/X-OFF flow control.
Profile # 2	As Profile # 1, but with Modem Signals disabled.
Profile #21	Used to connect the HP2334A Plus in Cluster Controller Configuration to supported printers.
Profile #31	All character and HP block mode applications for the HP2334A Plus working with HP terminals using X-ON/X-OFF flow control and ENQ/ACK protocol.

Table 6-2 PAD Profile Utilization

- **HP2334A Plus 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 Plus 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 (working with a remote public PAD)	Prof. #101	BDP
Profile #61	CAS/PAD (working with a public PAD)	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 (d)
Profile #74	HP3000 CAS/PAD (PSN)	Prof. #144	UDP
Profile #75	HP3000 CAS/PAD	Prof. #141	UDP (d)

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

**NOTE:** Only profiles #51, #61, #71, #73 and #75 are defined in the HP2334A Plus. Profiles #72 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 and #144) by using the UDP command.

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

BASIC PROFILE	UTILIZATION
Profile #51	Supports full duplex transmission between a CAS/PAD and a public PAD supporting only the first 11 X.3 parameters.
Profile #61	Supports full duplex transmission between a CAS/PAD and a public PAD supporting only the first 12 X.3 parameters.
Profile #71	Supports full duplex transmission (including block-mode) between an HP2334A Plus PAD and CAS/PAD for the HP3000. Supports HP terminals and printers.
Profile #72	Supports full duplex transmission and EDIT/1000 between an HP2334A Plus PAD and CAS/PAD for the HP1000.
Profile #73	Supports full duplex transparent transmission (binary transfers) between an HP2334A Plus 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 Plus PAD (see local par #14), for HP terminals only. Note: Passwords are displayed. For block mode applications use prof #71.
Profile #75	Supports full duplex transmission (including block-mode) with modem signals disabled between the HP2334A Plus PAD and CAS/PAD for the HP3000.

Table 6-4 CAS/PAD Profile Utilization

**NOTE:** When the "break" function is required the "break" character must be entered twice. It may, however, be necessary to enter the "break" character more than twice as the characters sent may not be sensed immediately.



- Remote PAD (associated to CAS/PAD) Profiles

PROF. NUMBER	COMMENTS	BDP or UDP
Profile #101	Remote PAD is a standard PAD (11 X.3 parameters).	BDP
Profile #121	Remote PAD is a standard PAD (12 X.3 parameters).	BDP
Profile #141	Remote PAD is an HP2334A Plus (X.3 and local parameters).	BDP
Profile #142	Remote PAD to support EDIT/1000 (HP1000).	UDP
Profile #143	Remote PAD supports full duplex transparent.	UDP (d)
Profile #144	Remote PAD is an HP2334A Plus (X.3 and local parameters).	UDP

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

**NOTE:** Only profiles #101, #121, #141 and #143 are defined in the HP2334A Plus; profiles #142 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 19 parameters of 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 19 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, 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 (BDPs)

PROFILE: 1 21 31 51 61 71 101 121 141

X.3 PARAMETERS:

01 Esc Data Transfer	1	0	1	0	0	0	1	1	1
02 Echo	1	0	1	0	0	0	0	0	0
03 Data Forwarding	2	0	2	0	0	127	0	0	127
04 Idle Timer	0	10	0	1	1	0	1	1	0
05 HP2334A Xon/Xoff	1	0	1	1	1	1	1	1	1
06 PAD messages	5	0	5	0	0	0	-	-	-
07 Break processing	21	0	21	0	0	0	21	21	21
08 Discard output	0	0	0	0	0	0	0	0	0
09 Cr padding	0	0	0	0	0	0	-	-	-
10 Line folding	0	0	0	0	0	0	-	-	-
11 Baud Rate	14	14	14	14	14	14	-	-	-
12 Device Xon/Xoff	1	1	1	1	1	1	-	1	1
13 Lf insertion	0	0	0	0	0	0	-	-	-
14 Lf padding	0	0	0	0	0	0	-	-	-
15 Editing mode	1	0	1	0	0	0	-	-	0
16 Backspace char.	8	8	8	8	8	8	-	-	-
17 Line delete char.	24	24	24	24	24	24	-	-	-
18 Line display char.	0	0	0	0	0	0	-	-	-

LOCAL PARAMETERS: (accessed with parameter 0: value 13)

01 Parity specifications	0	0	0	0	0	0	-	-	-
02 Read specifications	0	0	0	0	0	0	-	-	0
03 Read trigger	0	0	17	0	0	0	-	-	0
04 End of Record	0	0	0	0	0	0	-	-	0
05 Alternate EOR	0	0	0	0	0	0	-	-	0
06 Data compaction	0	0	0	0	0	0	-	-	-
07 Reserved	128	128	128	128	128	128	-	-	-
08 Subsys break char.	0	0	25	0	0	0	-	-	25
09 Subsys break proc.	0	0	64	0	0	0	-	-	64
10/11/12 Reserved	0	0	0	0	0	0	-	-	-
13 Line Delete Msg	3	3	1	3	3	3	-	-	1
14 Echo & modem sign.	2	2	2	2	2	4	-	-	-
15 Auto speed	0	0	0	0	0	0	-	-	-
16/17 Reserved	0	0	0	0	0	0	-	-	-
18 Read count MSB	63	63	63	0	0	0	-	-	8
19 Read count LSB	255	255	255	128	128	128	-	-	255
20 Async. mod. timer	50	50	50	0	0	0	-	-	-
21 Reserved	0	0	0	0	0	0	-	-	-
22 Write mode Enq Ack	64	64	88	64	64	96	-	-	92
23 Line size	1	1	1	1	1	1	-	-	-
24 Std PAD or CAS/PAD	0	0	0	101	121	141	-	-	-
25 Reserved	0	0	0	0	0	0	-	-	-

"-" indicates original profile parameter not modified.

Table 6-6 Profile Parameter Definition

USER DEFINED PROFILES (UDPs)

PROFILE: 2\* 72 73\* 74 75\* 100\* 142 143\* 144

X.3 PARAMETERS:

01 Esc Data Transfer	1	0	0	0	0	0	0	0	1
02 Echo	1	0	0	0	0	1	0	0	1
03 Data Forwarding	2	127	127	127	127	2	127	127	2
04 Idle Timer	0	0	0	0	0	0	0	0	0
05 HP2334A Xon/Xoff	1	1	0	1	1	1	1	0	1
06 PAD messages	5	0	0	0	0	0	-	-	-
07 Break processing	21	0	0	0	0	0	8	8	21
08 Discard output	0	0	0	0	0	0	0	0	0
09 Cr padding	0	0	0	0	0	0	-	-	-
10 Line folding	0	0	0	0	0	0	-	-	-
11 Baud Rate	14	14	14	14	14	3	-	-	-
12 Device Xon/Xoff	1	0	0	0	1	1	0	0	1
13 Lf insertion	0	0	0	0	0	4	-	-	-
14 Lf padding	0	0	0	0	0	0	-	-	-
15 Editing mode	1	0	0	0	0	1	0	0	1
16 Backspace char.	8	8	0	8	8	8	-	-	-
17 Line delete char.	24	24	0	24	24	24	-	-	-
18 Line display char.	0	0	0	0	0	0	-	-	-

LOCAL PARAMETERS: (accessed with parameter 0: value 13)

01 Parity specifications	0	0	0	0	0	0	-	-	-
02 Read specifications	0	0	1	0	0	0	0	0	0
03 Read trigger	0	0	0	0	0	0	0	0	0
04 End of Record	0	0	0	0	0	43	0	0	0
05 Alternate EOR	0	0	0	0	0	0	0	0	0
06 Data compaction	0	0	0	0	0	0	-	-	-
07 Reserved	128	128	128	128	128	128	-	-	-
08 Subsys break char.	0	0	0	0	0	0	25	0	25
09 Subsys break proc.	0	0	0	0	0	0	64	0	64
10/11/12 Reserved	0	0	0	0	0	0	-	-	-
13 Line Delete Msg	3	0	0	3	3	3	1	1	1
14 Echo & modem sign.	8	0	4	4	8	0	-	-	-
15 Auto speed	0	0	0	0	0	0	-	-	-
16/17 Reserved	0	0	0	0	0	0	-	-	-
18 Read count MSB	63	0	0	0	0	0	8	0	12
19 Read count LSB	255	128	64	128	128	128	255	64	255
20 Async. mod. timer	50	0	0	0	0	0	-	-	-
21 Reserved	0	0	0	0	0	0	-	-	-
22 Write mode Enq Ack	64	96	69	96	96	84	92	69	92
23 Line size	1	1	1	1	1	1	-	-	-
24 Std PAD or CAS/PAD	0	142	143	144	141	0	-	-	-
25 Reserved	0	0	0	0	0	0	-	-	-

UDPs marked with an asterisk (\*) are pre-defined in the HP2334A Plus.

Table 6-6 Profile Parameter Definition (continued)

## 6.7.5 UDP User Command

The UDP primary user command is used to create or modify User Defined Profiles (UDPs). The HP2334A Plus 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 Plus must initially be prepared as described in 6.3.1 and be in CONFIGURE mode as described in 6.3.2. Once the CONFIGURE asterisk (\*) prompt is obtained the UDP command may be entered and the HP2334A Plus 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 Plus can determine the associated BDP number, if any, which is the reference for modifications). If a BDP number is entered the HP2334A Plus will reject it with an "ERR" error message.

As described in 6.7.4, 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 Plus 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 Plus 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 6.8.1). A UDP can be created from BDP #21 by modifying this parameter to a value of 12 or 2400 bps (refer to 6.7.6 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 Plus 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 6.7.6.

### 6.7.6 UDP Definition Procedure

Once the UDP number has been entered the HP2334A Plus enters UDP level and displays the "free space" indicating the number of parameters that can be modified, the defined profiles in the HP2334A Plus 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 <b>RETURN</b>	List all the defined profiles and number of modifiable parameters.
UDP: DEL X <b>RETURN</b>	Delete Profile number "X".
UDP: SET p:v[,p:v[,...]] <b>RETURN</b>	Modify the profile where "p" is the parameter and "v" is the value.
UDP: SET? p:v[,p:v[,...]] <b>RETURN</b>	Modify profile and display the parameters(p= parameter, v= value).
UDP: PAR? <b>RETURN</b>	Display the profile before or after modification.
UDP: <b>RETURN</b>	Saves the created/modified UDP.
Prof. number? <b>RETURN</b>	Exit UDP level (returns CONFIGURE asterisk (*) prompt).

**NOTE:** The UDP is not defined in the HP2334A Plus until the UDP level is exited (UDP: **RETURN**). Up to 30 UDPs may be defined in the HP2334A Plus 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 Plus 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 or a CAS profile 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.

**NOTE:** Profile #100 must NOT be deleted, as it is reserved for off-line configuration and terminal loop back testing.

**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 a PAR n:INV message (or PAR 0:13, n:INV message for local parameters) will be displayed, where n is the parameter number. All other parameters 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 all of the parameters of a defined profile. Simply enter PAR? (then press **RETURN**). The HP2334A Plus PAD then responds by providing a listing, the format of which is as follows:

**Example:**

UDP: PAR?

PROFILE PARAMETERS

X3 parameters		Local parameters	
01_ Esc data transfer	001	01_ Parity specifications	000
02_ Echo	001	02_ Read specifications	000
03_ Data forwarding	002	03_ Read trigger	000
04_ Idle timer	000	04_ End of record	000
05_ HP2334A Xon/Xoff	001	05_ Alternate EOR	000
06_ PAD messages	005	06_ Data compaction	000
07_ Break processing	021	07_ Error message to HOST	128
08_ Discard output	000	08_ Sub sys break char.	000
09_ Cr padding	000	09_ Sub sys break process.	000
10_ Line folding	000	13_ Line delete message	003
11_ Baud rate	014	14_ Modem signals behavior	008
12_ Device Xon/Xoff	001	15_ Auto speed & auto parity	000
13_ Lf insertion	000	18_ Read bytecount MSB	063
14_ Lf padding	000	19_ Read bytecount LSB	255
15_ Editing mode	001	20_ Async. modem sig. timer	000
16_ Backspace char.	008	22_ Write specifications	064
17_ Line delete char.	024	23_ HP2334A bytecount(*256)	001
18_ Line display char.	---	24_ Remote assoc. prf (CAS)	000

Note: The parameter values given in this example are for Profile #2.

**LIST Command.**

This command lists all of the profiles (BDPs & UDPs) defined in the HP2334A Plus 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 : 1,2,21,31,51,61,71,73,75,100,101,121,141,143
```

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.



## 6.8 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 Plus 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 9 are reserved and cannot be modified: #7, #10, #11, #12, #16, #17, #21, #23 and #25.

### 6.8.1 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	Escape 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 Plus.

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 Plus 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 Plus 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 incoming data by the HP2334A Plus.**

This parameter enables the HP2334A Plus to control the flow of data from the terminal to the PAD. The HP2334A Plus 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 Plus 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 Plus 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 Plus 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).

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 Plus 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 Plus.

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
15	19200 bps

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

**Parameter #12: Flow control of outgoing data from the HP2334A Plus.**

This parameter provides for flow control between the HP2334A Plus and the terminal. The terminal indicates that it is ready to accept characters from the HP2334A Plus 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 #3 = 126 or 127. If an X-OFF character happens to be received by the HP2334A Plus 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. Values 0 or 1 are accepted for bit #0 but they have no action.

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

**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 Plus.

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 Plus 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 Plus 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.

## 6.8.2 HP2334A Plus Local PAD Parameters

**Local Parameter #1: Parity.**

This parameter allows the user to specify the parity used for transmission between the HP2334A Plus 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 Plus upon receipt of characters.

If bit X = 0, the parity bit of the characters transmitted between the terminal (device) and the HP2334A Plus 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 Plus is handling 7-bits data octets and the remote host computer receives characters with the parity bit set to 0.

The configured parity must be the same for both the HP2334A Plus and the terminal/host computer port.

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 Plus 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 command.
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 Plus accepts any parameter combinations.

If page block mode handshake is enabled (bit 6 set), then the HP2334A Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 #6: Data Compaction.**

This parameter allows the user to select data compaction by the suppression of redundant characters. The user is also able to select the special character to be used by the data compaction process.

VALUE (decimal)	ACTION
0	No data compaction.
1	Enable data compaction function with decimal 128 as special character.
2 to 255	Data compaction enabled with special character defined.

**NOTE:** The data compaction feature is incompatible with binary mode, and is disabled during binary write and read.

In data compaction mode the HP2334A Plus is not transparent to the defined special character and the character will be discarded. Data may be lost if data compaction is not configured on both sides of the synchronous connection.

If the data compaction facility is used Local Parameter #6 must have the same value in the CAS profile (71 - 99) and in the PAD profile (1 - 50). This parameter is NOT downloaded by the CAS profile.

This parameter is modifiable 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 Plus 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 Plus 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.
4	2	Indication of break is forwarded.
16	4	Discard output to terminal.
64	6	Terminate current input.

Possible values: 0, 64, 84 (4+16+64).

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 Plus 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 Plus 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 Plus 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 Plus 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 repeatedly entered until the reception of a Welcome message (in the case of SVCs) or the system prompt (in the case of PVCs). 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 Plus 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 Plus should accept for subsequent read requests. When the byte count is reached the HP2334A Plus 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.

Note: The user maximum block mode screen size = 128 x Lpar #18 + Lpar #19.

This parameter is modifiable using an X.29 command only.

**Local Parameter #20: Asynchronous modem signals timer.**

This parameter allows the user to specify a modem signals timer to allow for modem signal fluctuations on asynchronous connections.

VALUE	ACTION
0	No timer.
1 to 255	Indicate the value of the timer in hundredths (1/100) of a second.

This parameter can be modified using X.28 or X.29 PAD commands.

**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 Plus will output data as soon as it is received; with a soft-preempt the HP2334A Plus 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 Plus 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 Plus 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 Plus will assume a positive answer and resume output.

**WARNING:** Binary write and binary read must be used with caution. The pre-defined UDPs 73 and 143 are provided for binary transfer. The **CONTROL** P BIN **RETURN** command must be used to switch to the profile just before binary transfer and the **BREAK** ASK **RETURN** command to 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 Plus is processed according to Bit-3.

If the ENQ character happens to be added by the HP2334A Plus after the last character of the output sequence (not monitored by the HP2334A Plus), then either an ACK or a logical break will be considered as an Acknowledgment. (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 acknowledgment (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 Plus 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 Plus does not buffer too many bytes when working in character mode.

VALUE (decimal)	ACTION
n	Indicate the HP2334A Plus line size divided by 256 (in characters).

**NOTE:** The HP2334A Plus 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 Plus) but subsequent buffers may have character delete and line delete characters in them which must be processed by the remote host. The HP2334A Plus 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 Plus 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:  $n=0$  or  $100 < n < 161$

**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 ( $71 < \text{profile} < 100$ ).

**NOTE:** The Remote PAD (associated to CAS/PAD) profile that is to be downloaded to the calling PAD is defined at the HP2334A Plus CAS/PAD location.

This parameter is not modifiable using X.28 or X.29 commands.

### 6.8.3 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.

## 6.9 AUTOMATIC DIAL ASSIGNMENT

### 6.9.1 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 Plus has a Symbolic Remote Address (SRA) facility (see Section 6.6) 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 Plus performs the necessary call procedure to establish an SVC using the SRA associated to the port. The call procedure is performed when the PAD is "ready".

When asynchronous devices (or computer ports) are connected to the HP2334A Plus 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).

**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. The LISTSRA command will show the allocated numbers.

**NOTE:** The ADL facility can be used on the HP2334A Plus in both CAS and PAD configurations.

### 6.9.2 ADL Assignment Procedure

Once the required SRAs (see Section 6.6) have been defined and the HP2334A Plus 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> <b>RETURN</b>	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[,...]]:- <b>RETURN</b>	De-assign ADL from port number pn by entering a "-" character for <m>.
ADL: LIST <b>RETURN</b>	List ADL assignment.
ADL: <b>RETURN</b>	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.

### 6.9.3 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.
<pre>                 .   1   2   3   4                 D   -   -   -   -                 C   -   -   -   -                 B   -   -   -   -                 A   -   -   !   -             </pre>	
	The listing shows port A3 disabled.
ADL:	The prompt is returned after listing.

**NOTE:** The port disable only becomes effective after resetting the HP2334A Plus or after a disconnection between the device and the HP2334A Plus.

### 6.10 LIST COMMAND

This command permits the user to list the complete HP2334A Plus configuration including the cards and firmware installed in the HP2334A Plus. The command may be entered when the HP2334A Plus 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.

## 6.11 CONFIGURATION EXAMPLES

### 6.11.1 Stat Mux (Non-PSN) Configuration Example

This example makes use of the HP2334A Plus Default Configurations, as described in Section 6.2, but assumes that the HP2334A Plus has already been configured, and the default configuration consequently required. In this case the DEF-PAD and DEF-CAS commands are used (See 6.3.4). Any required modifications can be made as described in 6.3.1.

#### CONFIGURATION LISTING EXAMPLES:

##### ON THE FIRST HP2334A Plus (DEVICES SIDE)

```
* DEF-PAD <cr>           Define the HP2334A Plus as a default PAD
```

```
* LIST <cr>
```

```
HSA
```

```
HP2334 CONFIGURATION X.25 LEVEL I
```

```
-----  
-PHYS. LINK: X.21bis DTE          -EXT. SPEED : 19200  
-LINE SPEED: Supplied by the modem -MOD. TIMER : 6000 ms  
-----
```

```
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 : 2             -WIND. SIZE OUT: 2  
-THROUGHPUT IN : 19200        -THROUGHPUT OUT: 19200  
-PACK. SIZE IN : 128         -PACK. SIZE OUT: 128  
-FIRST PVC : 1              -LAST PVC : 7  
-FIRST SVC IN :             -LAST SVC IN :  
-FIRST 2W SVC : 16          -LAST 2W SVC : 17  
-FIRST SVC OUT:             -LAST SVC OUT :  
-D-BIT : NO  
-PKT. NUMBERING: 8  
-FAC. SUPPORTED:  
-PVC ASSOC. PRT: 1:A2, 2:A3, 3:A4, 4:B1, 5:B2, 6:B3, 7:B4  
-----
```

HP2334 CONFIGURATION X.25 LUG

-----  
 -REMOTE ADDRESS  
 -----

HP2334 CONFIGURATION X.25 SRA

-----  
 -REMOTE ADDRESS  
 -01) 01<---REM\_ADDR  
 -02) 17<---RDIAG  
 -----

HP2334 CONFIGURATION: PORT POOLS

-----  
 -First port pool: From -- to --  
 -Second port pool: From -- to --  
 -Third port pool: From -- to --  
 -----

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 02334-80400 . 02334-80410 . 02334-80420 . 02334-80430  
 SC-D . .  
 SC-C . .  
 SC-B 5181-0514 . 5181-0515 . RS232MOD 4 ports  
 SC-A 5181-0514 . 5181-0515 . RS232MOD 4 ports

\*

ON THE SECOND HP2334A Plus (HOST COMPUTER PORTS SIDE)

\* DEF-CAS <cr> Define the HP2334A Plus as a default CAS

\* LIST <cr>

HSA

HP2334 CONFIGURATION X.25 LEVEL I

```
-----
-phys. link: X.21bis DTE          -EXT. SPEED : 19200
-LINE SPEED: Supplied by the modem -MOD. TIMER : 6000 ms
-----
```

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 : 2                -WIND. SIZE OUT: 2
-THROUGHPUT IN : 19200           -THROUGHPUT OUT: 19200
-PACK. SIZE IN : 128             -PACK. SIZE OUT: 128
-FIRST PVC     : 1                -LAST PVC      : 7
-FIRST SVC IN  :                   -LAST SVC IN   :
-FIRST 2W SVC  : 16              -LAST 2W SVC  : 17
-FIRST SVC OUT :                   -LAST SVC OUT  :
-D-BIT        : NO
-PKT. NUMBERING: 8
-FAC. SUPPORTED:
-PVC ASSOC. PRT: 1:A2, 2:A3, 3:A4, 4:B1, 5:B2, 6:B3, 7:B4
-----
```

HP2334 CONFIGURATION X.25 LUG

```
-----
-REMOTE ADDRESS
-----
```

HP2334 CONFIGURATION X.25 SRA

```
-----
-REMOTE ADDRESS
-01) 01<---REM_ADDR
-02) 17<---RDIAG
-----
```

HP2334 CONFIGURATION: PORT POOLS

```
-----
- First port pool: From -- to --
- Second port pool: From -- to --
- Third port pool: From -- to --
-----
```

ASG

Assignment for each port

	1	2	3	4
D	71	71	71	71
C	71	71	71	71
B	71	71	71	71
A	71	71	71	71

```
-----
CPU      02334-80400 . 02334-80410 . 02334-80420 . 02334-80430 .
SC-D
SC-C
SC-B     5181-0514 . 5181-0515 . RS232MOD 4 ports
SC-A     5181-0514 . 5181-0515 . RS232MOD 4 ports
```

\*

## 6.11.2 X.25 Stat Mux Configuration Example

Note: The X.25 Statistical Multiplexer configuration is similar to the Default Statistical Multiplexer configuration given in the previous example, and can be created using the default configurations as a starting point. Therefore only the changes need to be entered in the dialogue. The following example details the dialogue to accomplish some example changes.

