PERQ Systems Corporation

PERQ2 USER GUIDE

March 1984

Preface

How to Use This Guide

This guide introduces you to using PERQ Systems hardware. The guide is intended for the user who has some knowledge of computers, but who is not necessarily a expert.

This preface contains:

Details of publications for the PERQ user;

General advice on the proper use of PERQ and its peripherals;

A reminder to return the customer reply form supplied with PERQ;

Space for you to record useful information and telephone numbers.

The rest of the guide is divided into two parts. Part 1 contains information on the standard PERQ system. Part 2 provides space for you to file separate publications describing optional peripherals such as printers. There are also three appendices of more technical information.

If you are an inexperienced computer user or have no knowledge of PERQ, start by reading the introduction to PERQ in Chapter 1.

Next, familiarize yourself with the PERQ's essential controls and indicators by reading Chapter 2.

Chapter 3 describes how to prepare the system for use. If your PERQ has just been installed you should follow all the procedures described in Chapter 3. If operating system software has already been loaded, you need only refer to the procedures for switching on and off and logging in and out.

All users should read the advice on care and handling of equipment given in Chapter 4.

If you have any problems with your PERQ hardware, refer to the problem solving advice in Chapter 5.

Appendices 1 and 2 give detailed information about the PERQ's interfaces. You should read these appendices if you intend to connect anything other than standard equipment to the PERQ.

Appendix 3 lists the main hardware specifications