### CONFIGURATION DIALOGUE EXAMPLE

#### ON THE FIRST HP2334A Plus (DEVICES SIDE)

DIALOGUE	EXPLANATION
* DEF-PAD <cr>	Define the HP2334A Plus as a default PAD
* HSA <cr>	Call the protocol parameter configuration dialogue

#### DIALOGUE FOR LEVEL1 CONFIGURATION

HSA: LEVEL1 <cr>                      Select configuration of Level 1

Mod. signals timer? <cr>  
Ext. speed? <cr>

HSA:

#### LISTING OF LEVEL1 CONFIGURATION

HSA: LIST1 <cr>                      List the stored configuration of Level 1

HP2334 CONFIGURATION X.25 LEVEL I

```
-----
- PHYS. LINK: X.21bis DTE                      - EXT. SPEED : 19200
- LINE SPEED: Supplied by the modem         - MODEM TIMER : 6000 ms
-----
```

HSA:

#### DIALOGUE FOR LEVEL 2 CONFIGURATION

HSA: LEVEL2 <cr>                      Select configuration of level 2

NTK type ? <cr>  
Frame window? <cr>  
Timer T1? 1600 <cr>

HSA:



LISTING OF LEVEL 2 CONFIGURATION

HSA: LIST2 <cr> List the stored configuration of Level 2

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 LEVEL 3 CONFIGURATION

HSA: LEVEL3 <cr> Select the Level 3 configuration

```

Lcl addr.? 13809748200 <cr>
Thrput in? 9600 <cr>
Thrput out? 9600 <cr>
Wind sz in ? <cr>
Wind sz out? <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? 17 <cr>
Fst svc out? <cr>
Use X.25 facilities? YES <cr>
Neg pk sz? YES <cr>
Neg wd sz? NO <cr>
Neg thrput? YES <cr>
Rev. char. acc? YES <cr>
D-bit? NO <cr>
Ass. pvc? A2 <cr>
Ass. pvc? A3 <cr>
Ass. pvc? B1 <cr>
Ass. pvc? C4 <cr>

```

HSA:

LISTING OF LEVEL 3 CONFIGURATION

HSA: LIST3 <cr> List the stored configuration of Level 3

HP2334 CONFIGURATION X.25 LEVEL III

```

-----
-LOCAL ADDRESS : 13809748200
-WIND. SIZE IN : 2
-THROUGHPUT IN : 9600
-PACK. SIZE IN : 128
-FIRST PVC : 1
-FIRST SVC IN : 6
-FIRST 2W SVC : 10
-FIRST SVC OUT :
-D-BIT : NO
-PKT. NUMBERING: 8
-FAC. SUPPORTED: PKT.SZ THO.PT RV.CGA
-ASSOC. PVC : 1:A2,2:A3,3:B1,4:C4
-----
-WIND. SIZE OUT: 2
-THROUGHPUT OUT: 9600
-PACK. SIZE OUT: 128
-LAST PVC : 4
-LAST SVC IN : 8
-LAST 2W SVC : 17
-LAST SVC OUT :

```

HSA:

DIALOGUE FOR SRA CONFIGURATION

HSA: SRA <cr> Define the Symbolic Remote Addresses

Call limited to SRA? NO <cr>

Add or Clear? CLEAR <cr>

Sra ? REM\_ADDR <cr>

Remote Addr Ass.? 13802066601 <cr>

Sra ? RDIAG <cr>

Remote Addr Ass.? 13802066617 <cr>

Sra ? <cr>

HSA:

LISTING OF SRA CONFIGURATION

HSA: LISTSRA <cr> List the SRA configuration

HP2334 CONFIGURATION X.25 SRA

```

-----
-REMOTE ADDRESS
-01) 13802066601<---REM_ADDR
-02) 13802066617<---RDIAG
-----

```

HSA:

HSA: <cr> Exit synchronous network configuration

\*

ON THE SECOND HP2334A Plus (HOST COMPUTER PORTS SIDE)

DIALOGUE	EXPLANATION
* DEF-CAS <cr>	Define the HP2334A Plus as a default CAS
* HSA <cr>	Call the protocol parameter configuration dialogue

DIALOGUE FOR LEVEL1 CONFIGURATION

HSA: LEVEL1 <cr>                      Select configuration of Level 1

Mod. signals timer? <cr>

Ext. speed? <cr>

HSA:

LISTING OF LEVEL1 CONFIGURATION

HSA: LIST1 <cr>                      List the stored configuration of Level 1

HP2334 CONFIGURATION X.25 LEVEL I

```

-----
- PHYS. LINK: X.21bis DTE                      - EXT. SPEED : 19200
- LINE SPEED: Supplied by the modem         - MODEM TIMER : 6000 ms
-----

```

HSA:

DIALOGUE FOR LEVEL 2 CONFIGURATION

HSA: LEVEL2 <cr>                      Select configuration of level 2

NTK type ? <cr>

Frame window? <cr>

Timer T1? 1600 <cr>

HSA:

LISTING OF LEVEL 2 CONFIGURATION

HSA: LIST2 <cr> List the stored configuration of Level 2

HP2334 CONFIGURATION X.25 LEVEL II

```

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

```

HSA:

DIALOGUE FOR LEVEL 3 CONFIGURATION

HSA: LEVEL3 <cr> Select the Level 3 configuration

```

Lcl addr.? 13802066600 <cr>
Thrput in? 9600 <cr>
Thrput out? 9600 <cr>
Wind sz in ? <cr>
Wind sz out? <cr>
Def mod vc tbl.? YES <cr>
Fst pvc? 1 <cr>
Lst pvc? 4 <cr>
Fst svc in? <cr>
Fst 2w svc? 5 <cr>
Lst 2w svc? 17 <cr>
Fst svc out? <cr>
Use X.25 facilities? YES <cr>
Neg pk sz? NO <cr>
Neg wd sz? NO <cr>
Neg thrput? NO <cr>
Rev. char. acc? YES <cr>
D-bit? NO <cr>
Ass. pvc? A1 <cr>
Ass. pvc? A2 <cr>
Ass. pvc? A3 <cr>
Ass. pvc? A4 <cr>

```

HSA:

LISTING OF LEVEL 3 CONFIGURATION

HSA: LIST3 <cr> List the stored configuration of Level 3

HP2334 CONFIGURATION X.25 LEVEL III

```

-----
-LOCAL ADDRESS : 13802066600
-WIND. SIZE IN : 2
-THROUGHPUT IN : 9600
-PACK. SIZE IN : 128
-FIRST PVC : 1
-FIRST SVC IN :
-FIRST 2W SVC : 5
-FIRST SVC OUT :
-D-BIT : NO
-PKT. NUMBERING: 8
-FAC. SUPPORTED:
-ASSOC. PVC : 1:A1,2:A2,3:A3,4:A4
-WIND. SIZE OUT: 2
-THROUGHPUT OUT: 9600
-PACK. SIZE OUT: 128
-LAST PVC : 4
-LAST SVC IN :
-LAST 2W SVC : 17
-LAST SVC OUT :
RV.CGA
-----

```

HSA:

DIALOGUE FOR SRA CONFIGURATION

HSA: SRA <cr> Define the Symbolic Remote Addresses

Call limited to SRA? NO <cr>

Add or Clear? CLEAR <cr>

Sra ? REM\_ADDR <cr>

Remote Addr Ass.? 13809748201 <cr>

Sra ? RDIAG <cr>

Remote Addr Ass.? 13809748217 <cr>

Sra ? <cr>

HSA:

LISTING OF SRA CONFIGURATION

HSA: LISTSRA <cr> List the SRA configuration

HP2334 CONFIGURATION X.25 SRA

```

-----
-REMOTE ADDRESS
-01) 13809748201<---REM_ADDR
-02) 13809748217<---RDIAG
-----

```

HSA: <cr>

Exit synchronous network configuration

\*

USER DEFINED PROFILE

\* UDP Enter User Defined Profile level

Prof number? 144

-PROFILE : 144 -FREE SPACE : 43 parameters

-EXISTING PROFILES : 1,2,21,31,51,61,71,73,75,100,101,121,141,143

UDP: SET 2:1,3:2,13:0,15:1,0:13,4:30,5:13,14:1,18:12

UDP: PAR?

PROFILE PARAMETERS

X3 parameters		Local parameters	
01_ Esc data transfer	001	01_ Parity specifications	000
02_ Echo	001	02_ Read specifications	096
03_ Data forwarding	002	03_ Read trigger	000
04_ Idle timer	000	04_ End of record	030
05_ HP2334A Xon/Xoff	001	05_ Alternate EOR	013
06_ PAD messages	005	06_ Data compaction	000
07_ Break processing	021	07_ Error message to HOST	128
08_ Discard output	000	08_ Sub sys break char.	025
09_ Cr padding	000	09_ Sub sys break process.	064
10_ Line folding	000	13_ Line delete message	001
11_ Baud rate	014	14_ Modem signals behavior	001
12_ Device Xon/Xoff	001	15_ Auto speed & Auto parity	000
13_ Lf insertion	000	18_ Read bytecount MSB	012
14_ Lf padding	000	19_ Read bytecount LSB	255
15_ Editing mode	001	20_ Async. modem sig. timer	000
16_ Backspace char.	008	22_ Write specifications	092
17_ Line delete char.	024	23_ HP2334A bytecount(*256)	001
18_ Line display char.	---	24_ Remote assoc. prf (CAS)	000

UDP:

UDP: <cr>

Prof number? 74 <cr>

-PROFILE : 74

-FREE SPACE : 43 parameters

-EXISTING PROFILES : 1,2,21,31,51,61,71,73,75,100,101,121,141,143,144

UDP: SET 12:0,0:13,24:144

UDP: PAR?

PROFILE PARAMETERS

X3 parameters		Local parameters	
01_ Esc data transfer	000	01_ Parity specifications	000
02_ Echo	000	02_ Read specifications	000
03_ Data forwarding	127	03_ Read trigger	000
04_ Idle timer	000	04_ End of record	000
05_ HP2334A Xon/Xoff	001	05_ Alternate EOR	000
06_ PAD messages	000	06_ Data compaction	000
07_ Break processing	000	07_ Error message to HOST	128
08_ Discard output	000	08_ Sub sys break char.	000
09_ Cr padding	000	09_ Sub sys break process.	000
10_ Line folding	000	13_ Line delete message	003
11_ Baud rate	014	14_ Modem signals behavior	000
12_ Device Xon/Xoff	000	15_ Auto speed & Auto parity	000
13_ Lf insertion	000	18_ Read bytcount MSB	000
14_ Lf padding	000	19_ Read bytcount LSB	128
15_ Editing mode	000	20_ Async. modem sig. timer	000
16_ Backspace char.	008	22_ Write specifications	096
17_ Line delete char.	024	23_ HP2334A bytcount(*256)	001
18_ Line display char.	000	24_ Remote assoc. prf (CAS)	144

UDP: <cr>

Prof number? <cr>

Exit User Defined Profile level

\*

### 6.11.3 X.25 Cluster Controller Configuration Example

Note: The X.25 Cluster Controller configuration can be created using the Default PAD as a starting point. In this way, only the required changes need to be entered in the dialogue. The following example details the dialogue to accomplish some example changes.

#### CONFIGURATION DIALOGUE EXAMPLE

DIALOGUE	EXPLANATION
* DEF-PAD <cr>	Define the HP2334A Plus as a default PAD
* HSA <cr>	Call the protocol parameter configuration dialogue

#### DIALOGUE FOR LEVEL1 CONFIGURATION

HSA: LEVEL1 <cr>                      Select configuration of Level 1

Mod. signals timer? <cr>

Ext. speed? <cr>

HSA:

#### LISTING OF LEVEL1 CONFIGURATION

HSA: LIST1 <cr>                      List the stored configuration of Level 1

HP2334 CONFIGURATION X.25 LEVEL I

```

-----
- PHYS. LINK: X.21bis DTE                      - EXT. SPEED : 19200
- LINE SPEED: Supplied by the modem         - MODEM TIMER : 6000 ms
-----

```

HSA:

#### DIALOGUE FOR LEVEL 2 CONFIGURATION

HSA: LEVEL2 <cr>                      Select configuration of level 2

NTK type ? <cr>

Frame window? <cr>

Timer T1? 1600 <cr>

HSA:



LISTING OF LEVEL 2 CONFIGURATION

HSA: LIST2 <cr> List the stored configuration of level 2

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 ? <cr>
Wind sz out? <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? 17 <cr>
Fst svc out? <cr>
Use X.25 facilities? YES <cr>
Neg pk sz? YES <cr>
Neg wd sz? NO <cr>
Neg thrput? YES <cr>
Rev. char. acc? YES <cr>
D-bit? NO <cr>
Ass. pvc? A2 <cr>
Ass. pvc? A3 <cr>
Ass. pvc? B1 <cr>
Ass. pvc? C4 <cr>

```

HSA:

LISTING OF LEVEL 3 CONFIGURATION

HSA: LIST3 <cr> List the stored configuration of level 3

HP2334 CONFIGURATION X.25 LEVEL III

```

-----
-LOCAL ADDRESS : 13809748200
-WIND. SIZE IN : 2
-THROUGHPUT IN : 9600
-PACK. SIZE IN : 128
-FIRST PVC : 1
-FIRST SVC IN : 6
-FIRST 2W SVC : 10
-FIRST SVC OUT:
-D-BIT : NO
-PKT. NUMBERING: 8
-FAC. SUPPORTED: PKT.SZ THO.PT RV.CGA
-ASSOC. PVC : 1:A2,2:A3,3:B1,4:C4
-WIND. SIZE OUT: 2
-THROUGHPUT OUT: 9600
-PACK. SIZE OUT: 128
-LAST PVC : 4
-LAST SVC IN : 8
-LAST 2W SVC : 16
-LAST SVC OUT :
-----
    
```

HSA:

DIALOGUE FOR MESSAGE CONFIGURATION

```

HSA: MSG <cr> Define internal message.
PAD Mess header? `Login: ' <cr>
Welcome message? ` ' <cr>
Password ? `hp2334 ' <cr>
    
```

HSA:

LISTING OF MESSAGE CONFIGURATION

HSA: LISTMSG <cr>

HP2334 CONFIGURATION X.25 LEVEL IV

```

-----
-WELCOME MESSAGE:
-PAD MESS. HEADER: Login:
-PASSWORD: hp2334
-----
    
```

HSA:

DIALOGUE FOR LUG CONFIGURATION

HSA: LUG <cr> Define the Local User Group 'members'

Add or Clear? ADD <cr>  
 Remote addr? 138020555 <cr>  
 Remote addr? 138020555XX <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  
 -01) 138020555  
 -02) 138020555XX  
 -03) 75XX20XXXX  
 -----

Note: The "X"s in the remote addresses serve as place holders.

HSA:

DIALOGUE FOR SRA CONFIGURATION

HSA: SRA <cr> Define the Symbolic Remote Addresses

Call limited to SRA? NO <cr>  
 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
-01) 0311030300044<---USA
-02) 138020666<---GRENOBLE
-----
```

HSA:

DIALOGUE FOR PORT POOL CONFIGURATION

HSA: POOL <cr>

Mod. first port pool?

First port? A3 <cr>  
Last port? C2 <cr>

Mod. second port pool?

First port? <cr>

HP2334 CONFIGURATION: PORT POOLS

```
-----
-First port pool: From A3 to C2
-Second port pool: From -- to --
-Third port pool: From -- to --
-----
```

HSA: <cr> Exit synchronous network configuration

PROFILE ASSIGNMENT

\* ASG <cr> Enter profile 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 profile assignment mode

\* Standard configuration prompt

AUTOMATIC DIAL

\* ADL <cr> Enter automatic dial assignment mode

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> Exit automatic dial assignment mode

\*

## **7.1 INTRODUCTION**

This chapter describes how to operate the HP2334A Plus and how the HP2334A Plus PAD is controlled from a local terminal by using X.28 PAD commands.

The HP2334A Plus 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 Plus 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. Section 7.5 is included for reference purposes and describes how an HP2334A Plus 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

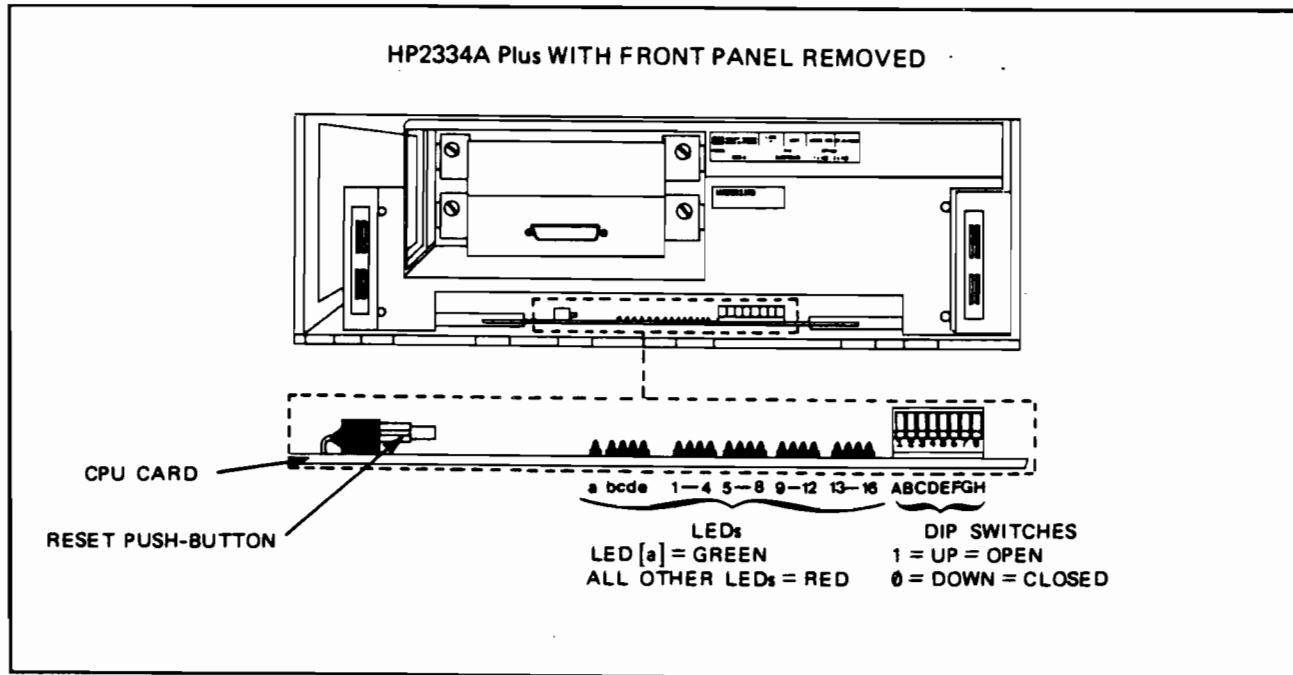


Figure 7-1 CPU Card LEDs and Switches

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 Plus to the "power-on" state. This enables the HP2334A Plus to be initialized without having to power-off and then power-on again.
- **DIP Switches.** The eight DIP switches are used as follows:
  - 1) To select the initial default configuration. (See Section 6.2, Selecting a Default Configuration.)
  - 2) Switches ABC 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 DEFGH are set to 00100) and are interpreted in different ways according to the operating mode of the HP2334A Plus (see below).
  - 3) Switches DEFGH are sensed only at power-on or when the HP2334A Plus is initialized by pressing the Reset push-button. These switches are used primarily to select the HP2334A Plus 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.
- **LEDs.** The 21 LEDs are as follows:

The green LED [a] is extinguished during execution of the self diagnostic tests and when the HP2334A Plus is halted due to an error. It is continuously lit when the HP2334A Plus 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 Plus mode of operation. The normal operating mode of the HP2334A Plus 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 Plus is RUN mode. In RUN mode a connected asynchronous device can communicate with a remote DTE (host computer) via the the HP2334A Plus and the synchronous network (or PSN).

**Preparation.** Before RUN mode can be entered the HP2334A Plus must be configured with a default configuration, or a modified default configuration if required, 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 Plus 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 Plus 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 ABC. 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 the Cr character) if auto speed/parity is selected in the port profile. When the modem signals are monitored the port is "ready" when the DTR and RTS are (ON) (see 4.10.1).



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 Plus 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 Plus 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 Plus 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 Plus 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 Plus PAD and perform the functions shown in Table 7-1 (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 Plus 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 6.8.2) unless one or more **(RETURN)** (or Cr) characters are 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. If SVCs are used it is recommended that the call is established using the ADL facility. With termtype 18 the ADL assignment must be on the device port (printer side), and with termtype 26 the ADL assignment must be on the system port (system side). 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 Plus 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 Plus will establish the call on the first free SVC in the required category (for more details refer to VC assignment in 6.5.3). 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.

**NOTE:** When entering a PAD selection command, editing is enabled in order to be able to use the character delete (normally backspace) and line delete (normally **(CONTROL)** [X]) characters.

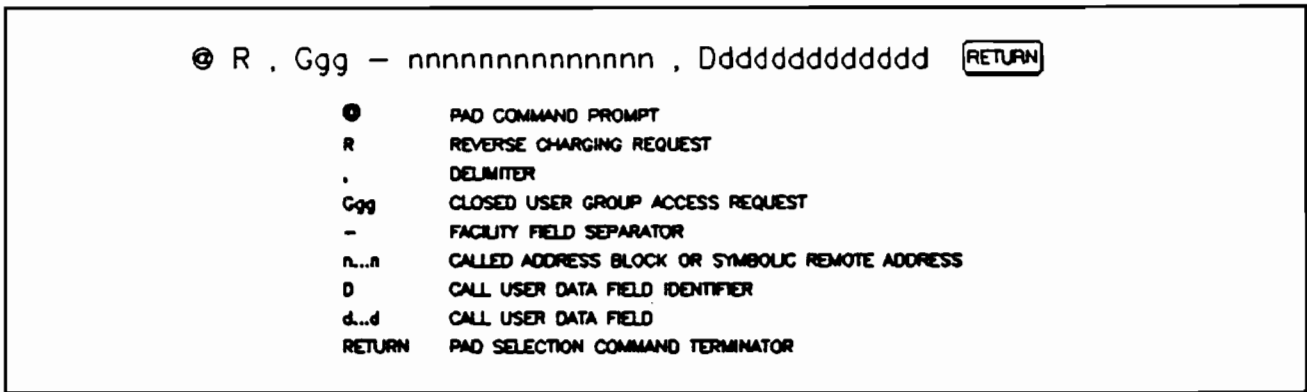


Figure 7-2 X.28 Selection Command Format (for PSNs)

*OPTIONAL:*

<p>R ,   Ggg   -</p>	<p>Requests Reverse Charging ( " , " =delimiter) G = Request access to PSN Closed User Group, gg = CUG identification (gg = 00 to 99) " - " = facility field separator</p>
----------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

*MANDATORY:*

<p>nnnnnnnnnnnnnnnn            or qqqqqqqqqqqqqqpp            or #ssssssss            or xxxxy[pp]</p>	<p>Called address, may include sub-address last two digits (15 digits max.). (See Fig. 4-7)  q = called address (13 digits max.) pp = sub-address (2 digits max.)(Fig. 4-7)  # denotes SRA (see Section 6.6) s = symbolic address (8 characters maximum)</p>
<p>then</p>	<p>Abbreviated TELENET type network address: xxx = area code(3 digits) yy = local address (1 to 4 digits)+ optional pp = sub-address (2 digits), see NOTE.</p>

*OPTIONAL:*

<p>,Ddddddddddddd  then</p>	<p>D = Call User Data field identifier d = user data field (maximum 12 characters; bytes 4 to 16). " , " = delimiter.</p>
-------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------

*MANDATORY:*

<p><span style="border: 1px solid black; padding: 2px;">RETURN</span></p>	<p>The Cr character (or +) must be used as the selection command terminator.</p>
---------------------------------------------------------------------------	----------------------------------------------------------------------------------

**NOTE:** For TELENET type networks only: the address is expanded automatically (zeros filled) into X.121 format in the call request packet.

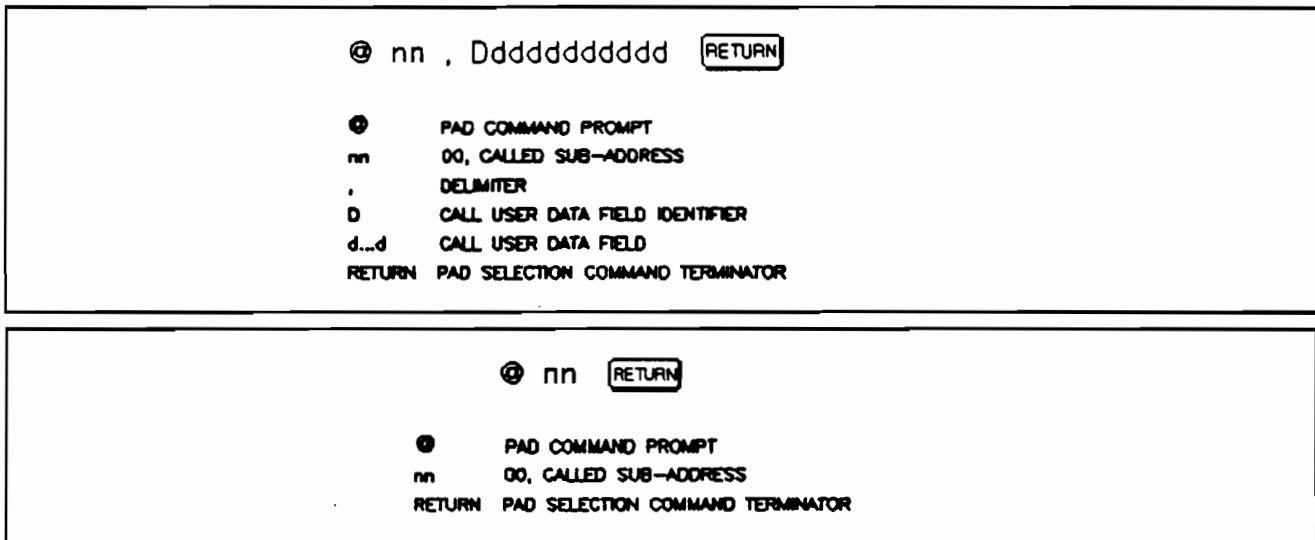


Figure 7-3 PAD Selection Command (with no PSN)

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, 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 requires the HP2334A Plus to be in the PAD data transfer state.

The HP2334A Plus 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 Plus 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 Plus PAD responds with a "CLR CONF" service signal and PAD command prompt "@" which are displayed at the terminal. The HP2334A Plus is then in PAD command state and the call is cleared.
- RETURN (Cr) or " + " - The PAD command terminator returns the HP2334A Plus to the PAD data transfer state.
- CONTROL [P] - The DLE character (or defined character in X.3 par. #1) returns the HP2334A Plus 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 Plus (1st time)
	(If auto speed/parity are selected in the port profile then press <b>RETURN</b> )
HP2334A ON TRANSPAC	PAD identification signal (user defined WELCOME message)
@	PAD command prompt
R-138123456 <b>RETURN</b>	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); <b>RETURN</b> (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)
<b>CONTROL</b> [P]	Escape from PAD data transfer state
@	PAD command prompt
CLR <b>RETURN</b>	Clears the SVC
CLR CONF	Clear confirmation service signal
@	PAD command prompt is returned

## 7.4 LOCAL CONTROL OF THE HP2334A Plus 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 Plus 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.

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
- Entering local diagnostic mode
- Entering Binary mode
- Entering ASCII mode
- 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 Plus)
- PAD identification (user defined)
- Virtual circuit status
- Acknowledgment of PAD command signals
- Profile information (parameters and values)
- HP2334A Plus PAD operation (local errors - see Section 7.6)

## 7.4.1 PAD Command Signals

PAD COMMAND SIGNAL FORMAT	FUNCTION	PAD SERVICE SIGNAL SENT IN RESPONSE
Selection PAD command signal	To establish an SVC	COM or CLR xxx
SET (List of parameters/values)	To temporarily set/change parameter values	Acknowledgment
SET? (List of parameters/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 the values of specified parameters	PAR (Lists parameters and their values) or INV (INV = invalid)
PROF (identifier)	Temporarily sets the PAD parameters to new defined profile value	Acknowledgment
STAT	To request status information on a port	FREE or ENGAGED
DIAL (*)	To re-dial the SRA assigned to users port	COM, CLR xxx or No Symbolic Address
LDIAG (*)	To enter local diagnostic mode	HP2334A Plus displays diagnostic menu
CLR	To clear an SVC	CLR CONF or CLR ERR
RESET	To reset a VC	Acknowledgment
INT	To transmit an interrupt packet	Acknowledgment
RPROF(identifier) (*)	To request remote CAS/PAD to temporarily use the specified profile	Acknowledgment
BIN (*)	To enter binary mode	RPROF DONE
ASC (*)	To enter ASCII mode	RPROF DONE
HELP (*)	To provide information	HELP menu displayed

\* Non-standard X.28 Commands.

Table 7-1 PAD Command Signals

The PAD command signals together with the type of PAD service signals that are sent in response 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.

**SET Command.** 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 all parameters excluding the erroneous one will set, and a PAR n:INV error message given (where n is the parameter number with an erroneous value).
- The SET command size is limited to 128 characters.
- The local parameters are accessed through parameter #0 set at value 13 which acts as a separator.

Example:

SET 2:0, 4:1, 5:0, 0:13, 1:1 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 #1 to value 1.

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 Plus 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.** 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 R (space character is optional)

**Note:** The "0" acts as a separator between parameters and local parameters.

The HP2334A Plus 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.

**PROF (Profile) Command.** 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 than 51). If the requested profile is not defined in the HP2334A Plus, 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 Plus changes the values of the parameters (where required) and sends an acknowledgment PAD service signal. The parameters change back to the original profile values when the SVC is cleared or when the HP2334A Plus is reset if the command applies to a PVC.

**STAT (Status) Command.** 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)

**DIAL Command.** This command can only be used if there is no previously established connection. The DIAL command allows the user to re-dial the Remote Symbolic Address assigned to his port (by ADL assignment). If no SRA is assigned, a "No Symbolic Remote Address" message is displayed on the users terminal.

**LDIAG Command.** This command can only be used if there is no previously established connection. The LDIAG command allows the user to collect information on the synchronous line and port status. There is also a port reset facility. The LDIAG command also allows a local access to the HP2334A Plus configuration. When a port enters diagnostic mode it becomes unavailable for incoming calls, and these are rejected with CLR DTE 0. In the case of a problem on the line, or if the device drops its modem signals while in LDIAG mode, the port will revert to the PAD Command state.

Once the LDIAG command has been entered, it must be followed by the internal password. For security reasons the HP2334A Plus does not prompt for this password, and if it is not entered correctly the user will return to the PAD Command state. Note that the echo is disabled while the password is being entered.

Once the correct password has been entered the following menu is displayed:

HP2334A Rev 26.40 DIAGNOSTIC MODE

Commands	Actions
STAT1[,R]	<cr> Display [and reset] level1 statistics.
STAT2[,R]	<cr> Display [and reset] level2 statistics.
STATP	<cr> Display port status.
STATL[,R]	<cr> Bandwidth utilization in Tx and Rx mode.
CONF	<cr> Access to configuration.
RESET pn	<cr> Reset the port pn where p={A B C D} and n={1 2 3 4}.
RESET HP2334A	<cr> Reset the HP2334A.
EXIT	<cr> Return to control mode.

LDIAG>

**Note:** If a password has not been assigned (default case), the above menu is displayed on entering the LDIAG command.

The following sub-commands are available in LDIAG mode:

**STAT1[,R] sub-command.** The STAT1 sub-command allows the user to access the line drop counter, which is used to determine the quality of the synchronous line. The counter sums the number of line drops, a drop being defined as the synchronous line dropping its modem signals for a time less than the modem signals timer value (defined in the Level 1 configuration).

The counter also sums the number of line failures, a failure being defined as the synchronous line dropping its modem signals for a time greater than the modem signals timer value.

This information is displayed in the following format:

```
LDIAG> STAT1 RETURN
```

```
Number of line drops    : 00000
```

```
Number of line failures: 00000
```

```
LDIAG>
```

**Note:** The counters are displayed on 5 digits, and can have values from 00000 to 65535.

The reset option (STAT1,R) resets the counters once they have been read.

**STAT2[,R] sub-command.** The STAT2 sub-command enables the user to collect X.25 level 2 statistics, which are displayed in the following format:

```
LDIAG> STAT2 RETURN
```

```
Number of I_frames received      : 00000
```

```
Number of RR_frames received     : 00000
```

```
Number of RNR_frames received    : 00000
```

```
Number of REJ_frames received    : 00000
```

```
Number of FRMR_frames received   : 00000
```

```
Number of overruns               : 00000
```

```
Number of bad FCS                : 00000
```

```
Number of aborted frames received : 00000
```

```
LDIAG>
```

The option STAT2,R will reset the counters after they have been displayed.

**STATP sub-command.** The STATP sub-command allows the user to check the port status. This information is displayed in the following format:

```
LDIAG> STATP (RETURN)
```

```
HP2334A port status
```

```
.  1  2  3  4
```

```
D  -  -  -  -
```

```
C  H  L  H  H
```

```
B  E  E  H  H
```

```
A  E  E  E  E
```

where H, L, E mean:

H: Device modem signals <high>

L: Device modem signals <low>

E: Port engaged

```
LDIAG>
```

**Notes:**

A port has the status "H" if the modem signals DTR and RTS are high.

A port has the status "L" if the connected device does not supply the correct modem signals.

A port has the status "E" when it is engaged. When a PVC is selected, and the modem signals are high, the E status is permanently displayed.

When "-" is displayed, the device adapter card is not installed.

**STATL[R] sub-command.** The STATL sub-command allows the user to view the bandwidth utilization in both transmit and receive modes. The HP2334A Plus collects the number of characters in each frame in both transmit and receive mode (including the two bytes of FCS and one flag) during a two second period.

The collected information is then displayed as follows:

LDIAG> STATL RETURN

HP2334A BANDWIDTH UTILIZATION IN TRANSMIT MODE

0      2400      4800      7200      9600      12000      14400      16800      19200  
|.....|.....|.....|.....|.....|.....|.....|.....|



HP2334A BANDWIDTH UTILIZATION IN RECEIVE MODE

0      2400      4800      7200      9600      12000      14400      16800      19200  
|.....|.....|.....|.....|.....|.....|.....|.....|



LDIAG>

Note: The < symbol on the display indicates the maximum bandwidth utilization ever reached.

The sub-command STATL,R also displays the bandwidth utilization, but in addition it resets the maximum bandwidth utilization indicators (<).

NOTE: Because the STATL sub-command uses the HP inverse video feature it can only be displayed on HP terminals (e.g. HP262X or HP239X terminals).

CONF sub-command. The CONF sub-command allows the user access to the HP2334A Plus local configuration. This local access allows the user to list and modify the configuration while still in on-line mode. All the off-line commands are available, including the HELP facility, as detailed in Chapter 6. When the user has finished modifying the configuration, the command EXIT will return the HP2334A Plus to diagnostic mode (LDIAG> prompt). Note that the configuration can only be accessed by one user at a time, and if the configuration is being accessed by another user (locally or remotely) the following message is given:

WARNING: Configuration being accessed...

Example configuration access dialogue:

```
LDIAG> CONF RETURN
      [ listing of configuration is given. ]
*      [ configuration prompt. ]
      [ users modifications to configuration. ]
* EXIT RETURN
LDIAG>
```

**NOTE:** THE VIRTUAL CIRCUIT TABLE CANNOT BE MODIFIED IN ON-LINE MODE, AND THE DEF-PAD AND DEF-CAS COMMANDS SHOULD NOT BE USED.

In on-line mode the "Def/Mod VC Table?" prompt in the dialogue for Level 3 configuration is replaced by "WARNING: the VC table cannot be modified in on-line mode". This prevents communication problems which could be caused by an on-line modification to the VC table.

**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 Plus then the next call will be rejected by the PSN.

**RESET pn sub-command.** The RESET pn sub-command allows the user to locally reset a specific port on the HP2334A Plus. The syntax of the sub-command is as follows:

```
LDIAG> RESET pn RETURN      [where pn is the port to reset]
                                [p={A|B|C|D} and n={1|2|3|4} ]
```

If the port number is valid, the message **Reset done!!!** is displayed.

If the port number is considered as invalid, the message **Invalid port number...** is displayed.

A port number is considered invalid if:

- 1) The syntax of pn is incorrect.
- 2) The adapter card containing that port number is not installed.
- 3) The port number pn is the users port number.

The RESET sub-command resets the internal parameters of the specific port and downloads the assigned profile. Modem signals will be dropped in accordance with the local parameter #14. In the case of SVCs, the connection will be cleared. If the Xon/Xoff protocol is enabled (parameter #5 = 1) and the auto-speed is disabled, a DC1 is sent to the connected device (asynchronous side).

In the case of a reset on a PAD port in PVC connection, the assigned profile is downloaded and a RESET DTE 0 followed by RESET DTE 127 (if the connected device has its modem signals up) sent to the CAS or PAD support. On the reception of RESET DTE 127 the CAS will send the remote associated profile to adapt the initial profile. The port is then ready for operation.

In the case of a reset on a CAS port in PVC connection, the assigned profile is downloaded and a RESET DTE 0 is sent to the PAD port. On the reception of this the PAD sends a RESET DTE 127 to the CAS. The CAS will then send the remote associated profile to adapt the initial profile. The port is then ready for operation.

**RESET HP2334A sub-command.** This sub-command allows the user to reset the HP2334A Plus in on-line mode. A complete power-on test sequence is made, causing all dynamic memory to be reset.

**Note:** The CMOS RAM is not reset, leaving the original configuration intact.

**EXIT sub-command.** This sub-command allows the user to exit from the local diagnostic mode and return to the PAD command state. On execution of this sub-command the PAD command prompt "@" is returned.

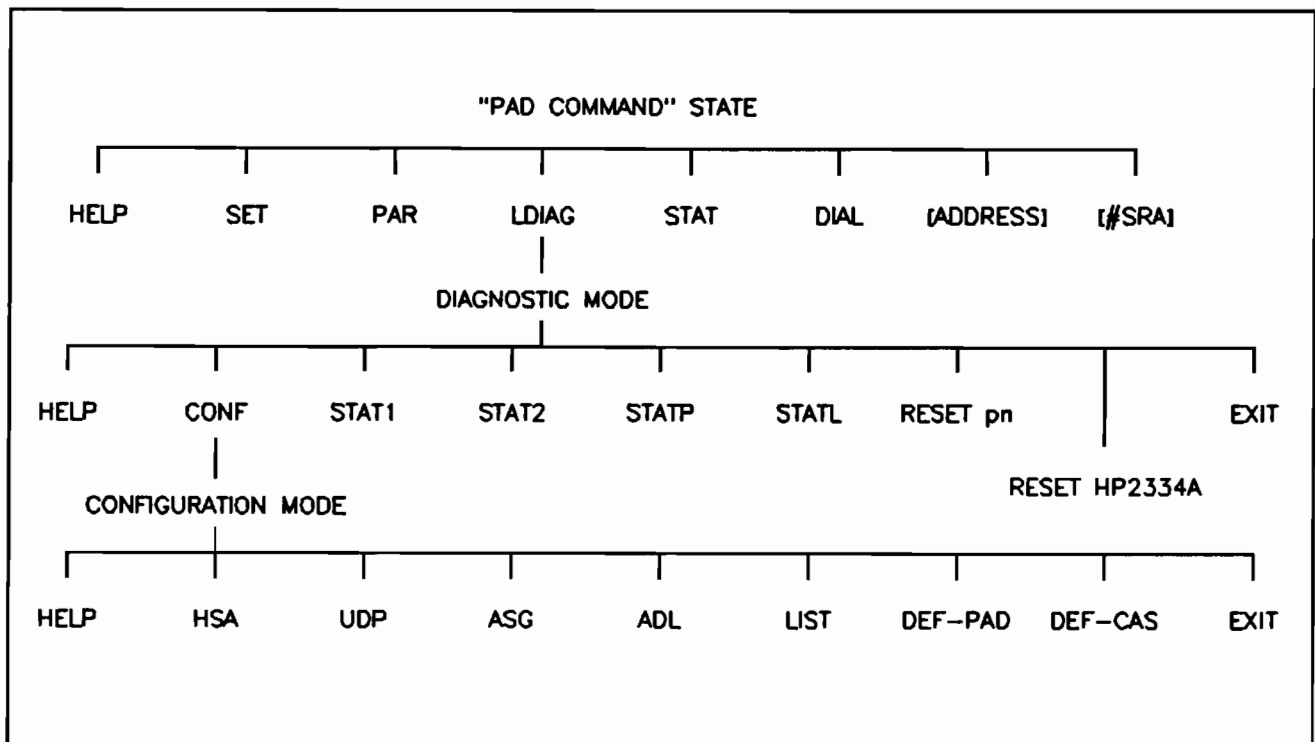


Figure 7-4 Diagnostic Mode Menu Path

**CLR (Clear) Command.** This command can only be used when a connection is established on the corresponding port. 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:

```

CONTROL P
@
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.

**RESET Command.** The RESET PAD command allows the user to reset an established VC. The format of the reset PAD command is:

```

CONTROL P
@
RESET RETURN

```

The HP2334A Plus PAD then responds with an acknowledgment PAD service signal as follows:

```
RESET CONF
```

**INT (Interrupt) Command.** This command can only be used when a connection is established on the corresponding port. The INT command may be used to send an interrupt packet from the HP2334A Plus PAD to the remote DTE. The format of the interrupt command is:

```

CONTROL P
@
INT RETURN

```

The only acknowledgment PAD service signal for an interrupt command is a "Cr Lf Cr" which results in the terminal cursor moving down by one line.

**RPROF Command.** This command can only be used when a connection is established on the corresponding port. RPROF is a non-standard X.28 command that enables the user to request a remote HP2334A Plus 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 #74) 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 #144). 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.



The format of the RPROF command is:

```

(CONTROL) P
@
RPROF nn (RETURN)

```

Where nn = the profile identifier (must be between 51 and 99)

**NOTE:** Only a remote HP2334A Plus 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 acknowledgment service signal. The remote action of the command will result in an acknowledgment 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 Plus (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 Plus is reset if the command is used over a PVC.

**NOTE:** The RPROF command can only be used when the remote PAD is an HP2334A Plus.

**BIN Command.** This command must be used in the PAD data transfer state. The BIN command enables the user to enter binary mode, in order to access binary applications or carry out binary transfers. The command BIN is equivalent to the command `(CONTROL) P RPROF 73 (RETURN)`, and therefore profile 73 is required (in an unmodified state) on the remote PAD.

The format of the BIN command is as follows:

```

(CONTROL) P
@
BIN (RETURN)

```

The HP2334A Plus PAD then responds with the acknowledgment:

```
RPROF DONE
```

### WARNING

The user must be aware that the BIN command uses the pre-defined UDP 73. Any modifications to this profile may affect the operation of this function.

**ASC Command.** This command must be used in the PAD data transfer state. The ASC command enables the user to exit binary mode and return to ASCII mode, with the original profile assigned to the CAS/PAD HP2334A Plus.

The ASC command can take one of two forms, depending whether the HP2334A Plus is in Binary or ASCII mode.

If the HP2334A Plus is in Binary mode the format of the command is as follows:

```
  (BREAK)
@
  ASC (RETURN)
```

If the HP2334A Plus is in ASCII mode the format of the command is as follows:

```
  (CONTROL) P
@
  ASC (RETURN)
```

If the modification is accepted the HP2334A Plus PAD responds, in both cases, with the acknowledgment:

```
RPROF DONE
```

**#RDIAG Command.** This command is used to call a remote test port using the pre-defined Symbolic Remote Address RDIAG. It is not a PAD command, but it is used in the PAD command state after escaping from the PAD data transfer state if it is enabled. This command, and its associated sub-commands, are explained in more detail in Chapter 8, USING THE TEST PORT.

## 7.4.2 PAD Service Signals

**PAD Message Header.** The PAD message header is an HP2334A Plus 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.

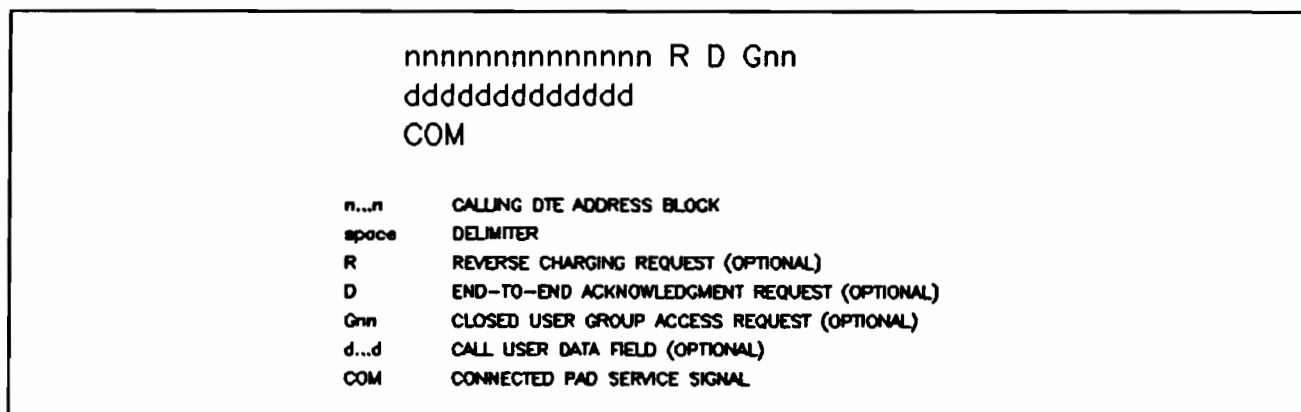
**Network Status Service Signal.** If X.25 Level 3 cannot be established then a network status service signal is displayed, the format of which is as follows:

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 Plus. 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 7-5.



**Figure 7-5 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 Plus 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, or X.25: *The PSN Connection*, Appendix D. Details of both publications are given in Appendix F.

**NOTE:** If the PSN or the remote DTE performs a restart on an established SVC or stops communication then the HP2334A Plus 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, 2 and 3 set) the PAD identification service signal (HP2334A Plus defined WELCOME message) is displayed and the HP2334A Plus 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 2 and 3 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 Plus then responds by providing the following acknowledgment 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 acknowledgment to the status PAD command. The format of the acknowledgment 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)

**Acknowledgment PAD Service Signals.** These PAD service signals provide acknowledgment 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 Plus).

**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 Plus).

**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 acknowledgment 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 Plus) 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 Plus, 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 7-6 and 7-7. For further information refer to the CCITT X.1 to X.29 Recommendations. (See Appendix E).

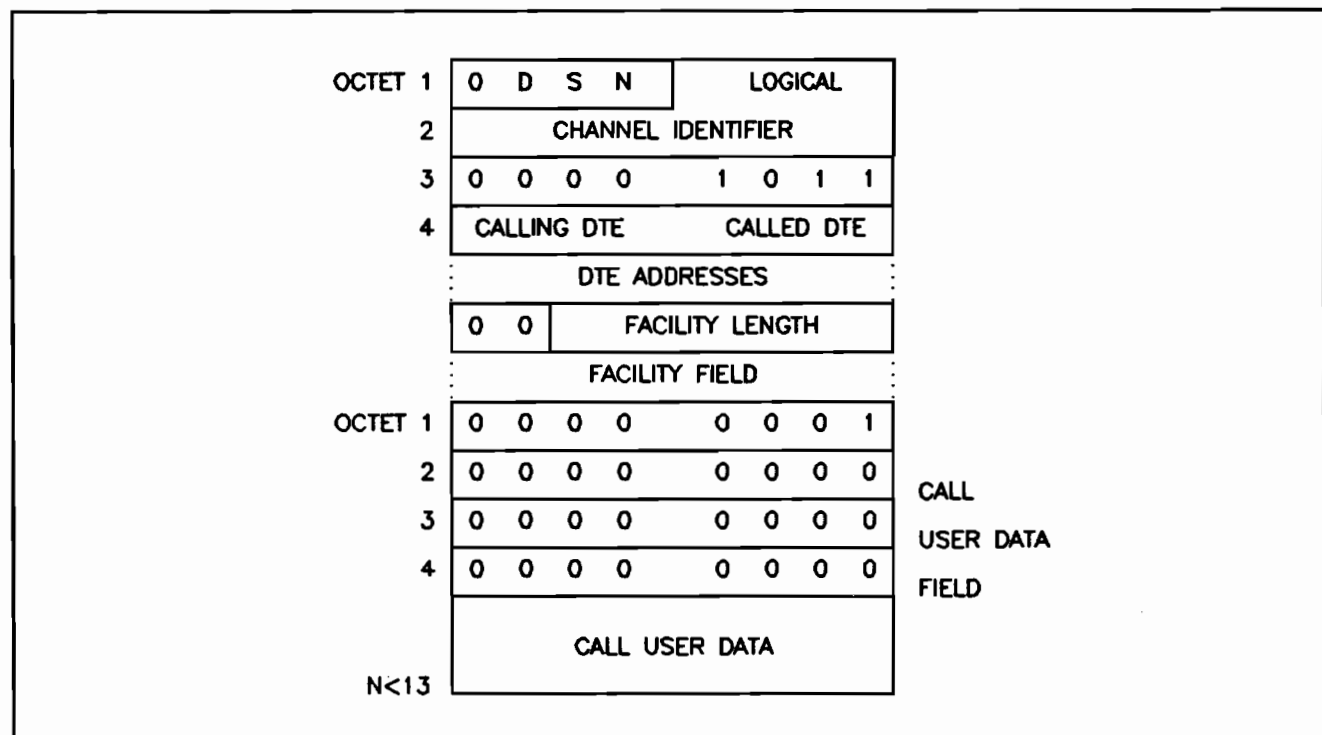


Figure 7-6 PAD Call Packet Format

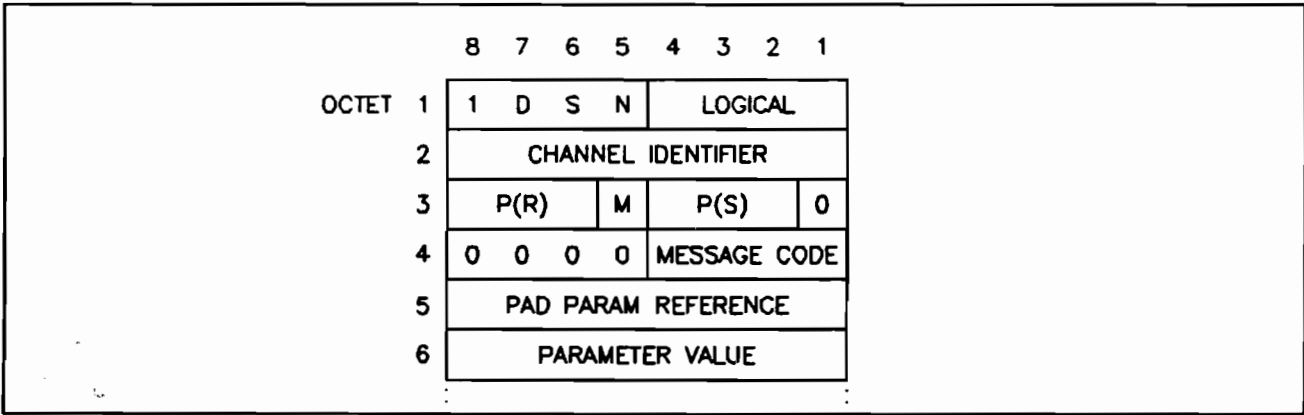


Figure 7-7 PAD Message Packet Format

**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 Plus 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		PAD	
RECEIVE	TRANSMIT	RECEIVE	TRANSMIT
Parm. indication Ind. of break Error message	Set Set & Read	Set Set & Read Read Invit. to clear	Parm. indication Ind. of break 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. This is in order to resume output to the remote asynchronous device (terminal), assuming it is in discard mode.

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 a) if no error b) PAD fails to modify some parameters	a) none 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 &amp; 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 1.

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 the PAD will return the X.29 error message.

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 Plus. This may occur in the following situations:

- While operating the HP2334A Plus (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 Plus 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 Plus line fuse or power supply fuse blows then refer to Chapters 12 and 14.

## 7.6.2 LED Display

LEGEND:	DIP SWITCHES	LED DISPLAY
	1 = UP = OPEN	1 = LED ON
	0 = DOWN = CLOSED	0 = LED OFF
	X = DON'T CARE	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 Plus.
- 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 Plus software failure is detected. Record the pattern displayed on LEDs [1] to [16]. Check the DIP switch setting and reset the HP2334A Plus. If the failure persists, contact the nearest HP sales and Service office.

2) If DIP switch setting is 

SWITCH TEST
ABCDEFGH
0000011

 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	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 after power-on or reset:  
00000001

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 after power-on or reset:  
XXX00000

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	1	1

No X.25 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
1	B	B	X	X

When the HP2334A Plus has entered the Run mode:

- LED [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:

- 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 Plus port and refer to section 7.6.3.
- 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  
                          0 1 1 0        1 0 1 0        0 0 0 1        0 0 0 0

Slots A, B and C are fitted with Modem Control Adapter cards and the links between the HP2334A Plus and devices connected to ports A2, A3, B1, B3 and C4 are ready for data transmission. 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  
                          0 1 1 0        0 1 1 0        0 0 1 0        0 0 0 0

Virtual circuits are established for ports A2, A3, 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.

- If DIP switch setting is
 

RUN MODE							
X.25 LEVEL 2 ACTIVITY							
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

- 6) If DIP switch setting is
 

SELF DIAGNOSTICS							
ABCDEFGH							
XXX00100							

 or  
 If DIP switch setting is
 

TERMINAL LOOPBACK MODE							
ABCDEFGH							
00000101							

 or  
 If DIP switch setting is
 

MODEM LOOPBACK MODE							
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 Plus 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 Plus device port.
- That the connecting cable between the HP2334A Plus 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 Plus, 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 Plus 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 Plus port or if it affects all the device ports. Verification of the HP2334A Plus 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 Plus synchronous network configuration conforms with the PSN subscription and/or the remote HP2334A Plus 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 Plus with a non-subscribed facility will affect all the device ports.

## 7.6.5 HP2334A Plus PAD Operation Error Messages

Some PAD messages are specific to the HP2334A Plus and are sent to a device (terminal) when an error occurs on the communication link between the HP2334A Plus 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 Plus (the power supply may be defective or the line voltage incorrect.)

### PARITY ERROR

- The HP2334A Plus 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 Plus.

### 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 Plus 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.)

## 8.1 INTRODUCTION

The HP2334A Plus Test Port provides the following primary functions:

- Access to on-line diagnostic facility.
- On-line modification of the HP2334A Plus configuration.
- Local HP2334A Plus port Reset
- HP2334A Plus Reset.
- Communications testing (text retransmission).
- Listing of HP2334A Plus installed firmware (ROM part numbers).
- Display of X.25 Levels 1 and 2 statistical information.

## 8.2 ACCESSING THE TEST PORT

### 8.2.1 Local Test Port

The HP2334A Plus local test port may be accessed when the unit is operating on-line, i.e. in RUN mode. The HP2334A Plus must be in the PAD command state (@ prompt) for the terminal (device) accessing the test port. For an HP2334A configured as a CAS the terminal must be connected to port A1.

The local test port is accessed by entering the command LDIAG.

**WARNING:** If the local HP2334A Plus has a CAS configuration, profile 1 is temporarily available on port A1 in order to access both the local and the remote test ports. This facility is only available the first time the HP2334A Plus is configured (by default, using the DIP switches). The local test port **MUST** be accessed before the remote test port, as exiting the remote test port sends a CLR to the local HP2334A Plus and the assigned CAS profile is downloaded into port A1. This blocks further access to the local test port on a CAS configured HP2334A Plus, unless profile 1 has been assigned to this port.

Example:

```
@ LDIAG (RETURN)
```

```
password
```

```
[HP2334A Plus displays diagnostic menu]
```

```
LDIAG>
```

For a complete description of LDIAG, its associated sub-commands and their syntax refer to 7.4.1., **LDIAG Command**.

## 8.2.2 Remote Test Port

The HP2334A Plus remote test port may be accessed when the unit is operating on-line, i.e. in RUN mode. The HP2334A Plus (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 Plus (and subscribed for if used with a PSN) in order to access the test port.

If the HP2334A Plus is connected in a Stat. Mux. configuration over a leased line the remote test port may be accessed by using the pre-defined Symbolic Remote Address RDIAG. This automatically establishes an SVC with the remote test port.

Note that with Stat Mux configured networks the SRA RDIAG is entered once the PAD command prompt (@) is obtained in order to establish an SVC with the remote HP2334A Plus test port.

Example:

```
@ #RDIAG RETURN
```

```
password
```

```
Welcome to the test port [Enter <ESC U> for a user interface]
```

If the HP2334A Plus is connected to a PSN the remote test port may be accessed by entering the PAD selection command with the HP2334A Plus remote address and the test port sub-address.

The HP2334A Plus 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
```

Once the SVC is established (COM) the echo is disabled and the HP2334A Plus waits for the correct test port password (defined during a previous off-line or on-line configuration, see Section 6.6) to be entered. If the password is entered incorrectly then the SVC is cleared automatically. If the password is entered correctly then the HP2334A Plus provides an acknowledgment by displaying the following message on the users terminal:

```
Welcome to the test port [Enter <ESC U> for a user interface]
```

After the welcome message has been displayed the echo is re-enabled. The test port does not provide a prompt. 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] ) or the EXIT command must be entered to return the PAD command prompt "@" followed by the CLR PAD command (CLR RETURN) to clear the SVC.

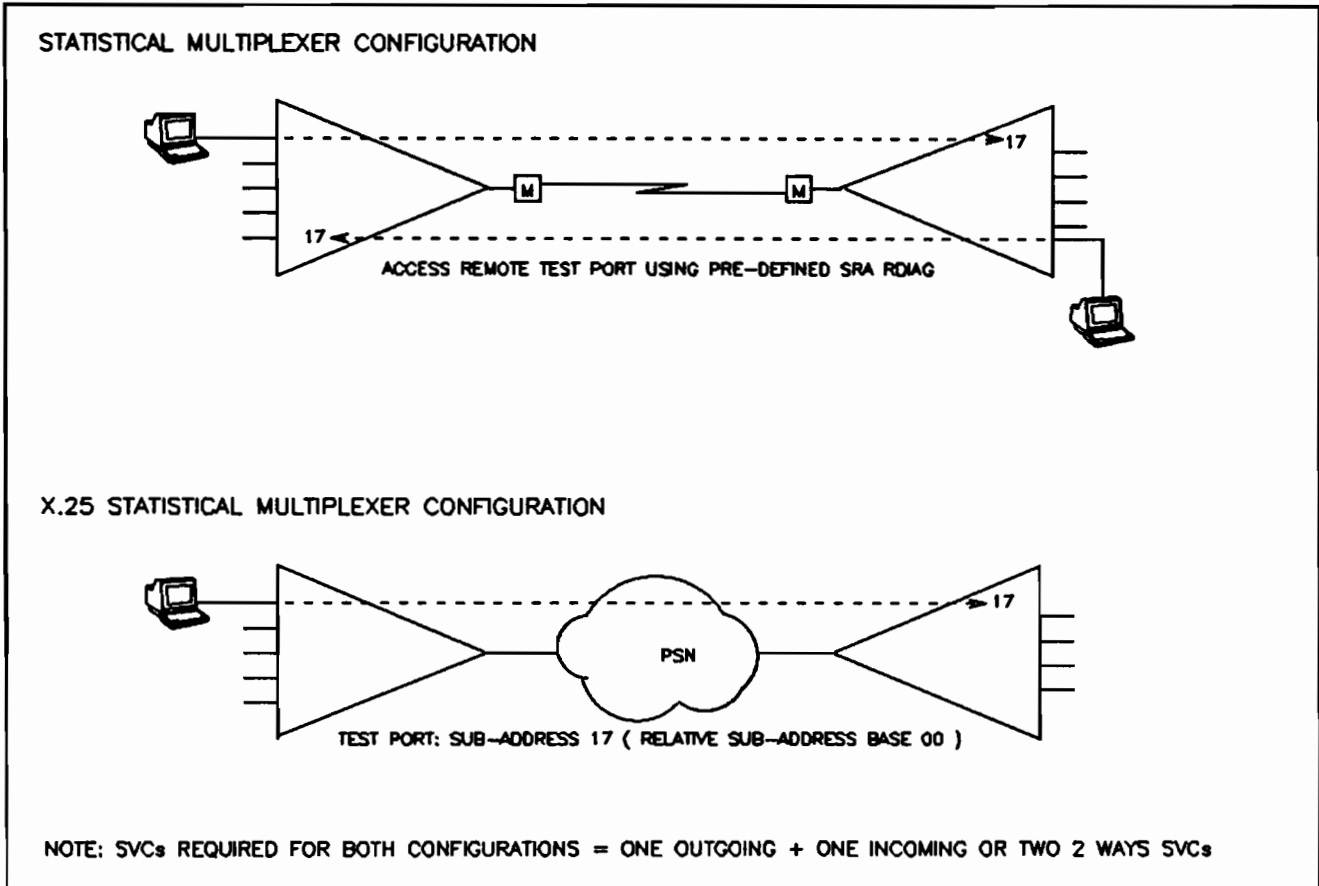


Figure 8-1 HP2334A Plus Test Port Access

ESCAPE SEQUENCE	HP2334A Plus RESPONSE	EXPLANATION
ESC U	Displays Diagnostic menu.	HP2334A Plus enters on-line diagnostic mode.
ESC C	Configuration listing.	HP2334A Plus enters on-line configuration mode.
ESC S	Displays port status.	HP2334A Plus provides a port status display.
ESC E	None.	HP2334A Plus performs a RESET (like a power-on or using the reset push-button).
ESC Rpn	Reset done !!! or Invalid port number.	HP2334A Plus resets port number pn, where p={A B C D} and n={1 2 3 4}.
text ESC d	text.	HP2334A Plus retransmits the text as it has been received (text = 1 to 127 bytes).
ESC *s^	HP2334A Rev 26.40	Equipment type identification.
ESC /x0R	ROM part numbers.	HP2334A Plus provides a listing of the installed ROM part numbers.
ESC /x0P	Level 1 statistical information.	Read and Reset Level 1 statistics.
ESC /x1P	Level 1 statistical information.	Read Level 1 statistics.
ESC /x0S	Level 2 statistical information.	Read and Reset Level 2 statistics.
ESC /x1S	Level 2 statistical information.	Read Level 2 statistics.

Table 8-1 HP2334A Plus Test Port Escape Sequences

### 8.3 ON-LINE DIAGNOSTIC MODE

To enter diagnostic mode the " ESC U " escape sequence must be entered (i.e. simply press the [ESC], [U] 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.

On entering diagnostic mode the diagnostic menu is displayed and the RDIAG prompt " RDIAG> " is given.

The RDIAG menu is displayed as follows:

HP2334A Rev 26.40 DIAGNOSTIC MODE

Commands	Actions
STAT1[,R]	<Cr> Display [and reset] level1 statistics.
STAT2[,R]	<cr> Display [and reset] level2 statistics.
STATP	<cr> Display port status.
STATL[,R]	<cr> Bandwidth utilization in Tx and Rx mode.
CONF	<cr> Access to configuration.
RESET pn	<cr> Reset the port pn where p={A B C D} and n={1 2 3 4}.
RESET HP2334A	<cr> Reset the HP2334A.
EXIT	<cr> Return to control mode.

RDIAG>

The following sub-commands are available in RDIAG mode:

**STAT1[,R] Command.** The STAT1 command allows the user to access the line drop counter, which is used to determine the quality of the synchronous line. The counter sums the number of line drops, a drop being defined as the synchronous line dropping its modem signals for a time less than the modem signals timer value.

The counter also sums the number of line failures, a failure being defined as the synchronous line dropping its modem signals for a time greater than the modem signals timer value.

This information is displayed in the following manner:

```
RDIAG> STAT1 RETURN
Number of line drops      : 00000
Number of line failures: 00000
RDIAG>
```

**Note:** The counters are displayed on 5 digits, and can have values from 00000 to 65535.

The reset option (STAT1,R) resets the counters once they have been read.



**STAT2[R] Command.** The STAT2 command enables the user to collect X.25 level 2 statistics, which are displayed in the following format:

```
RDIAG> STAT2 RETURN

Number of I frames received      : 00000
Number of RR frames received     : 00000
Number of RNR frames received   : 00000
Number of REJ frames received   : 00000
Number of FRMR frames received  : 00000
Number of overruns              : 00000
Number of bad FCS               : 00000
Number of aborted frames received : 00000
```

RDIAG>

The option STAT2,R will reset the counters after they have been displayed.

**STATP Command.** The STATP command allows the user to check the port status. This information is displayed in the following format:

```
RDIAG> STATP RETURN

HP2334A port status

.  1  2  3  4

D  -  -  -  -
C  H  L  H  H
B  E  E  H  H
A  E  E  E  E
```

where H, L, E mean:

```
H: Device modem signals <high>
L: Device modem signals <low>
E: Port engaged
```

RDIAG>

**Notes:**

A port has the status "H" if the modem signals DTR and RTS are high.

A port has the status "L" if the connected device does not supply the correct modem signals.

A port has the status "E" when it is engaged. When a PVC is selected, and the modem signals are high, the E status is permanently displayed.

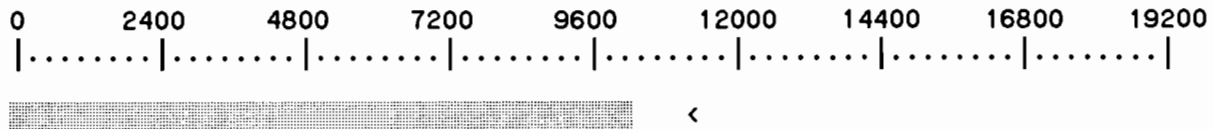
When "-" is displayed, the device adapter card is not installed.

**STATL[,R] Command.** The STATL command allows the user to view the bandwidth utilization in both transmit and receive modes. The HP2334A Plus collects the number of characters in each frame in both transmit and receive mode (including the two bytes of FCS and one flag) during a two second period.

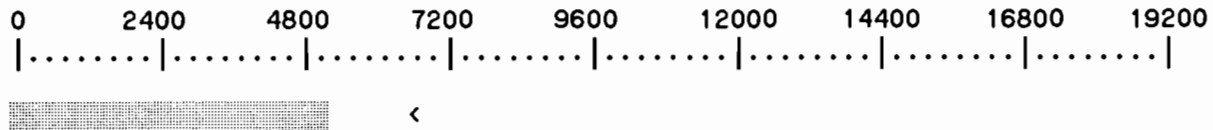
The collected information is then displayed as follows:

RDIAG> STATL **RETURN**

HP2334A BANDWIDTH UTILIZATION IN TRANSMIT MODE



HP2334A BANDWIDTH UTILIZATION IN RECEIVE MODE



RDIAG>

**Note:** The symbol on the display indicates the maximum bandwidth utilization ever reached.

The command STATL,R also displays the bandwidth utilization, but in addition it resets the counters.

**NOTE:** Because the STATL command uses the HP inverse video feature it can only be displayed on HP terminals (e. g. HP262X or HP239X terminals).

**CONF Command.** The CONF command allows the user access to the HP2334A Plus remote configuration. This remote access allows the user to list and modify the configuration while still in on-line mode. All the off-line commands are available (including the HELP facility) as detailed in Chapter 6. When the user has finished modifying the configuration, the command EXIT will return the HP2334A Plus to diagnostic mode (RDIAG> prompt). Note that the configuration can only be accessed by one user at a time, and if the configuration is being accessed by another user (locally or remotely) the following message is given:

**WARNING: Configuration being accessed...**

Example configuration access dialogue:

```

RDIAG> CONF RETURN
          [ listing of configuration is given. ]
*        [ configuration prompt. ]
          [ users modifications to configuration. ]
* EXIT RETURN
RDIAG>
    
```

**NOTE: THE VIRTUAL CIRCUIT TABLE CANNOT BE MODIFIED IN ON-LINE MODE.**

In on-line mode the "Def/Mod VC Table?" prompt in the dialogue for Level 3 configuration is replaced by "WARNING: the VC table cannot be modified in on-line mode". This prevents communication problems which could be caused by an on-line modification of the VC table.

**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 Plus then the next call will be rejected by the PSN.

**RESET pn Command.** The RESET pn Command allows the user to remotely reset a specific port on the HP2334A Plus. The syntax of the command is as follows:

```

RDIAG> RESET pn RETURN    [where pn is the port to reset]
                               [p={A|B|C|D} and n={1|2|3|4} ]
    
```

If the port number is valid, the message **Reset done!!!** is displayed.

If the port number is considered as invalid, the message **Invalid port number...** is displayed.

A port number is considered invalid if:

- 1) The syntax of pn is incorrect.
- 2) The adapter card containing that port number is not installed.
- 3) The port number pn is the users port number.

The RESET command resets the internal parameters of the specific port and downloads the assigned profile. Modem signals will be dropped in accordance with the local parameter #14. In the case of SVCs, the connection will be cleared. If the Xon/Xoff protocol is enabled (parameter #5 = 1) and the auto-speed is disabled, a DC1 is sent to the connected device (asynchronous side).

In the case of a reset on a PAD port in PVC connection, the assigned profile is downloaded and a RESET DTE 0 followed by RESET DTE 127 (if the connected device has its modem signals up) sent to the CAS or

PAD support. On the reception of RESET DTE 127 the CAS will send the remote associated profile to adapt the initial profile. The port is then ready for operation.

In the case of a reset on a CAS port in PVC connection, the assigned profile is downloaded and a RESET DTE 0 is sent to the PAD port. On the reception of this the PAD sends a RESET DTE 127 to the CAS. The CAS will then send the remote associated profile to adapt the initial profile. The port is then ready for operation.

**RESET HP2334A Command.** This command allows the user to reset a remote HP2334A Plus in on-line mode. A complete power-on test sequence is made, causing all dynamic memory to be reset.

**Note:** The CMOS RAM is not reset, leaving the original configuration intact.

**EXIT Command.** This command allows the user to exit from the remote diagnostic mode and return to the PAD command state. On execution of this sub-command the PAD command prompt "@" is returned.

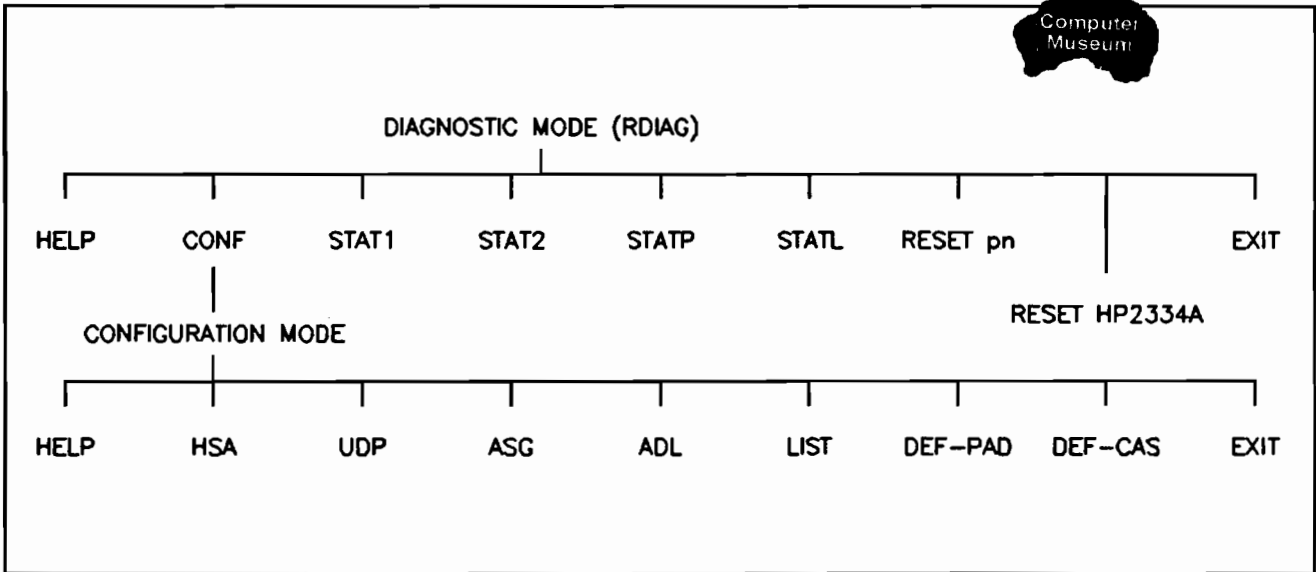


Figure 8-2 Diagnostic Mode Menu Path

## 8.4 CONFIGURATION MODE

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 Plus configuration is listed in the same way as in off-line configuration mode (see 6.3.3) and the CONFIGURE asterisk prompt "\*" is then displayed. The configuration commands available are 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 <b>RETURN</b>	HP2334A Plus exits from on-line configuration mode.

**WARNING:** The "Def/Mod VC Table?" prompt in the dialogue for Level 3 configuration is replaced by "WARNING: the VC table cannot be modified in on-line mode".

This prevents communication problems which could be caused by an on-line modification of the VC table.

**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 Plus then the next call will be rejected by the PSN.

Because the HP2334A Plus is operating on-line (i.e. in RUN mode) when on-line modification of the HP2334A Plus 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 Plus 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 Plus memory as soon as the ADL sub-level is exited. The new automatic dial address assigned to a device port will then be used when the device (terminal) connected to the ADL assigned device port is powered off/on; when the HP2334A Plus is RESET (locally using the reset push-button switch, or remotely using the test port (see section 8.7)), 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) the new profile is downloaded when the user exits the ASG level.
- 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, the Reset/port in diagnostic mode or remotely using the test port (see Section 8. 7)).
- 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) the new profile is downloaded when the user exits the ASG level.
- 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, the Reset/port in diagnostic mode or remotely using the test port (see Section 8. 7)).

**NOTE:** Use of the RPROF nn command as detailed above is recommended for PVC assigned ports.

## 8.5 PORT STATUS

The HP2334A Plus test port provides a port status display 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 Plus gives the following port status display:

```
X X X X X X X X X X X X X X X X
```

The displayed line represents the 16 port status where X={H,L,E,-}

```
H: Device modem signals <High>
L: Device modem signals <Low>
E: Port engaged
-: Port not defined
```

**Note:** The first letter represents the status of port A1, and the last letter the status of port D4.

The port status is defined as follows:

Port status H if the modem signals DTR and RTS are high.

Port status L if the device does not provide the correct modem signals.

Port status E if the modem signals DTR and RTS are high and the port is engaged.

Port status - if the serial card corresponding to the port is not fitted.

## 8.6 PORT RESET OF THE HP2334A Plus

Any (or all) of the HP2334A Plus ports may be reset locally or from a remote location through the HP2334A Plus test port.

Once communication is established with the remote HP2334A Plus test port (see Section 8.2) a port reset may be performed by entering the "ESC Rpn" escape sequence (see Table 8-1). Note that pn is the port number to reset where p={A|B|C|D} and n={1|2|3|4}. This is followed by a RETURN (Cr) character.

Example. To reset port A3 enter: ESC RA3 RETURN

**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.

## 8.7 REMOTE RESET OF THE HP2334A Plus

The HP2334A Plus 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 Plus test port.

Once communication is established with the remote HP2334A Plus 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.

## 8.8 HP2334A Plus COMMUNICATIONS TEST

A remote HP2334A Plus test port can be accessed to provide a communications test between the local and the remote HP2334A Plus 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 Plus 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 Plus 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.



## 8.9 HP2334A Plus IDENTIFICATION & STATISTICS

### 8.9.1 Equipment Type Identification

The HP2334A Plus 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 Plus identifies the equipment type by displaying the "HP2334A Rev 26.40" message. Another escape sequence may then be entered or communication with the remote test port can be cleared as detailed in Section 8.2.

### 8.9.2 Firmware Identification

The HP2334A Plus 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 Plus 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.

### 8.9.3 X.25 Level 1 Statistics

The X.25 Level 1 statistical information is held in a buffer of -- bytes organized into 2 decimal words (5 decimal ASCII coded digits per word) separated by 1 space character (ASCII 20H).

Each word contains a statistical value and these are listed in the following order:

- 1) Number of line drops.
- 2) Number of line failures.

The above statistical information is displayed on entering either the "ESC /x0P" or "ESC /x1P" escape sequence (see Table 8-1) followed by a **RETURN** (Cr) character. The "ESC /x1P" escape sequence allows the user to read the statistical information without resetting the counters while the "ESC /x0P" escape sequence will display the current values and then reset both counters to zero.

**NOTE:** On counter overflow, the counter is reset.

**Example:**

ESC /x1P **RETURN**

00015 00002

(means 15 line drops and 2 line failures)

**Note:** A line drop is defined as the synchronous line dropping its modem signals for a time less than the modem signals timer value. A line failure is defined as the synchronous line dropping its modem signals for a time greater than the modem signals timer.

### 8.9.4 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 10 "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 reset.

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)

## 9.1 PACKAGE OVERVIEW

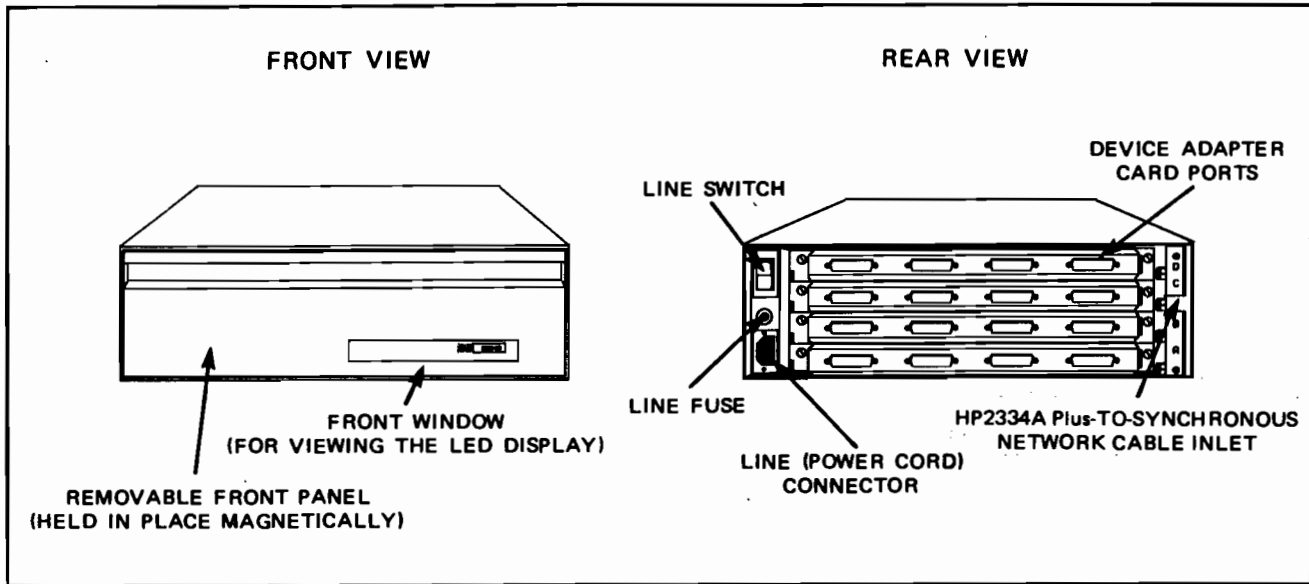


Figure 9-1 HP2334A Plus

The HP2334A Plus 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

DETAILED PRODUCT DESCRIPTION

When the HP2334A Plus 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 Plus-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).

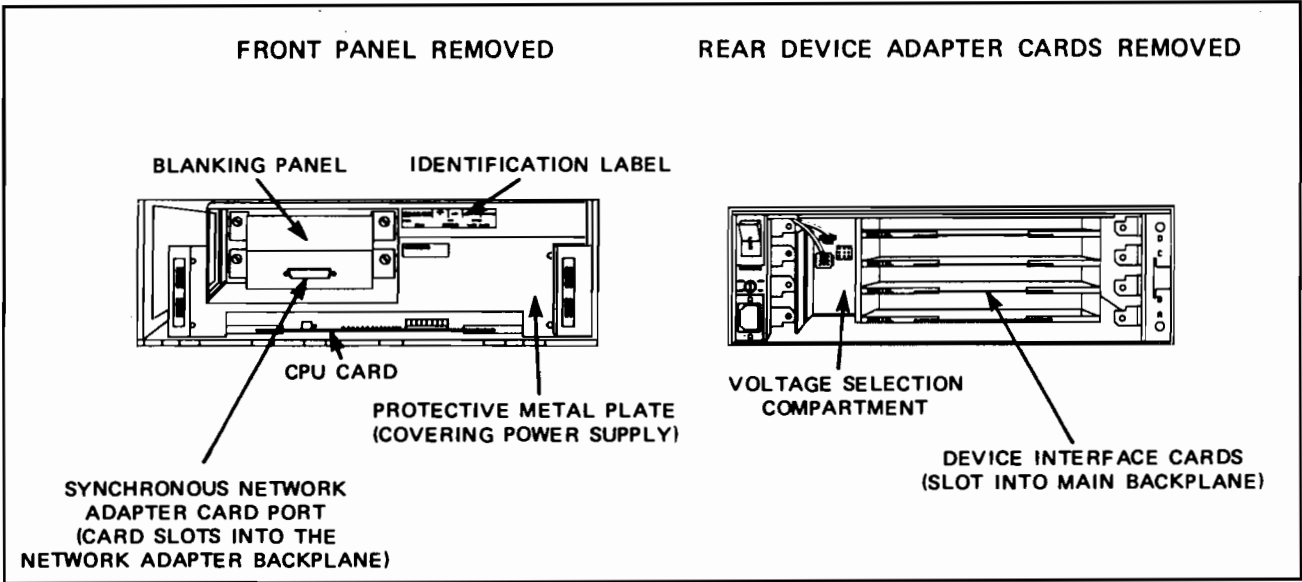


Figure 9-2 HP2334A Plus With Front Panel And Rear Cards/Panels Removed

## 9.2 ARCHITECTURE

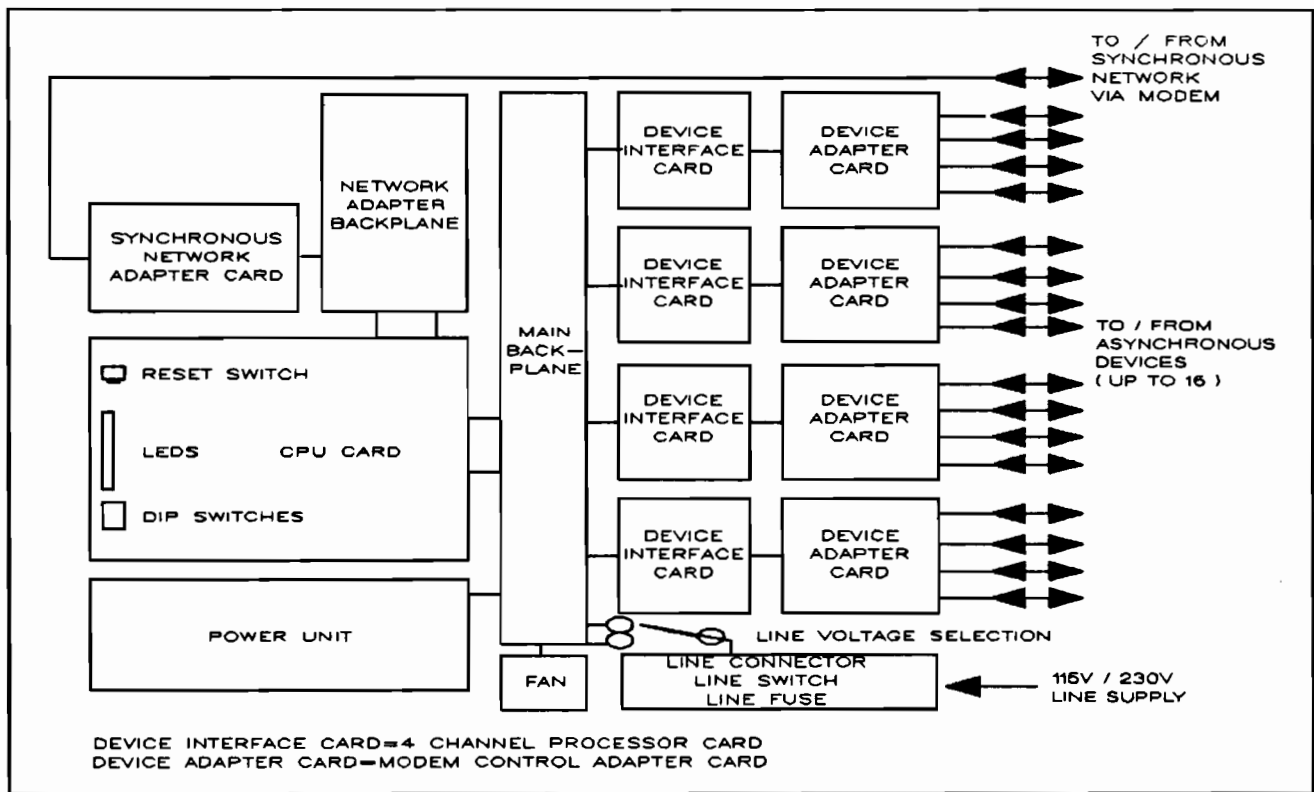


Figure 9-3 HP2334A Plus Internal Architecture

The HP2334A Plus 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 (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 Plus. 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 Plus, 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 Plus.
- 21 LED status indicators (LED [a] is green; all other LEDs are red).
- 8 DIP switches for HP2334A Plus default configuration/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.
- Two type 2764 UV-EPROMs (8 Kbytes each).
- Two type 27128 UV-EPROMs (16 Kbytes each).
- 4 kbytes 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 Plus. This modularity ensures that the installation, service and upgrading of the HP2334A Plus 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. 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 Plus. 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 Plus 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 Plus 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 Plus 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: Non-operating:	0 to +55 degrees Celsius. -40 to +75 degrees Celsius.
Humidity	Operating:  Non-operating:	5% to 95% (non condensing) at 40 degrees Celsius.  90% at +65 degrees Celsius to 95% at +40 degrees Celsius.
Altitude	Operating:  Non-operating:	4600 metres  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: Non-operating: Transportation handling:	102 mm tilt drop. 30g for 11ms / half sine. 752 mm drop (in packaging).
Magnetic Field Interference	Operating:  Non-operating	Max. 5 Gauss p-p.  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: 15 kV - no errors, 20kV - no loss of data, 25 kV - no damage.

Table 9-1 HP2334A Plus 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 Plus 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, 115V - standard 230V - Option 015	86.25 to 126.5 Volts 195.5 to 253.0 Volts
Maximum Voltages	Between phase / neutral: Between phase / ground: Between neutral / ground:	253 Volts 253 Volts <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 1000V - 30ns risetime - 375ns width 500V - 40ns risetime - 400ns width
	Power Interruption	Total loss of power for up to 2 cycles.

Table 9-3 HP2334A Plus Power Requirements

## 9.7 SAFETY APPROVALS

The HP2334A Plus 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 Deutscher Elektrotechniker)  
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.



## 10.1 INTRODUCTION

This chapter describes the theory of operation of the HP2334A Plus to block diagram level.

As depicted in Figure 10-1, the HP2334A Plus 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. 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 48 kbyte ROM (two type 2764 UV-EPROMS of 8 kbyte each and two type 27128A UV-EPROMS of 16 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 Plus 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.
- 4 kbytes 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 Plus 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 Plus 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 Plus activity on the front panel LEDs. The Empty Slot Detection signal provides HP2334A Plus configuration information. A low level forces each PCA plugged into the Main Backplane to generate a low true Identity signal.

**4 kbytes Static CMOS RAM.** The 1 kbyte of static CMOS RAM is used to store the HP2334A Plus configuration. This non-volatile memory is powered by a lithium cell located on the CPU PCA. In the event of a power-down a standby circuit prevents read and write operations. 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 Plus 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 Plus-to-synchronous network signals are listed in Table 4-3. 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 Plus. 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 MODEM CONTROL ADAPTER PCA

As shown in the Modem Control Adapter PCA block diagram (Figure 10-5), 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 4-2).

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.

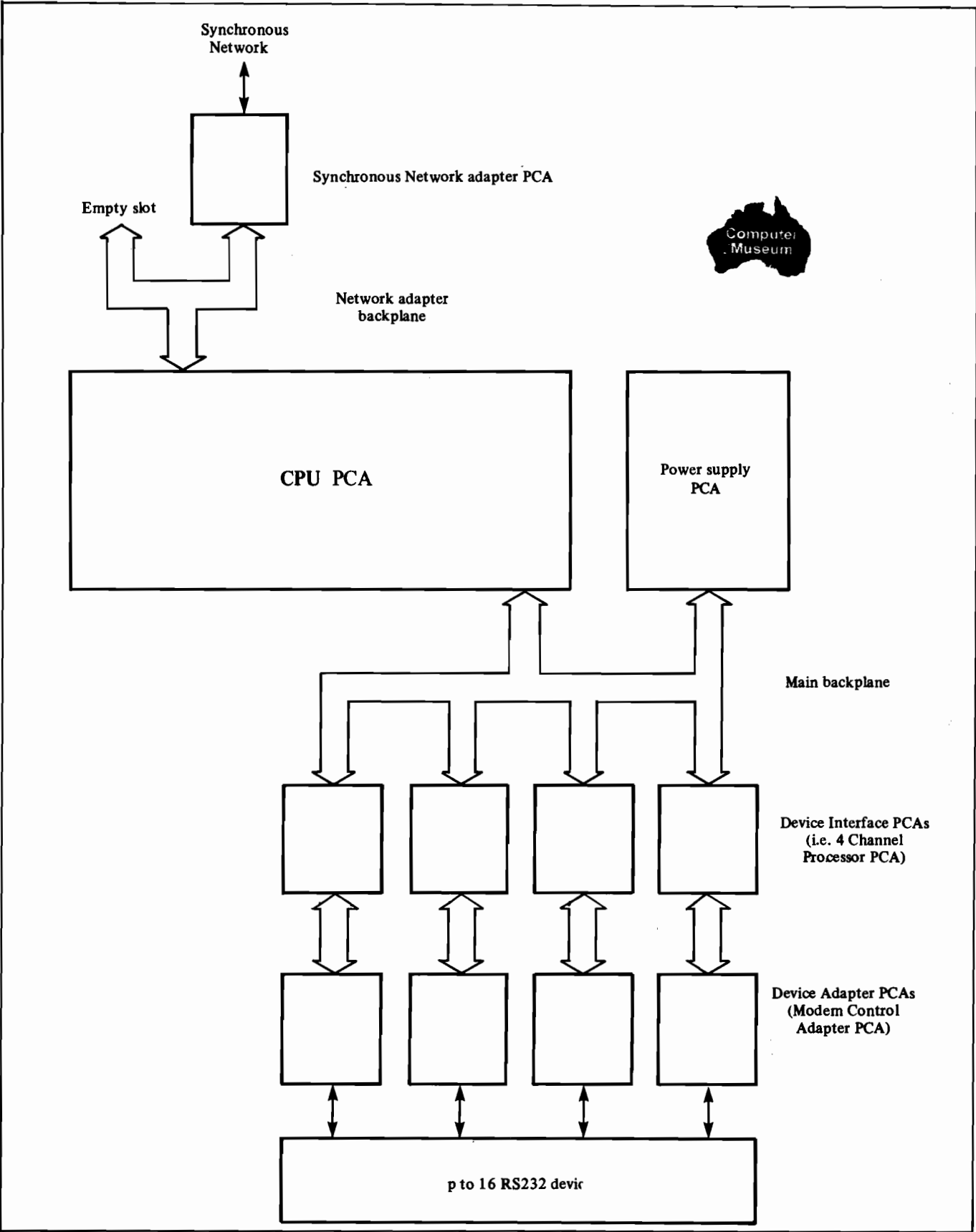


Figure 10-1 HP 2334A Plus Overall Block Diagram

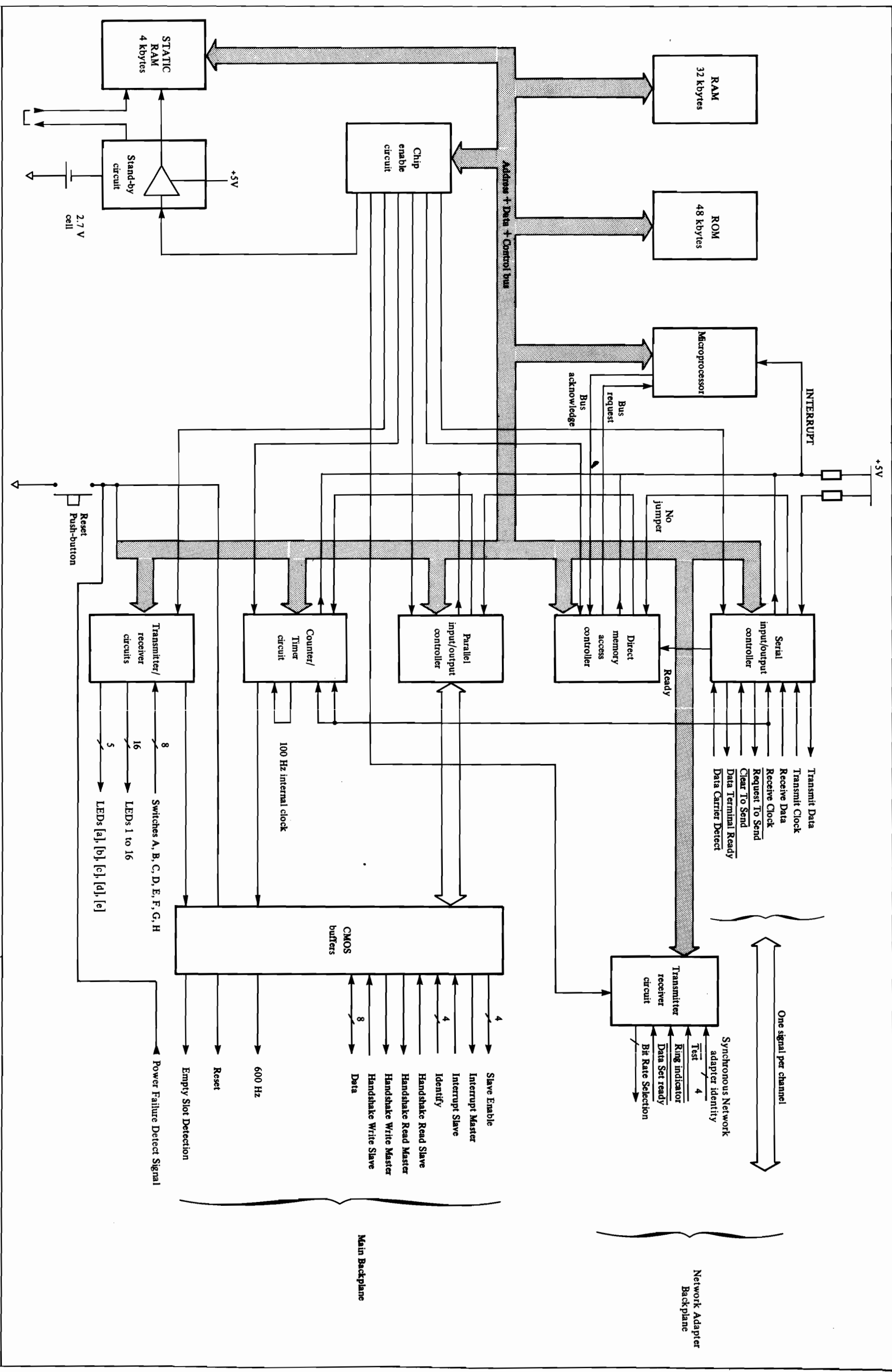


Figure 10-2 CPU PCA Block Diagram

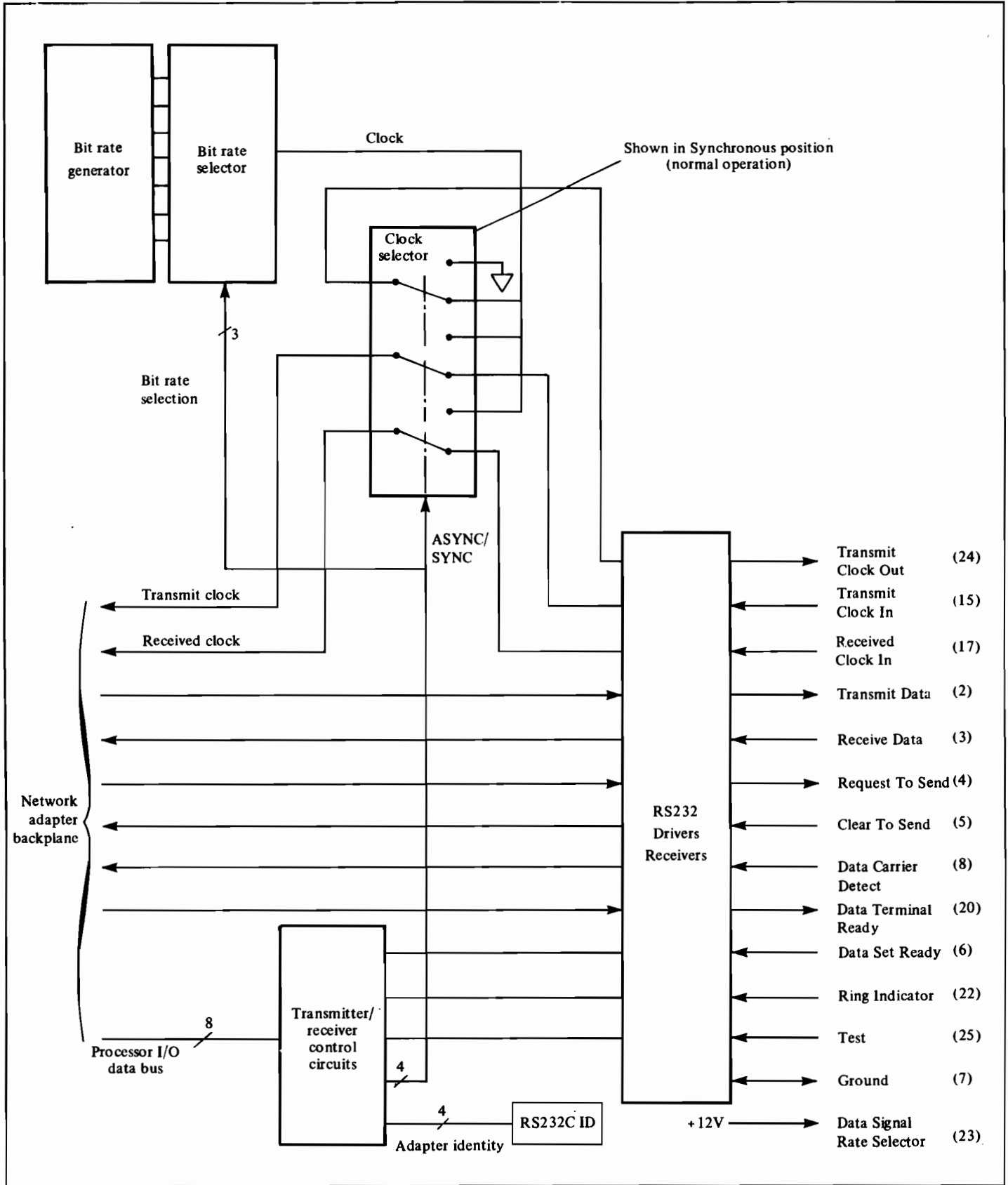


Figure 10-3 Synchronous Network Adapter PCA Block Diagram

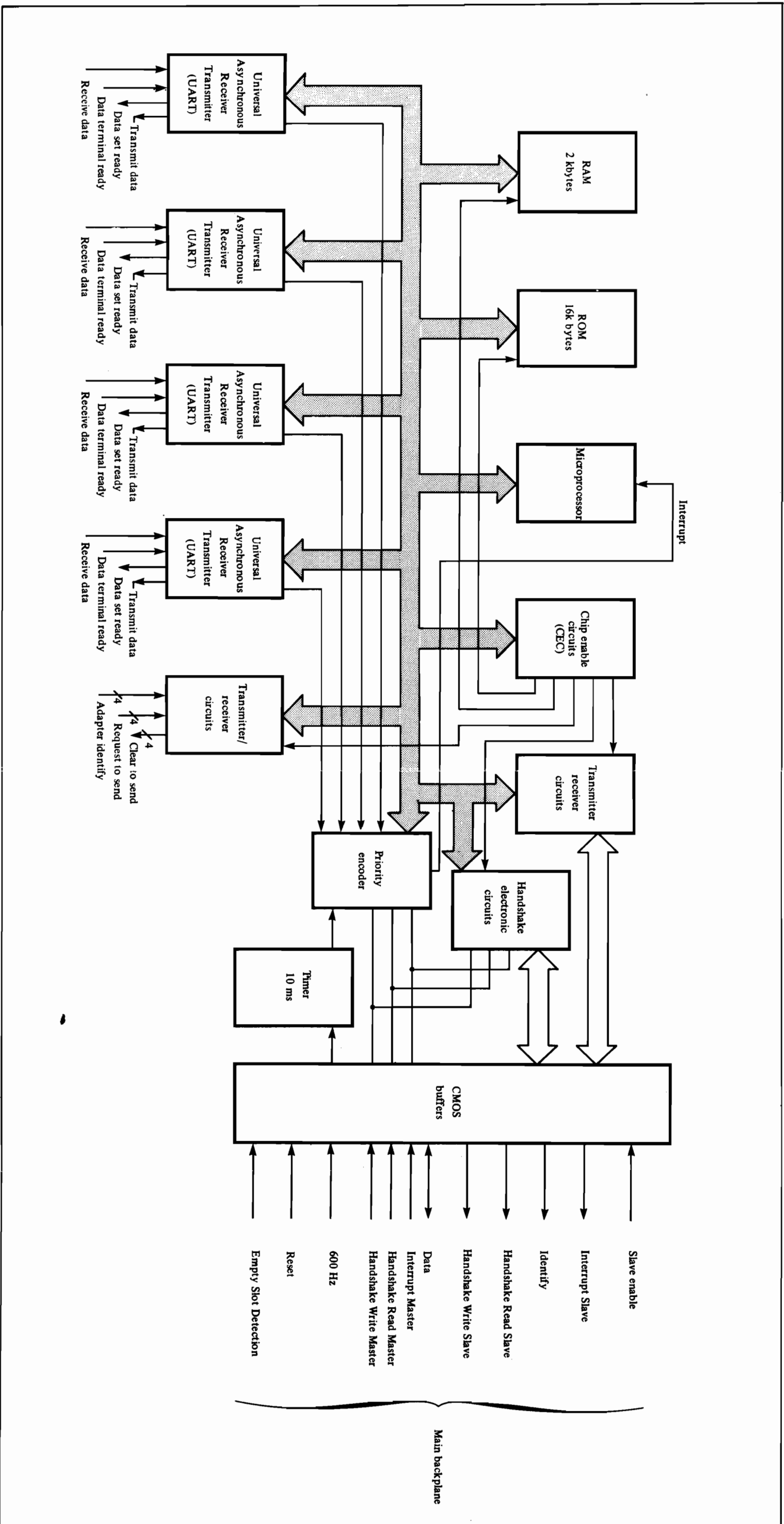


Figure 10-4 4 Channel Processor PCA Block Diagram

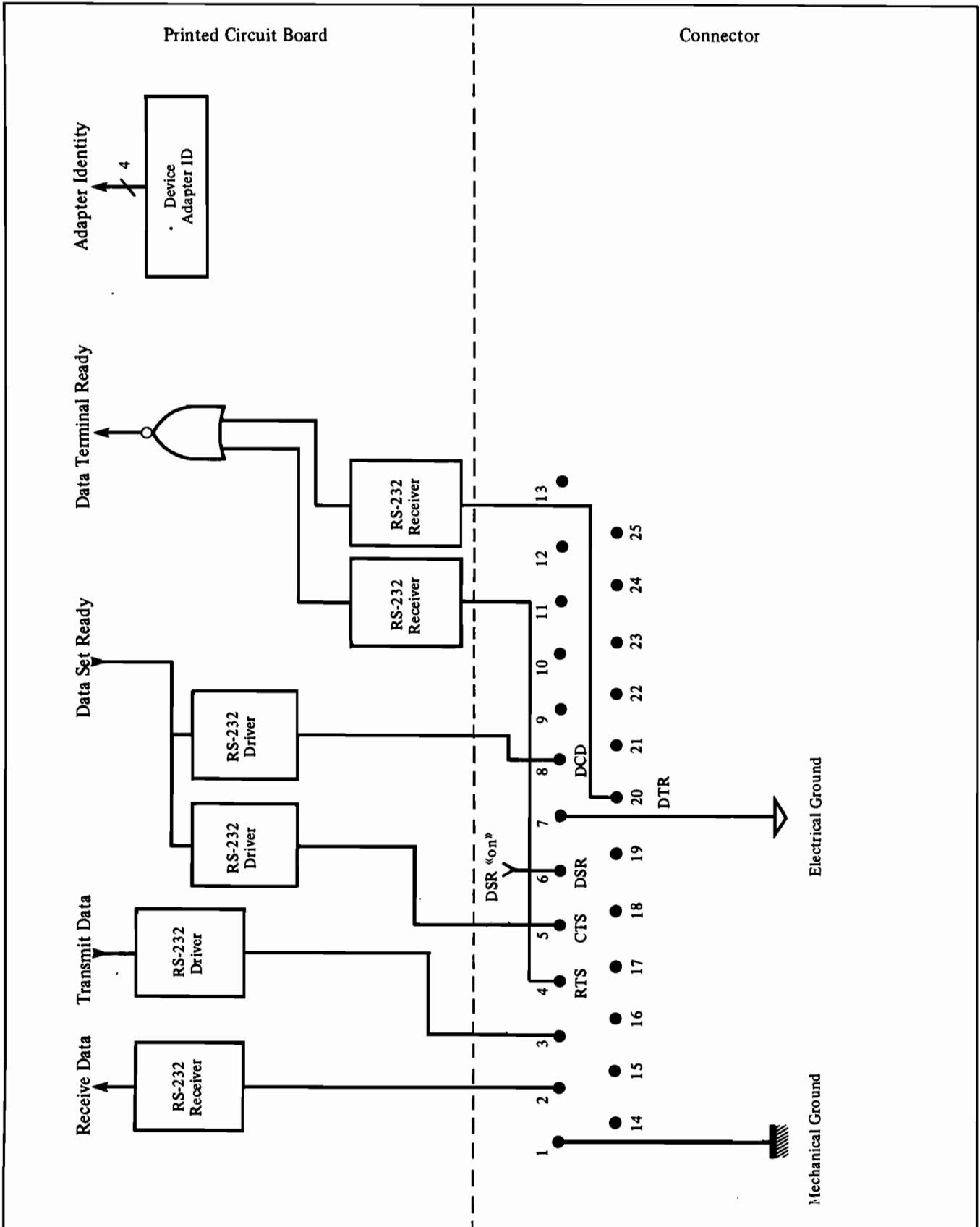


Figure 10-5 Modem Control Adapter PCA Block Diagram



## 11.1 INTRODUCTION

The HP2334A Plus 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 Plus'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 Plus 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.**

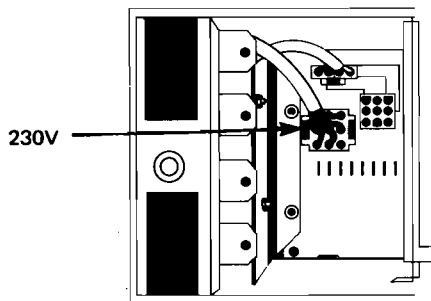
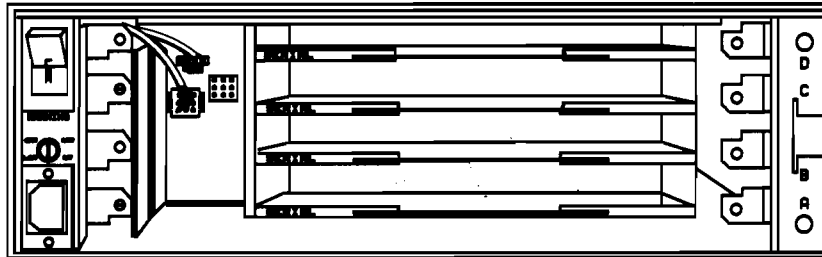
**DO NOT USE PETROLEUM BASED CLEANERS OR CLEANERS CONTAINING ACETONE, AMMONIA, BENZENE OR TRICHLOROETHYLENE AS THEY MAY DAMAGE THE OUTER CASE.**

If the HP2334A Plus cabinet outer casing becomes dirty it may be wiped clean using a lint-free cloth lightly moistened with warm soapy water.

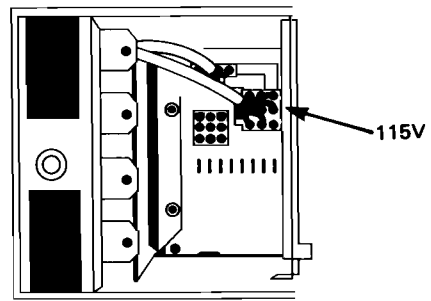




REAR OF HP2334A Plus WITH ADAPTER CARDS AND  
BLANKING PANELS REMOVED SHOWING THE VOLTAGE  
SELECTION COMPARTMENT



VOLTAGE SELECTION COMPARTMENT  
SHOWING 230V SELECTION POSITION



VOLTAGE SELECTION COMPARTMENT  
SHOWING 115V SELECTION POSITION

Figure 12-1 HP2334A Plus Voltage Selector and Line Fuse

## WARNING

THE POWER SUPPLY CONTAINS HIGH-VOLTAGE COMPONENTS. ENSURE THAT THE HP2334A Plus 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 Plus is fitted with a 75W power supply part number 0950-1717 which does not require any voltage adjustment. The HP2334A Plus's power requirement is detailed on the product identification label (see Section 4.3). The user should verify that the HP2334A Plus 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 Plus 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 Plus identification label. This may be verified as follows:

- 1) Ensure the HP2334A Plus is disconnected from the line (mains power) supply; i.e. by removing the power cord.
- 2) At the rear of the HP2334A Plus remove ALL of the Device Adapter Cards/blanking panels (see Section 15.3). Each card/panel is secured to the rear of the HP2334A Plus 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 Plus, 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 top rear of the compartment is for an internal power connection to the HP2334A Plus'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 Plus 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

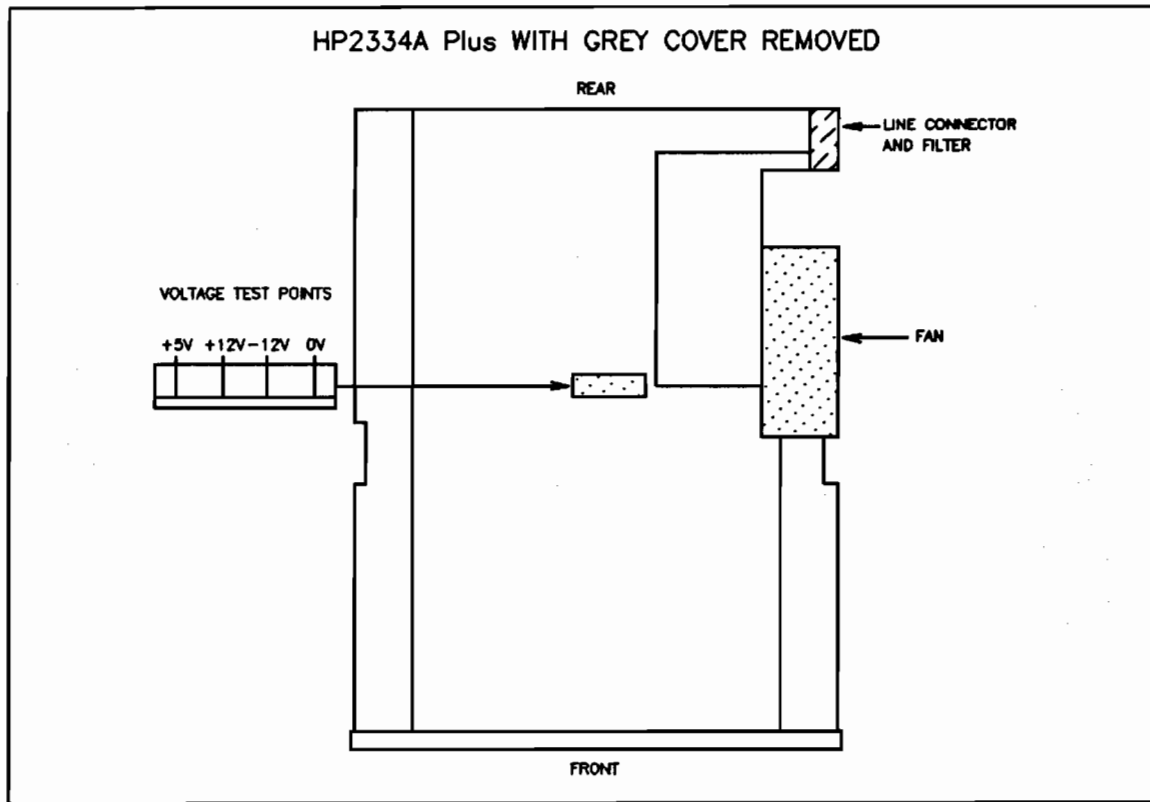


Figure 12-2 HP2334A Plus Power Supply Voltage Test Points

The HP2334A Plus 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 Plus should be prepared as follows:

- 1) Switch OFF the HP2334A Plus 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 Plus's gray protective cover as described in Section 15.5, but leave the PCAs in position.

## POWER SUPPLY VOLTAGE & FUSE CHECKING

**Voltage Checking Procedure.** A rectangular aperture in the top of the HP2334A Plus 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 Plus'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 Plus.
- 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.	+ 0.15V d.c. - 0.15V d.c.
+12V	+12V d.c.	+ 1.2 V d.c. - 1.2 V d.c.
-12V	-12V d.c.	+ 1.2 V d.c. - 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 Plus 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 Plus 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 Plus 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 Plus.
- 4) With the protective plate removed, withdraw the power supply from the front of the HP2334A Plus.
- 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.

## 13.1 INTRODUCTION

The HP2334A Plus is delivered ready assembled with all the ordered cards (i.e. Option(s) 123) in position. Figures 9-1, 9-2 and 13-1 depict the HP2334A Plus's internal structure and assembly.

If add-on interface(s) (i.e. 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 Plus add-on interface(s) requires a cross-head screwdriver and a flat-blade screwdriver.

### **WARNING**

THE HP2334A Plus ADD-ON INTERFACES MUST BE INSTALLED BY QUALIFIED PERSONNEL ONLY.

THE HP2334A Plus MUST BE DISCONNECTED FROM THE LINE (MAINS) POWER SUPPLY BEFORE ADD-ON INTERFACE INSTALLATION.

### **CAUTION**

THE HP2334A Plus COMPONENTS MUST BE HANDLED WITH CARE AND SHOULD NOT BE KNOCKED OR ALLOWED TO BE CONTAMINATED BY DIRT OR LIQUIDS.

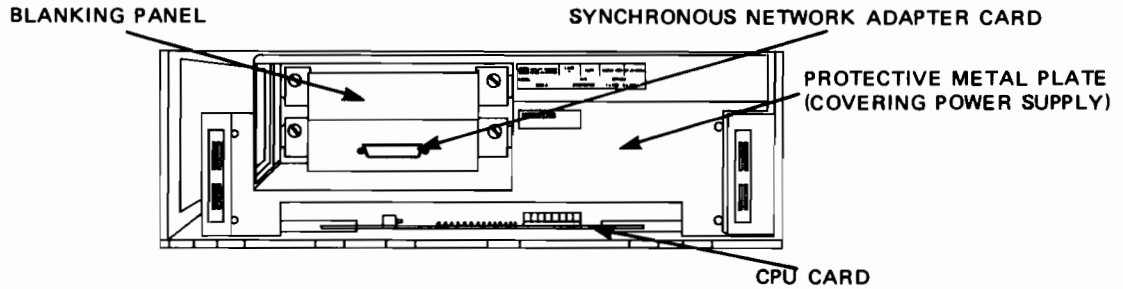
USE ANTI-STATIC HANDLING PROCEDURES WHEN INSTALLING OR REMOVING HP2334A Plus DEVICE INTERFACE/ADAPTER CARDS.

WHEN INSTALLING ANY CARD (PCA) ENSURE THAT IT IS CORRECTLY ALIGNED IN THE HP2334A Plus SLOT RUNNERS.

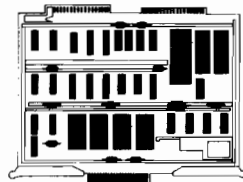
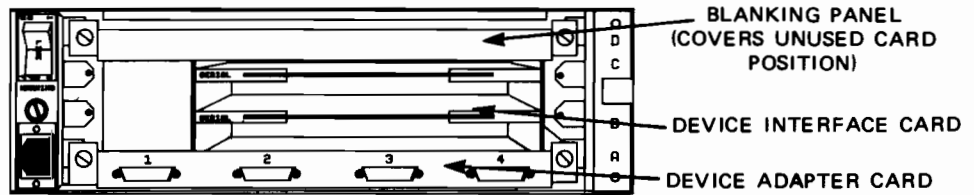


DEVICE INTERFACE/ADAPTER CARD INSTALLATION

HP2334A Plus WITH FRONT PANEL REMOVED SHOWING SYNCHRONOUS NETWORK ADAPTER AND CPU CARDS IN POSITION



REAR OF HP2334A Plus SHOWING DEVICE INTERFACE AND ADAPTER CARDS



DEVICE INTERFACE CARD (4 CHANNEL PROCESSOR CARD)



MODEM CONTROL (RS-232-C) ADAPTER CARD

Figure 13-1 HP2334A Plus Interface/Adapter Card Assembly

## 13.2 ADD-ON INTERFACE INSTALLATION

Each HP2334A Plus 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 (the Modem Control Adapter Card, part number 40261-60001) that connects with the Device Interface Card.

These cards must be installed in the HP2334A Plus 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 Plus should be mounted on a clean, dry, solid bench or table.

**NOTE:** At the rear of the HP2334A Plus 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 5061-3833) is positioned between the HP2334A Plus'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 is 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 Plus must be removed. This may be done by unscrewing the two screws securing each blanking panel to the rear of the HP2334A Plus, 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 Plus 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. Modem Control Adapter Card) connects with its associated Device Interface Card and is positioned at the rear of the HP2334A Plus (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 Plus. Each port is assigned a unique sub-address, depending on the card's position in the HP2334A Plus (see Figure 4-7).

The card must be mounted in slot A, B, C or D at the rear of the HP2334A Plus, 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 Plus 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 Plus configuration must be verified for the additional device ports. For further information on configuring the HP2334A Plus refer to Chapter 6.

## 14.1 INTRODUCTION

This chapter provides the troubleshooting information and procedures required, in case of an HP2334A Plus 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 Plus is of modular construction which ensures that installation, service and upgrading can be easily accomplished in the field.

The HP2334A Plus troubleshooting procedure provides verification of the following:

- Correct HP2334A Plus installation.
- HP2334A Plus power supply voltages and fuses.
- All HP2334A Plus PCAs (cards) using the power-on and self diagnostic tests.
- The HP2334A Plus 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 Plus, 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 Plus 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 Plus installation (see Chapter 4).
- 3) If the HP2334A Plus 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 Plus has been correctly configured (see Chapter 6). Note that the HP2334A Plus 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 Plus 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 Plus 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 Plus fails the power-on self test (i.e. power-on test (1) fails, see Table 14-1).
- If the HP2334A Plus 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 Plus installation.

## 14.3 MAIN TROUBLESHOOTING

HP2334A Plus 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 Plus. The DIP switches and reset push-button are described in Section 7.2.

**Troubleshooting.** If the HP2334A Plus has a failure when operational, the troubleshooting procedure described below should be followed, as it minimizes the down-time by re-assembling the HP2334A Plus on a step-by-step basis. The HP2334A Plus 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 Plus 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 Plus. 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. 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 Plus and tested sequentially.
- 12) Prepare the HP2334A Plus 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 Plus. 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 Plus'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 Plus 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 Plus-to-synchronous modem connection is operating correctly. Before starting, ensure that the HP2334A Plus's configuration is correct for the connected modem (baud rate, transmission mode, etc.).
- Unplug the 02333-60006 test connector from the HP2334A Plus-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 Plus 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 Plus-to-synchronous modem communications are deemed to be operating correctly.



### 14.3.1 Terminal Loop Back Test

When the HP2334A Plus is connected to the asynchronous devices (terminal(s)) and the HP2334A Plus has been configured, the HP2334A Plus-to-device communications may be checked using the terminal loop back test. This test causes a message to be sent from the HP2334A Plus to the devices and allows data entered at a connected terminal to be echoed back to the terminal, thereby checking the HP2334A Plus-to-device communications. The HP2334A Plus 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 Plus 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 Plus 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 Plus echoes each character as it is typed. When the terminal's

**RETURN** key is pressed (Cr character entered) the HP2334A Plus 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 Plus waits 10 seconds after the 80th character before continuing.

**Interpretation.** If the messages are correctly displayed on the terminal (device) then the HP2334A Plus-to-device communications may be assumed to be correct. The HP2334A Plus-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 Plus-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.

**NOTE:** The terminal loop-back test (and off-line configuration) uses profile #100, the main characteristic of which is 1200 bps as terminal speed. It may be modified using the UDP command (see Section 6.7.6.) to use 9600 bps as terminal speed.

### 14.3.2 Modem Loop Back Test

Once the HP2334A Plus has been connected to the asynchronous devices/synchronous network modem and configured, the HP2334A Plus-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 Plus 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 Plus 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 Plus-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 Plus-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 Plus-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 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.

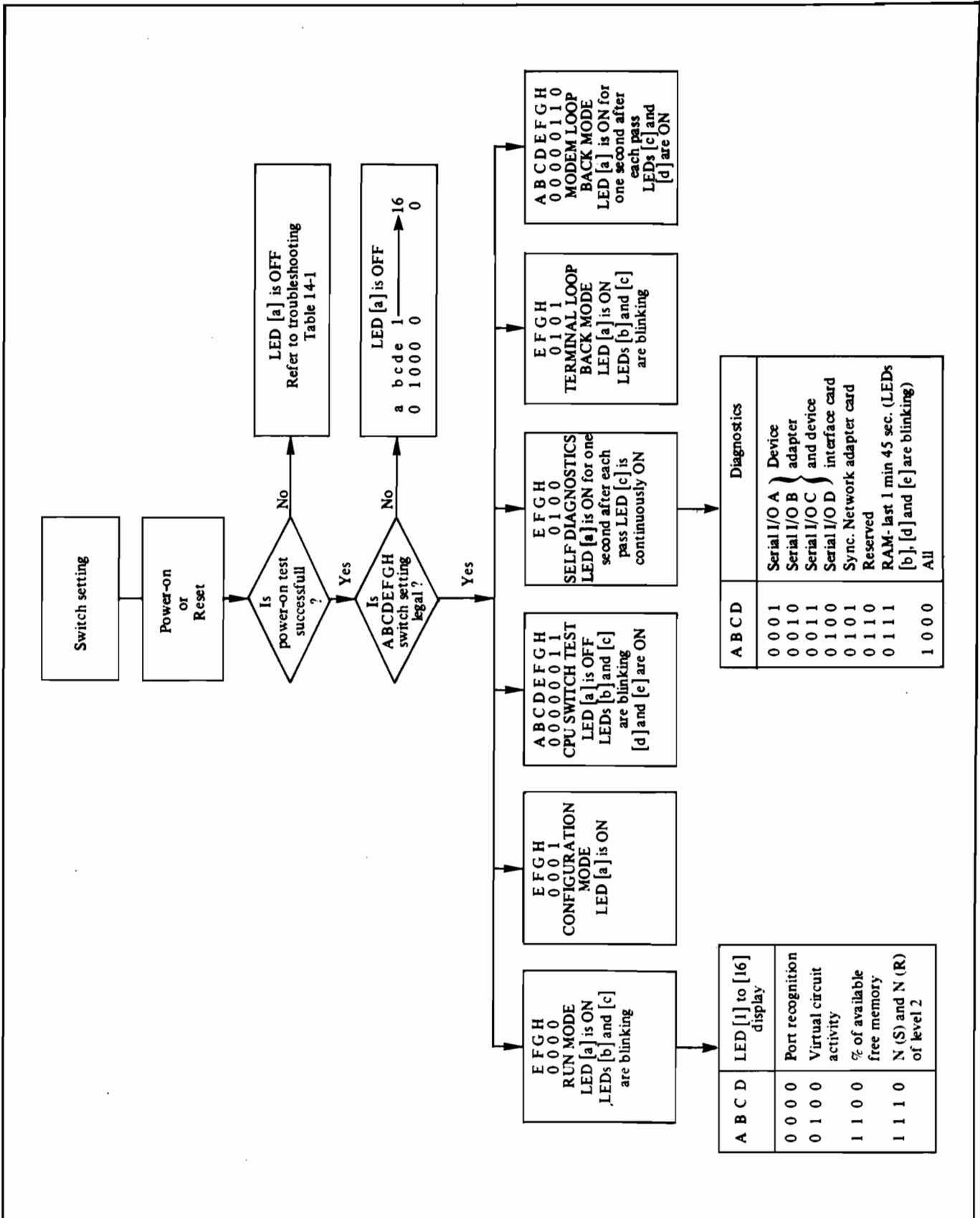


Figure 14-1 Power-On & Troubleshooting Sequence

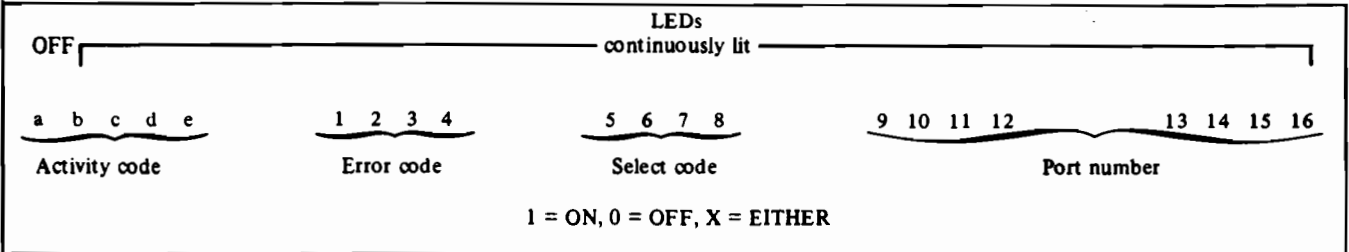
TESTS	TEST SEQUENCE	DESCRIPTION	LED ERROR READOUT																SUGGESTED ACTION									
			a	b	c	d	e	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16				
Power-on test	Visual check of the LEDs	(1) All the LEDs are ON for 1 second, then OFF for 1 second, then a lit LED is propagated from [a] to [16].	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1	2	3		
	CPU ROM 0 test	(2) ROM 0 CRC checking	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CPU microprocessor test	(3) The microprocessor executes an instruction set.	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CPU RAM test	(4) Dynamic RAM and CMOS RAM checking	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	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	0	
Internal bus and Device Interfaces test	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	0	0	0	0	0	
	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	0	
	Device interface PCA detection	(8) Device interface PCA detection	0	0	0	1	0	1	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
		(9) A write operation is performed on the device interface PCAs	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A read operation is performed on the device interface PCAs	(10) A read operation is performed on the device interface PCAs	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		(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	0	0	0	0	0	0	0	0
	Device interface microprocessor check	(12) Device interface microprocessor check	0	0	0	1	0	0	1	1	0	select code*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		(13) Device interface RAM test	0	0	0	1	0	1	0	1	0	select code*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Device interface ROM CRC and compatibility checking	(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	0	0	0	0	0	0	0	0
		(15) Check 600 Hz timer	0	0	0	1	0	1	1	0	0	select code*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Device adapter detection	(16) Device adapter detection	0	0	0	1	0	1	0	0	1	select code*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	(17) Switch setting check	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	0	
Switch test	Switch states are displayed on LED 9 to 16	Switch states are displayed on LED 9 to 16	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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*	0	7	6	5	4	3	2	1	0	0	0	0	0	0	0	
		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	0	
	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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					
Modem loopback		A test pattern is transmitted and read on the Synchronous Network adapter	0	0	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 14-1 Troubleshooting Test Sequence

(Continued...)



## LED SETTING IF HP2334A Plus HALTED DUE TO AN ERROR



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 occurred

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	<i>Error encountered in RUN or CONFIGURE mode</i>
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	<i>RAM failure</i>
1	0	0	0	DMA failure
1	0	0	1	Card missing
1	0	1	0	<i>Faulty card</i>
1	0	1	1	<i>Bad configuration</i>
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	<i>Device interface card A</i>
0	0	1	0	<i>Device interface card B</i>
0	0	1	1	<i>Device interface card C</i>
0	1	0	0	<i>Device interface card D</i>
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	<i>CPU Card</i>
1	1	1	1	<i>Undetermined</i>
0	1	1	1	<i>Undetermined</i>

**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



DIP SWITCH SETTINGS	
SWITCHES	MODE
0 = Down 1 = UP X = 0 or 1	
A B C D E F G H	
X X X X X 0 0 0	RUN. Where switches ABC select information displayed on LEDs [1] to [16]. i.e.: Port recognition (ports A/B/C/D 1 to 4) PVC + SVC circuits engaged (ports A/B/C/D 1 to 4) % of available free memory Frame level activity
0 0 0 0 0 0 0 0	
1 1 0 0 0 0 0 0	
1 1 1 0 0 0 0 0	
X X X X X 0 0 1	CONFIGURE. Where switches ABC select information displayed on LEDs [1] to [16]. i.e.: Port recognition (ports A/B/C/D 1 to 4) % of available free memory Not used
0 0 0 0 0 0 0 1	
1 1 0 0 0 0 0 1	
Other combinations	
X X X X X X X X X	SELF TESTS. 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
0 0 0 1 0 1 0 0	Diagnostic. Where switches ABCD select internal diagnostic routine. i.e.: Diagnostic of slot A (Device adapter/interface) } Requires test plug Diagnostic of slot B } Diagnostic of slot C } Diagnostic of slot D } Synchronous Network adapter card Extended RAM test (memory) lasts 1 min. 45 sec. All diagnostics routines (for plugged in PCs)
X X X X X 0 1 0 0	
0 0 0 1 0 1 0 0	
0 0 1 0 0 1 0 0	
0 0 1 1 0 1 0 0	
0 1 0 0 0 1 0 0	
0 1 0 1 0 1 0 0	
0 1 1 0 0 1 0 0	
0 1 1 1 0 1 0 0	
1 0 0 0 0 1 0 0	
X X X X X 0 1 0 1	Terminal loopback test. Port recognition (ports A/B/C/D 1 to 4) % of available free memory
0 0 0 0 0 1 0 1	
1 1 0 0 0 1 0 1	
0 0 0 0 0 1 1 0	Modem loopback test.
Other combinations	Not used

\*Note:  
Switches DEFGH only sensed at power-on or after reset. Switches ABC sensed all time, except during diagnostic test when only checked at power-on or after reset.

LED INTERPRETATION	
LEDs	MODE
1 = ON, 0 = OFF, b = blinking	
a b c d e 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	
a = ON	
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)
1 b b CF level 2	N (S)
a = ON	
1 b b 0 0	Port recognition or free memory
0 0 0 0 1	Extinguished
0 0 0 1 0	Extinguished
0 b b 1 1	Image of switches A to H
Blinking Continuously lit	
X 0 1 0 0	Internal diagnostic test.
LED [a] illuminates for one second at the end of each test cycle and LED [c] is continuously lit.	
In addition for the extended RAM test, LED [b], [d] and [e] blink continuously.	
1 b b 0 0	Port recognition or free memory
LED [a] is continuously lit.	Terminal loopback test.
X 0 1 1 0	Modem loopback test. If there is no Synchronous Network RS-232-C adapter fitted, this test is not performed and LED [a] is continuously lit.
LED [a] illuminates for one second at the end of each test cycle. LEDs [c] and [d] are 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.



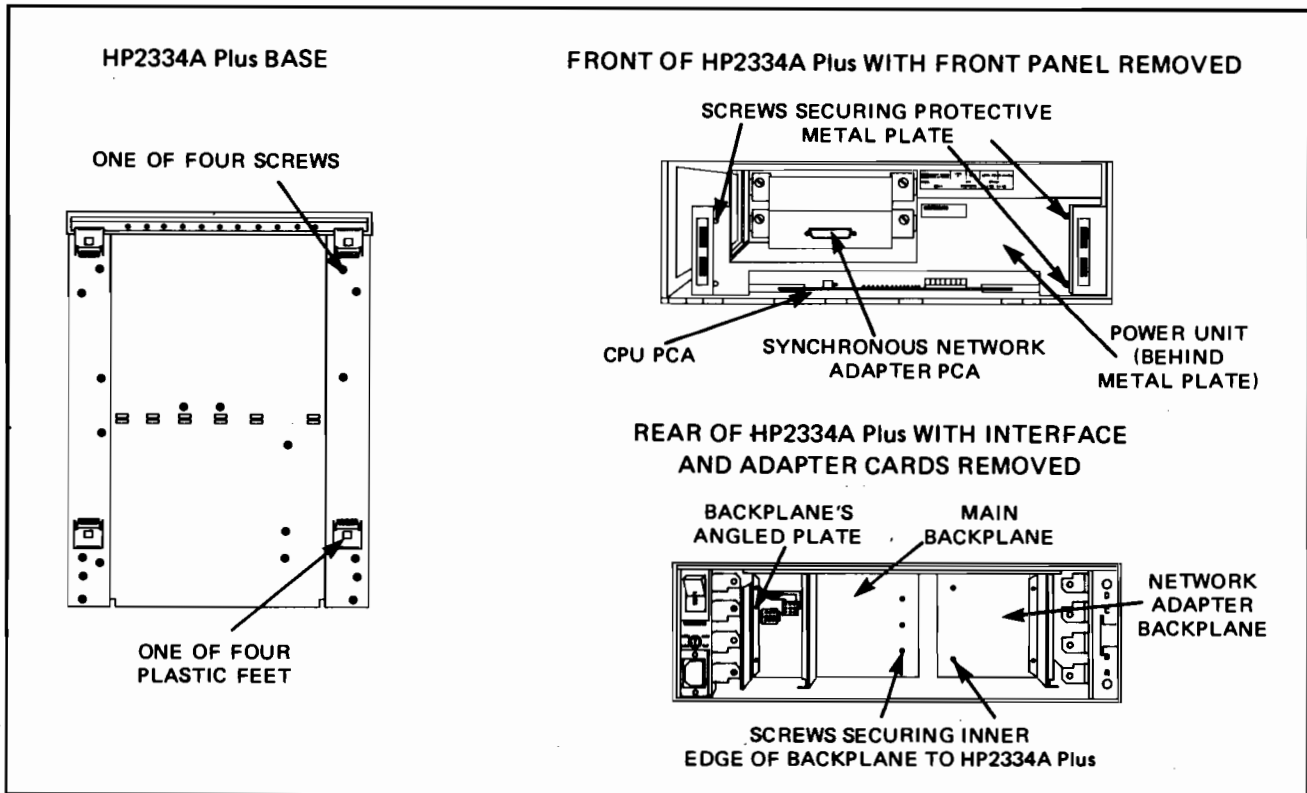


Figure 15-1 The HP2334A Plus Cabinet Assembly

**WARNING**

THE HP2334A Plus MUST BE DISMANTLED BY QUALIFIED PERSONNEL ONLY.

ENSURE THAT THE HP2334A Plus IS DISCONNECTED FROM THE LINE (MAINS) POWER SUPPLY (BY REMOVING THE POWER CORD) BEFORE STARTING THE DISMANTLING PROCEDURE.

**CAUTION**

THE HP2334A Plus 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 Plus'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 Plus 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 Plus

**CAUTION**

USE ANTI-STATIC HANDLING PROCEDURES WHEN  
REMOVING OR INSTALLING ANY HP2334A Plus 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 Plus, 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 Plus'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 Plus 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 Plus 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 Plus.
- 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 Plus.
- 3) Synchronous Network Adapter PCA. Remove the HP2334A Plus'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 the HP2334A Plus.
- 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 Plus. Then open the CPU PCA's extractors and slide the PCA out of the front of HP2334A Plus.

### NOTE

THE HP2334A Plus 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 Plus (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

### CAUTION

USE ANTI-STATIC HANDLING PROCEDURES WHEN REMOVING OR INSTALLING ANY HP2334A Plus PCA COMPONENT.

The HP2334A Plus CPU Card and Device Interface Card(s) (minus the removable ROM 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 - part number 02333-60031.
- 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 02334-80400  
 CPU ROM 1 - part number 02334-80410  
 CPU ROM 2 - part number 02334-80420  
 CPU ROM 3 - part number 02334-80430

#### Device Interface Card:

SER ROM 0 - part number 5181-0514  
 SER ROM 1 - part number 5181-0515

The ROM 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 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 Plus'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 Plus 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 Plus. 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 Plus, 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 Plus. The front edge of the cover mates with a recess in the HP2334A Plus'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 Plus 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 Plus, and the open side faces the HP2334A Plus's base.
- 2) Carefully slide the cover over the HP2334A Plus. 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 Plus'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 Plus'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 Plus TO AN ELECTRIC POWER SUPPLY WHEN THE COVER IS REMOVED.**

The fan is mounted at the right hand side of the HP2334A Plus (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 Plus 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 Plus.

**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 Plus. 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 Plus and other arrow (direction of rotation) should point towards the front of the HP2334A Plus.
- 2) Replace the three cross-head screws securing the fan to the HP2334A Plus 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 Plus's protective cover and the PCAs as required (see 15.4 and 15.3 respectively).

## 15.7 REMOVING/REPLACING THE BACKPLANES

The HP2334A Plus 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 Plus's 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus. Then carefully slide the backplane into HP2334A Plus 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 Plus.
- 3) Replace the screws securing the inner edge of the backplane to the HP2334A Plus. Then on the Network Adapter Backplane, replace the screws securing the angled metal plate to the side of the HP2334A Plus card cage. Note that for the Main Backplane, the fan's screws secure the angled metal plate to the HP2334A Plus 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.





## 16.1 ORDERING PARTS

To order parts (components, modules, options and accessories) for the HP2334A Plus, 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 HP2334A Plus 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
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	02334-90017
DIP Switch/LED Display Label	02334-80004

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	
02333-69031	02333-60031	CPU PCA, less components: ROM 0, ROM 1, ROM 2 and ROM 3.
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

COMPONENT	PART NUMBER
CPU PCA: ROM 0	02334-80400
ROM 1	02334-80410
ROM 2	02334-80420
ROM 3	02334-80430
LOCATION: Refer to Figure 16-1.	

Table 16-3 CPU PCA Program ROMs

COMPONENT	PART NUMBER
DEVICE INTERFACE CARD:	
ROM 0	5181-0514
ROM 1	5181-0515
LOCATION: Refer to Figure 16-2.	

Table 16-4 Device Interface (4 Channel Processor) PCA ROMs

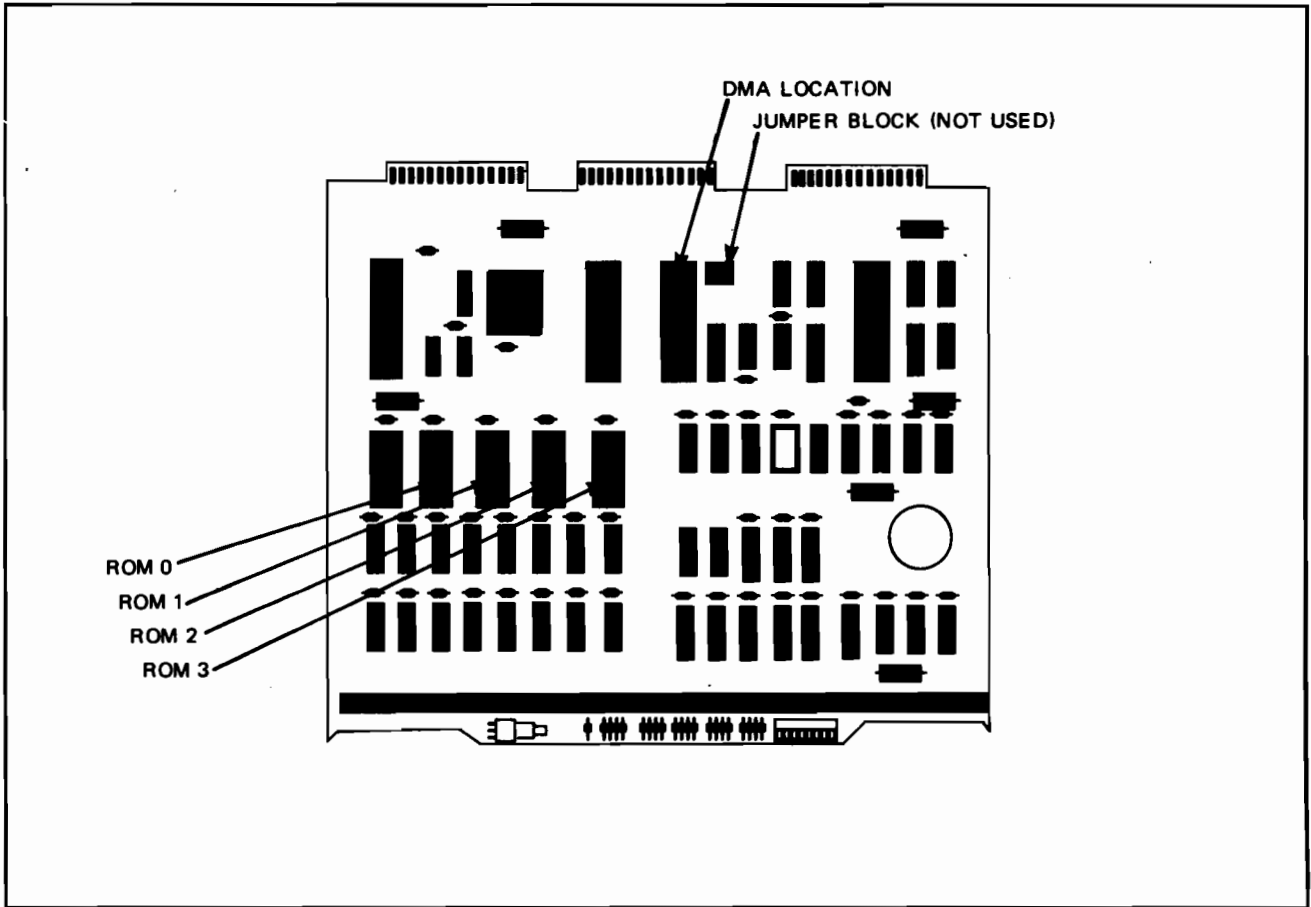


Figure 16-1 CPU PCA

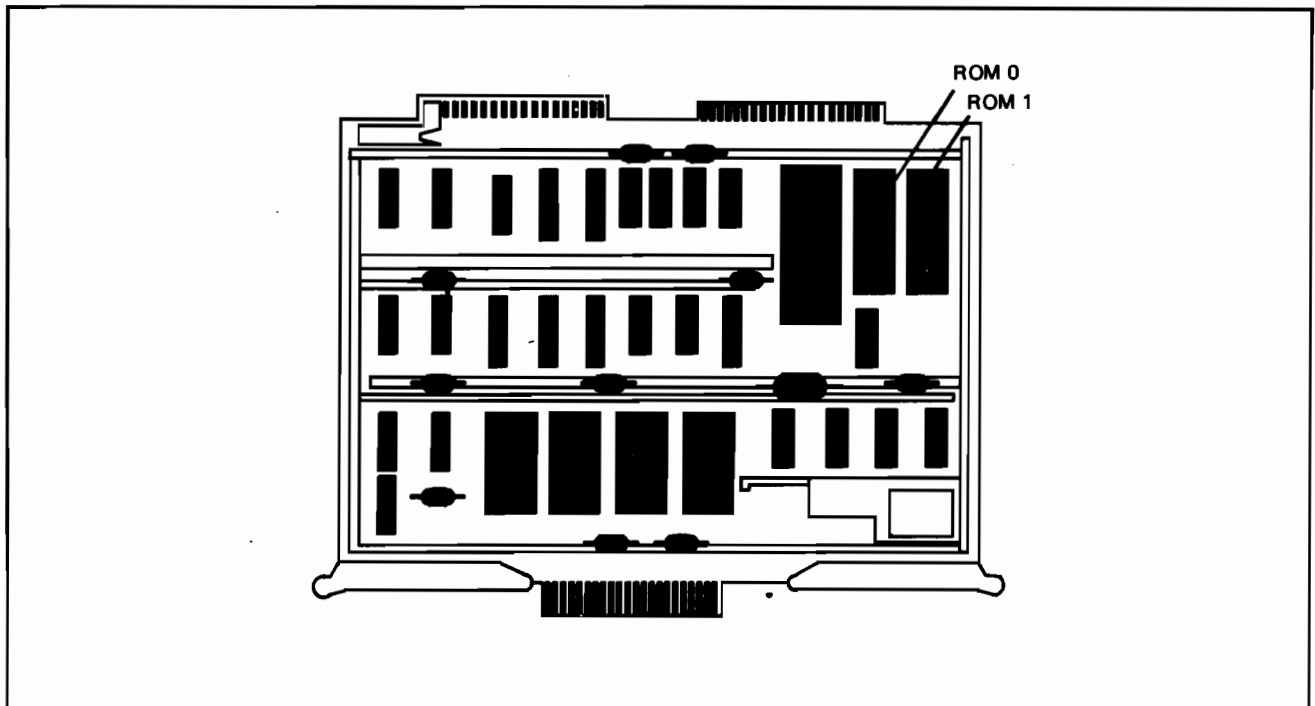
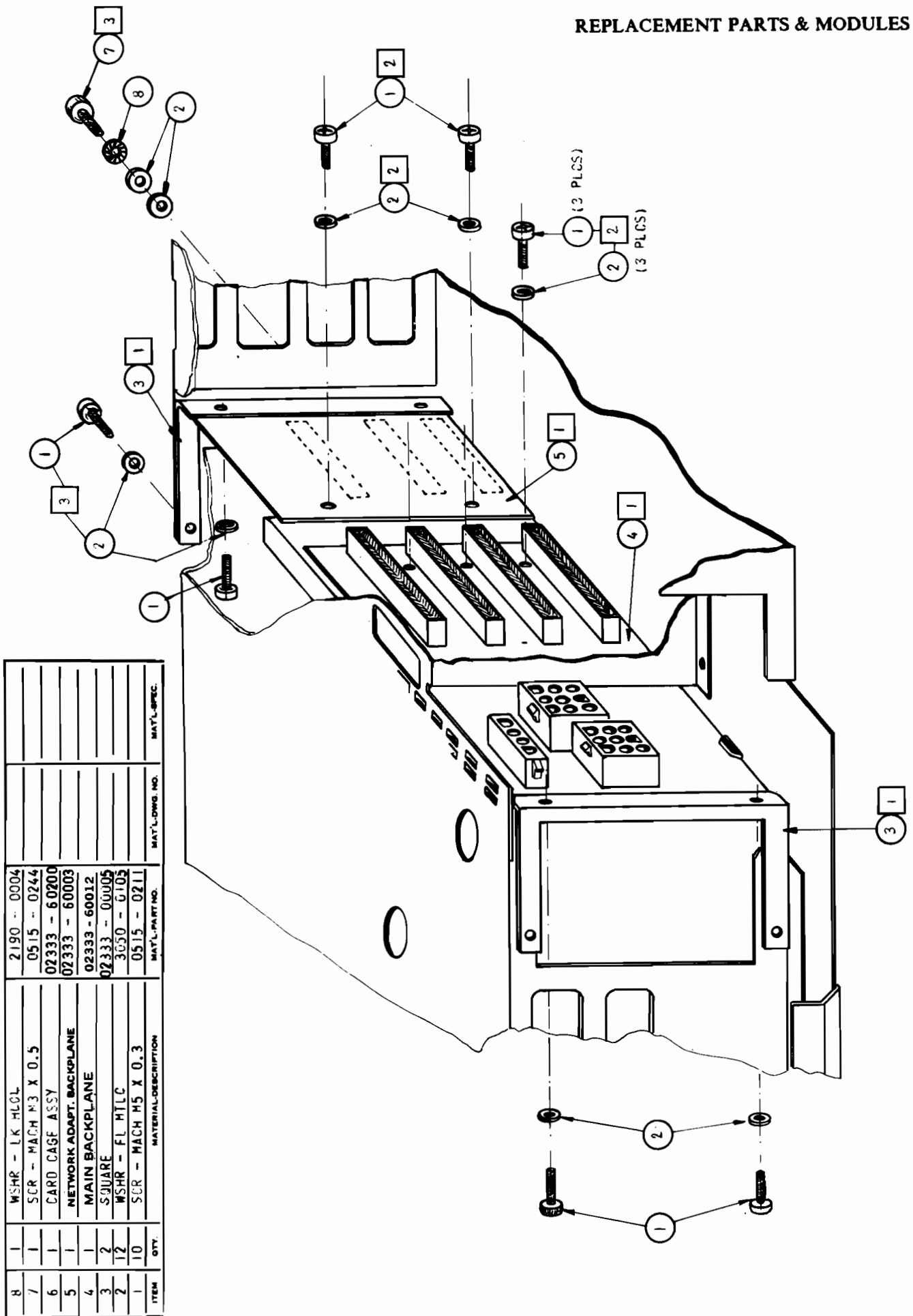
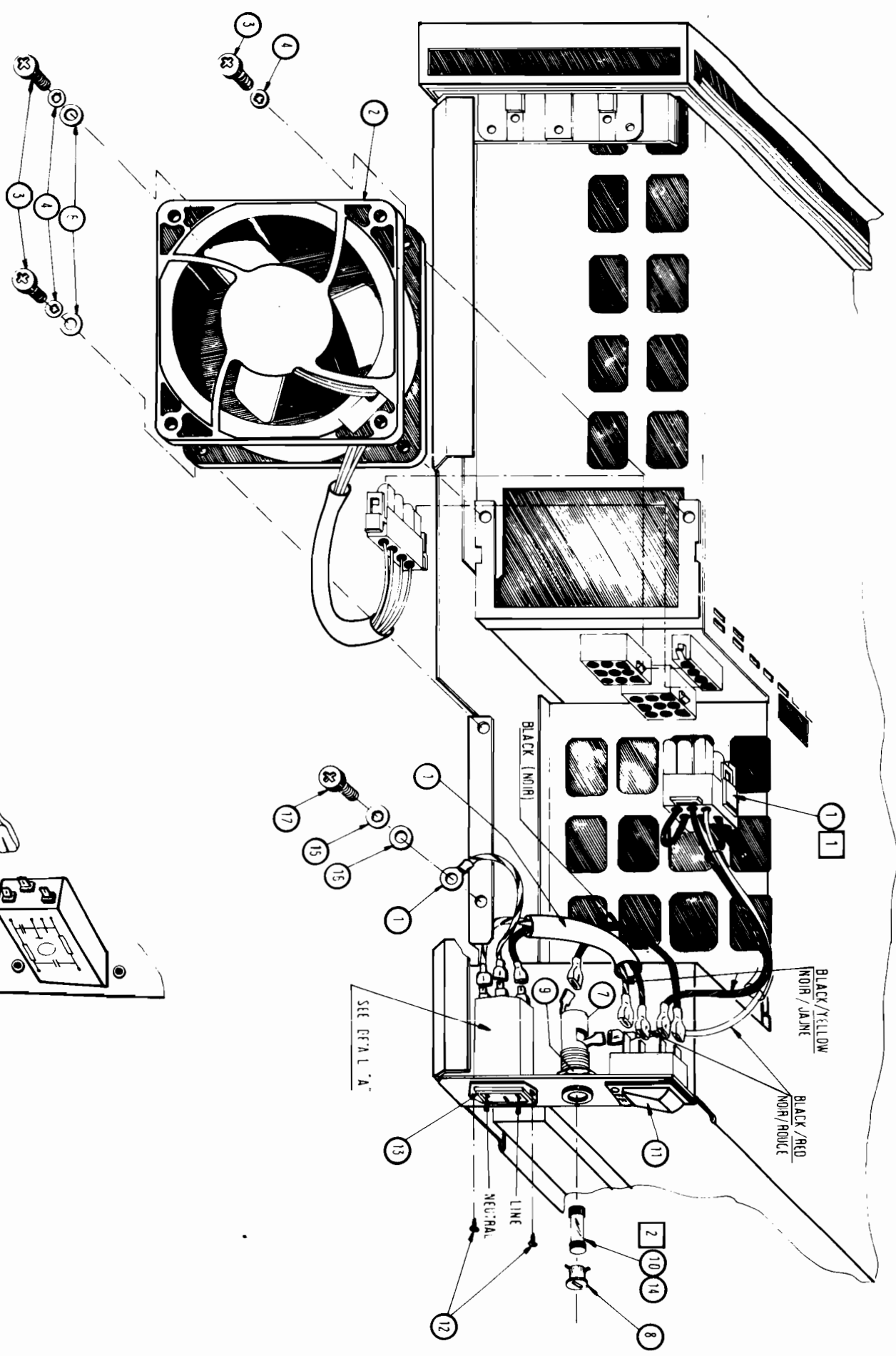


Figure 16-2 Device Interface (4 Channel Processor) PCA



ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.	MAT'L-DWG. NO.	MAT'L-SPEC.
8	1	WSHR - LK HLGL	2190 - 0004		
7	1	SCR - MACH #3 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 - 00009		
2	12	WSHR - FL HTLC	3050 - 0105		
1	10	SCR - MACH #5 X 0.3	0515 - 0211		

Figure 16-3 Backplane Assemblies



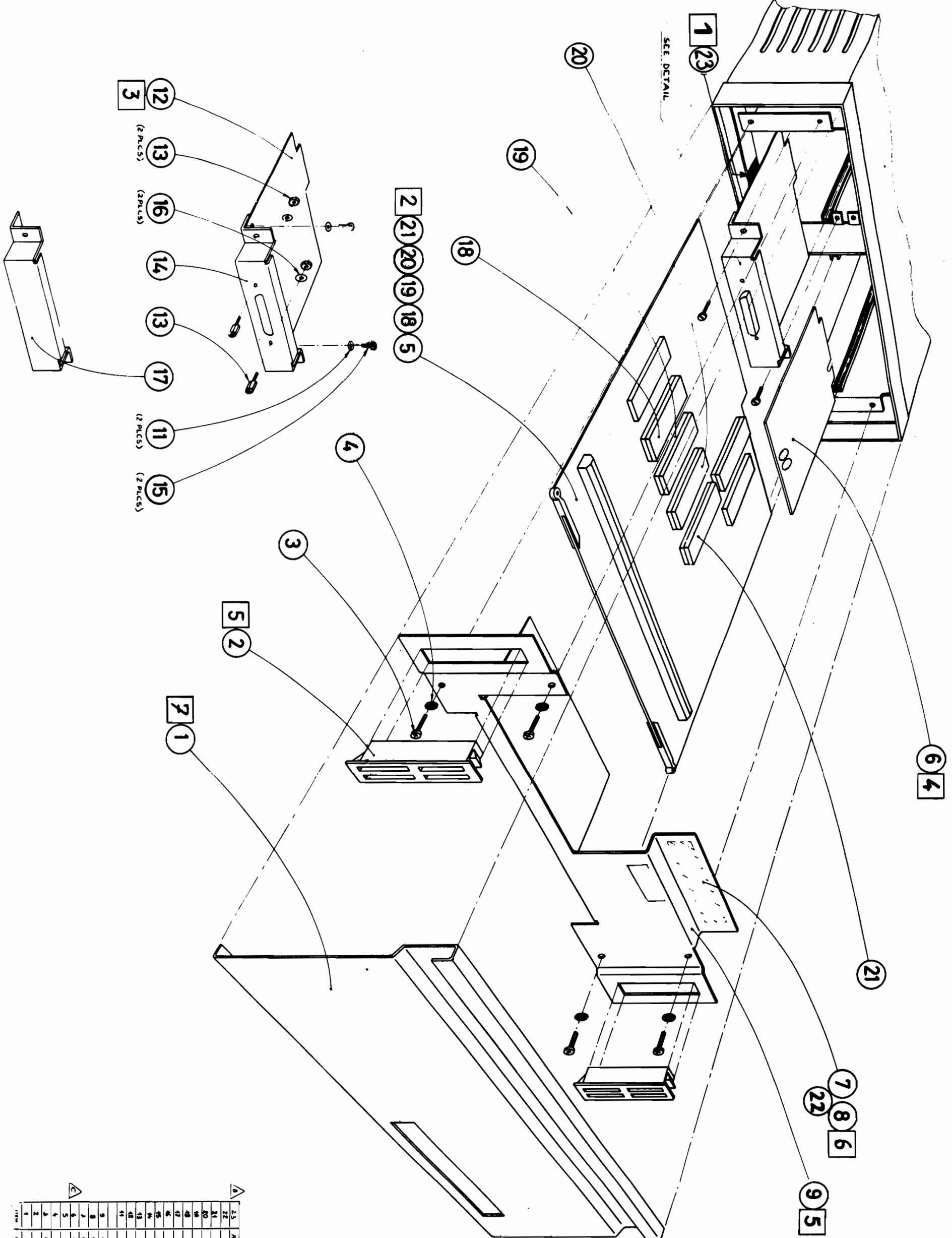
NOTES:

- 1 INSTALL 3 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	DESCRIPTION	MAT'L PART NO	MAT'L QTY	MAT'L DESC
17	1	SCR-MACH M3X0.7	0515-0210		
16	1	WSHR-FL-MILC	3050-0226		
15	1	WSHR-LK-INIL-T	2190-0009		
14	1	FUSE 1.5A 250V	2110-0059		
13	1	CONN-AC POWER	FPNH19714		
12	2	SCR-MACH M3X0.5	0515-0145		
11	1	SW-RKR DPST	3101-0452		
10	1	FUSE 3A 250V	2110-0029		
9	1	NUIT FUSEHOLDER	2110-0569		
8	1	FUSEHOLDER CAP	2110-0565		
7	1	FURTR-EXTR POST	2110-0622		
6	1	WSHR-FL-MILC	3050-0105		
5	3	SCR-MACH M3X0.5	0515-0211		
4	5	WSHR-LK INIL-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

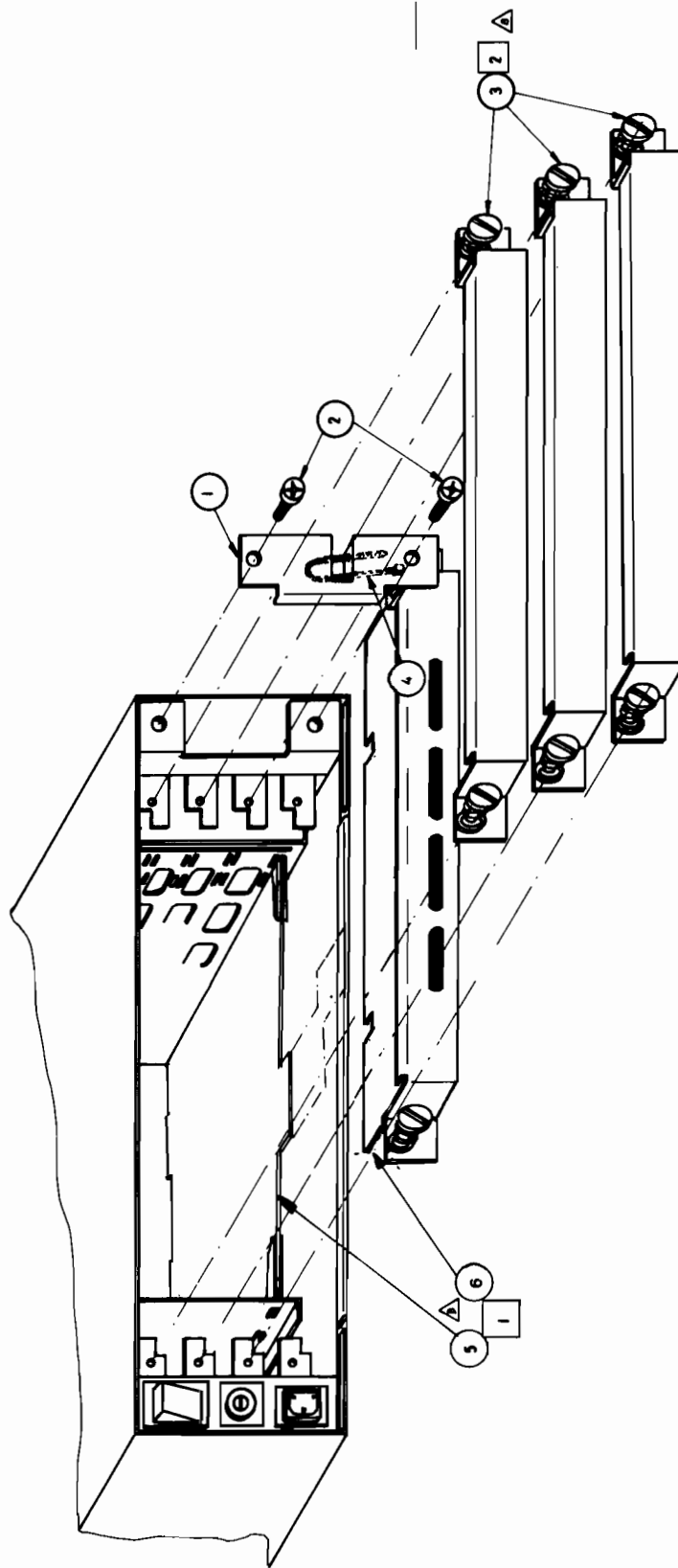


**NOTES:**

- 1 STICK THE INSULATOR 0460-1258 ON THE FRONT FRAME OF 02333-60200
- 2 ON (5) PLUG ROOMS (20) (21) (22) (23) AND INSTALL THE BOARD.
- 3 INSTALL ITEM (4) MOUNTED WITH (4) IN THE LOWER SLOT OF CARD CAGE. ABOVE INSTALL ITEM (4)
- 4 INSTALL POWER SUPPLY (6)
- 5 INSERT ITEMS (2) ON (3) THEN FIX (3)
- 6 FOR STD STICK SERIAL NUMBER LABEL (3)
- 7 FOR OPT. OMS USE LABEL (8) STICK (22)
- 7 INSTALL FRONT PANEL (1)

ITEM	QTY	UNIT	DESCRIPTION	MATERIAL DESCRIPTION	MFG. PART NO.	MFG. ORG. NO.	MFG. PART NO.
23	1	A/A	INSUL.	0460-1258			
22	1	LABEL	272-2527				
21	1	ROOM	02334-80630				
20	1	ROOM	02334-80630				
19	1	ROOM	02334-80630				
18	1	ROOM	02334-80630				
17	1	ROOM	02334-80630				
16	1	ROOM	02334-80630				
15	1	ROOM	02334-80630				
14	1	ROOM	02334-80630				
13	1	ROOM	02334-80630				
12	1	ROOM	02334-80630				
11	1	ROOM	02334-80630				
10	1	ROOM	02334-80630				
9	1	ROOM	02334-80630				
8	1	ROOM	02334-80630				
7	1	ROOM	02334-80630				
6	1	ROOM	02334-80630				
5	1	ROOM	02334-80630				
4	1	ROOM	02334-80630				
3	1	ROOM	02334-80630				
2	1	ROOM	02334-80630				
1	1	ROOM	02334-80630				

Figure 16-5 Front Panel And Cards Assembly



NOTES

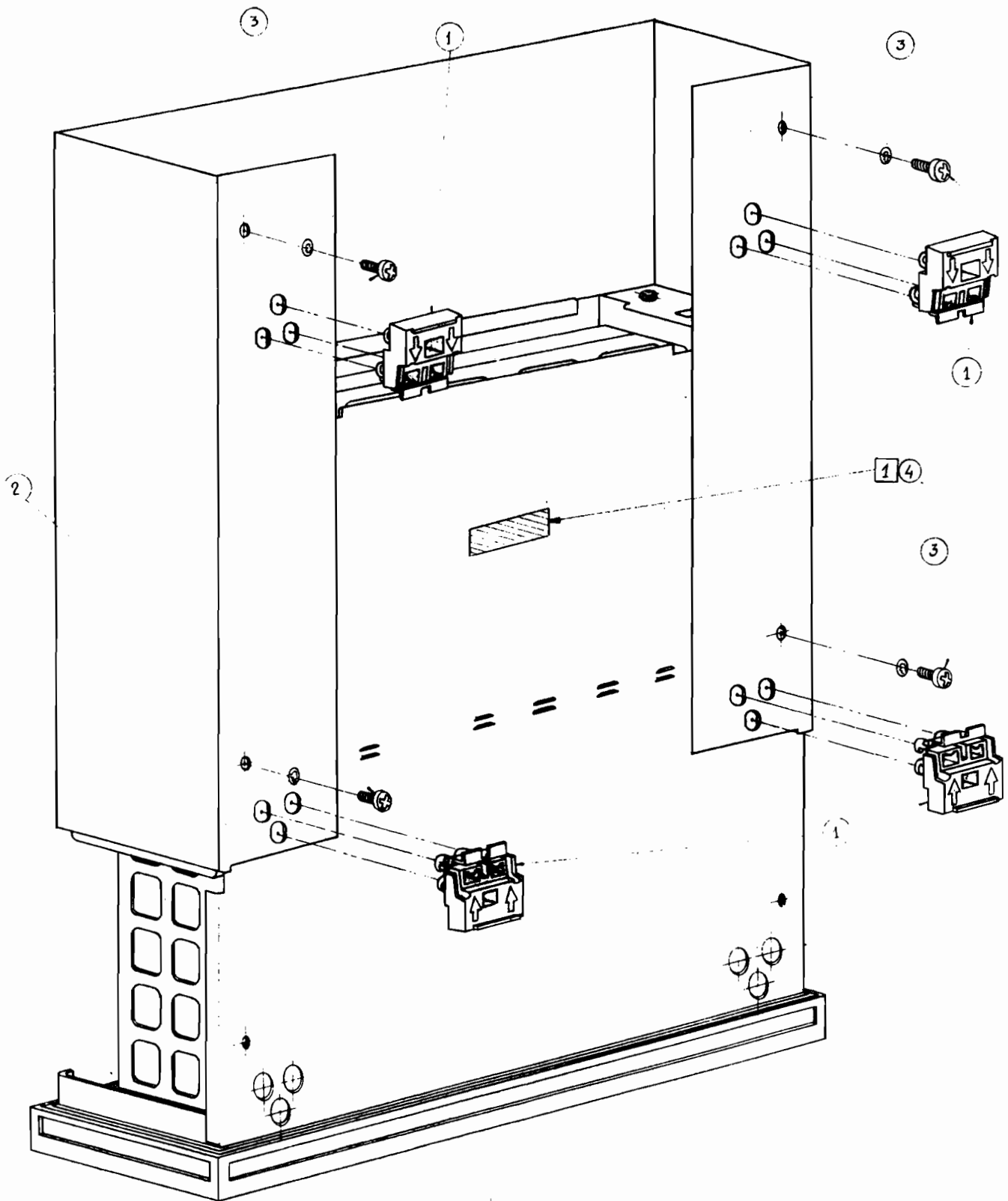
- 1 PLUG BOARDS OF OPTION 123 5 6
- 2 COMPLETE THE REAR PANEL WITH 3 QTY 1 THRU 4 ACCORDING TO THE ORDER.

QTY.	PART NO.	MATERIAL DESCRIPTION	MAT'L PART NO.	MAT'L QTY.	MAT'L SPEC.
1	40261 - 60004	MODEM CONTROL RS-232 ADAPT.			
1	5061 - 3833	DEVICE INTERFACE			
1	1400 - 0249	CABLE TIE			
1	02333 - 00006	PANEL REAR			
2	0515 - 0211	REAR - EACH H3 X 0.5			
1	02333 - 00006	PANEL REAR HS			

Figure 16-6 Rear Panels



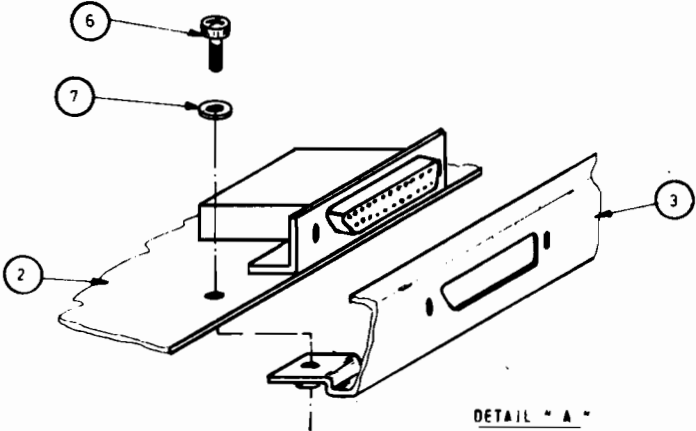
# REPLACEMENT PARTS & MODULES



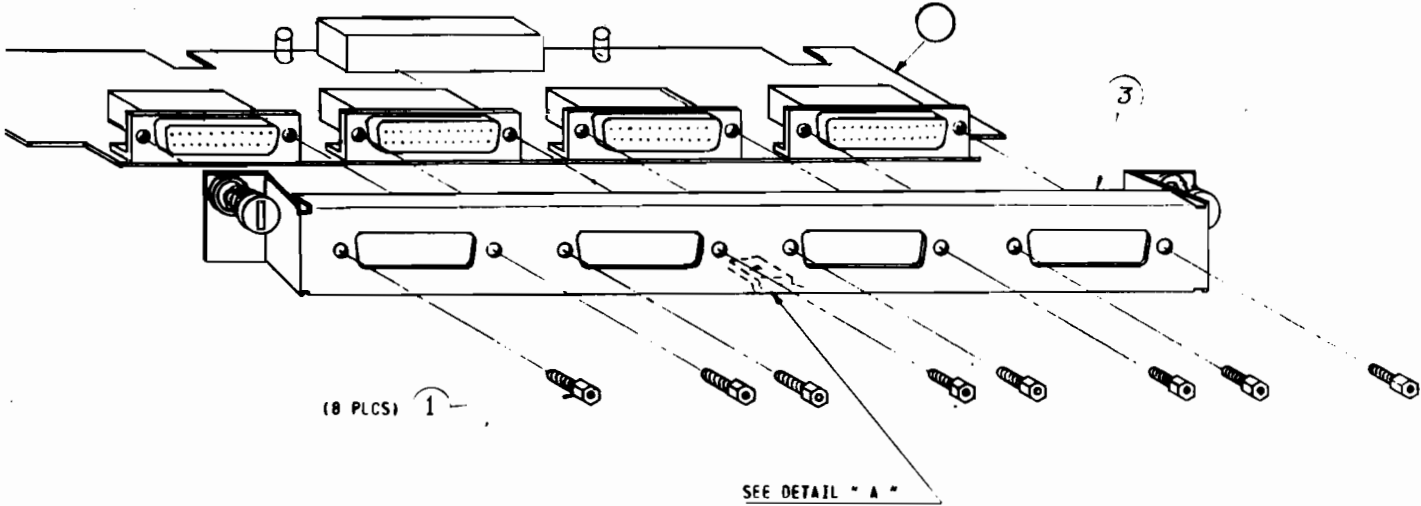
ITEM	QTY	MATERIAL DESCRIPTION	PART NUMBER	UNIT	REMARKS
4	1	LABFI - INFO	7121-2527		
3	4	WSHR-LK INTL T	2190-0004		
2	4	SCR-MACH M	0515-0211		
1	4	FOOT	5040-7201		

Figure 16-7 Cover Assembly

REPLACEMENT PARTS & MODULES



DETAIL " A "



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
2	1	MODEM CONTROL RS-232 ADAPT.	40261-60001
1		LOCK	1291 - 1198
ITEM	QTY	MATERIAL DESCRIPTION	MATL P/N

Figure 16-8 Modem Control Adapter Assembly



# CONFIGURATION RECORD

APPENDIX

A

**CONFIGURATION RECORD**

**X.25 LEVEL 1**  
 EXTERNAL SPEED:  MODEM SIGNALS   
 TIMER

**X.25 LEVEL 2**  
 NTK TYPE:  FRAME WINDOW   
 TIMER T1

**X.25 LEVEL 3**  
 LCL ADDRESS:

THRPUT IN	<input type="text"/>	THRPUT OUT	<input type="text"/>
WIND SZ IN	<input type="text"/>	WINDOW SZ OUT	<input type="text"/>
FST PVC	<input type="text"/>	LST PVC	<input type="text"/>
FST SVC IN	<input type="text"/>	LST SVC IN	<input type="text"/>
FST SVC 2W	<input type="text"/>	LST SVC 2W	<input type="text"/>
FST SVC OUT	<input type="text"/>	LST SVC OUT	<input type="text"/>
D-BIT	<input type="text"/>		

FAC SUPPORTED

PVC ASS. PORTS

**MSG**  
 PAD MSG HEADER   
 WELCOME MESSAGE

**SRA**  
 CALL LIMITED TO SRA   
 SRA  REMOTE ASS ADDR

**LUG**  
 REMOTE ADDRESSES

**POOL**

1st PORT POOL	FROM <input type="text"/>	TO <input type="text"/>
2nd PORT POOL	FROM <input type="text"/>	TO <input type="text"/>
3rd PORT POOL	FROM <input type="text"/>	TO <input type="text"/>

<b>ASG</b>	1	2	3	4
D	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
C	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
B	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
A	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

<b>ADL</b>	1	2	3	4
D	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
C	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
B	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
A	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## USER DEFINED PROFILES

	NUMBER	BASE	MODIFIED PARAMETER NUMBER: VALUE		
			X.3	LOCAL	
<b>PAD PROFILES:</b>					
<b>CAS/PAD PROFILES: PAD PROF ASS. TO CAS:</b>					
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:					
<b>EXAMPLE:</b>	<b>PAD PROF ASS. TO CAS:</b>	144	141	2:1, 3:2, 18:1	0:13, 4:30, 8:13, 18:12
	CAS PROF:	74	71		0:13, 24:144

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A HELP facility is incorporated into the HP2334A Plus, and it can be accessed from anywhere within the interactive operation. This HELP facility takes the form of screens which give information on available commands, and the associated syntax. Details of these screens and the information they contain is as follows:

In configuration mode (on-line or off-line). (\* prompt)

\* HELP **RETURN**

## HELP COMMAND for HP2334A CONFIGURATION

Information is available on the following topics:

-Define X.25 configuration.	< command: HSA>
-List complete configuration.	< command: LIST>
-Profile assignment.	< command: ASG>
-Automatic dial assignment.	< command: ADL>
-Create user profiles.	< command: UDP>
-Reset user configuration.	< command: DEF-PAD or DEF-CAS>
-Exit from on-line access mode.	< command: EXIT>

For more information, enter a command. Enter <cr> to leave HELP level.

HELP>

HELP> ASG **RETURN**

Profile Assignment. Prompt (ASG:).

Commands	Actions
pn[,pn[,...].]:<m>	<cr> Assign profile <m> to port number pn where pn=p[n] with p={A B C D} and n={1 2 3 4}.
LIST	<cr> List the profile assignment.

HELP>

HELP> HSA RETURN

Define X.25 configuration. Prompt (HSA:).

Commands	Actions
LEVEL1 <cr>	Configure X.25 level1 parameters.
LEVEL2 <cr>	Configure X.25 level2 parameters.
LEVEL3 <cr>	Configure X.25 level3 parameters.
MSG <cr>	Configure internal messages.
SRA <cr>	Define local user group.
POOL <cr>	Define port pools.
LIST1 <cr>	List level1 parameters.
LIST2 <cr>	List level2 parameters.
LIST3 <cr>	List level3 parameters.
LISTMSG <cr>	List internal messages.
LISTSRA <cr>	List symbolic remote addresses.
LISTLUG <cr>	List local user group.
LISTPOOL <cr>	List port pools.

HELP>

HELP> ADL RETURN

Automatic dial assignment. Prompt (ADL:).

Commands	Actions
pn[,pn[,...].]:<n>	<cr> Assign a SRA No. <n> to port No. pn where pn=p[n] with p={A B C D} and n={1 2 3 4}.
LIST	<cr> List the ADL assignment.

HELP>

HELP> LIST RETURN

List the following configuration parameters:

- X.25 parameters, SRAs, LUGs, Port Pools.
- Profile assignment.
- CPU part-numbers (4 ROMs).
- Serial card IDs and part numbers (2 ROMs).

HELP>

HELP> UDP RETURN

User profile creation. Prompt (UDP:).

Commands	Actions
LIST	<cr> List the defined profiles.
DEL X	<cr> Delete profile number X.
SET [?] p:v[,p:v]	<cr> Modify the profile where p is the parameter and v is the value.
PAR?	<cr> Display the user profile.

HELP>

HELP> DEF-PAD RETURN

Reset the configuration to the PAD default value.

HELP>

HELP> DEF-CAS RETURN

Reset the configuration to the CAS default value.

HELP>

HELP> EXIT RETURN

Exit from on-line local or remote access to configuration.

HELP>

HELP> RETURN

\*



In control mode (@ prompt)

@ HELP RETURN

X28 HELP COMMAND

Commands	Actions
123456	<cr> To call a remote device, enter the address.
#RDIAG	<cr> Use the SRA <RDIAG> to call the remote test port.
SET[?] p:v[,p:v]	<cr> Modify the profile where p is is the parameter and v the value.
PAR?	<cr> Display the assigned profile.
PROF X	<cr> Download the profile X.
STAT	<cr> Get the port status.
DIAL	<cr> Dial the assigned SRA.
LDIAG	<cr> Enter the diagnostic mode.
<cntl P> CLR	<cr> * Clear the communication.
<cntl P> RESET	<cr> * Reset the communication.
<cntl P> INT	<cr> * Send an interrupt packet.
<cntl P> RPROF X	<cr> * Modify remote profile X.
<cntl P> BIN	<cr> * Enter in BINARY mode.
<break> ASC	<cr> * Return to ASCII mode.

\* Command available in connection mode.

# HP2334A Plus / CCITT X.25 COMPARISON

APPENDIX

C

The implementation of X.25 (Level 3) in the HP2334A Plus 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 Plus 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 Plus, 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 Plus 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 Plus 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 Plus 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 Plus never sends RNR packets.

## **SECTION 5 Procedures for Datagram Service.**

The HP2334A Plus does not support Datagram service.

## **SECTION 6 Packet Formats.**

**6.1.11 General Format Identifier.** The HP2334A Plus 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 Plus:

- 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 Plus inserts 4 bytes containing 01H, 00H, 00H, 00H, then a maximum of 12 bytes (user dependent), as Call User Data field.

b) Received by the HP2334A Plus:

- 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 Plus:

- 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 Plus:

- We always insert a diagnostic field (cf Annex 5).
- We always set the cause field to 0.

b) When received by the HP2334A Plus:

- 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 Plus:

- Only three bytes; no user data inserted.

b) Received by the HP2334A Plus:

- 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 Plus:

- We always insert a cause and a diagnostic.
- We always set the cause to 0.

b) Received by the HP2334A Plus:

- 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 Plus:

- We always insert a cause and a diagnostic.
- We always set the cause to zero.

b) Received by the HP2334A Plus:

- 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 Plus 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.





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 Plus will provide the port corresponding sub-address (2 digits) in a call request packet when this facility is supported by the network.

The HP2334A Plus will process the sub-address (2 digits) when this is provided (and supported by the network).

PSN INTERNATIONAL NUMBERING PLAN

- UNITED STATES: DCC= 310 or 311

TELENET: DNIC= 3110

NTN = aaayyyy 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 Plus).

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.

PSN INTERNATIONAL NUMBERING PLAN

- FRANCE: DCC= 2080

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 (including  
a 2 digit sub-address).

Incoming call: 11 digits of NN for called address.

(Network type = NET,9)

Sub-address: 2 digits, included in NN.

In an incoming call: The HP2334A Plus considers the last two digits as the sub-address.

In an outgoing call: The HP2334A Plus provides the sub-address of the calling port.

International outgoing call with: Prefix= 1 + IDN

e.g. 1208038020333 for a call in France on Transpac.

(Call without sub-address).

Internal outgoing call with: no prefix + NN

e.g. 45611000333 for a call within Datex-P.

(Sub-address in this example = 33).

**NOTE:** When a line is subscribed for with DATEX-P the number of sub-address digits required must be specified.

• UNITED KINGDOM: DCC= 234

PSS: DNIC= 2342

NTN = aaanyyy 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.

PSN INTERNATIONAL NUMBERING PLAN

• 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



10



# ASCII CHARACTER SET

				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
					0	1	2	3	4	5	6	7
b4	b3	b2	b1									
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	l
1	1	0	0	12	(FE4) FF	FS	,	<	L	\	l	
1	1	0	1	13	(FE5) CR	GS	-	=	M	]	m	l
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	RS	/	?	O	_	o	DEL



Table E-1 ASCII Character Set/International Alphabet #5





# REFERENCE DOCUMENTATION

APPENDIX

F

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 Plus with HP1000 or HP3000 computer systems:

*HP2334A Plus CONFIGURATION GUIDE*. . . . . part number 02334-90018.

*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

G

## 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

## GLOSSARY OF TERMS AND ABBREVIATIONS

### 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

## GLOSSARY OF TERMS AND ABBREVIATIONS

### 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/DEMULATOR
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

## GLOSSARY OF TERMS AND ABBREVIATIONS

### 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

## GLOSSARY OF TERMS AND ABBREVIATIONS

### 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 ELEKTROTECHNIKER





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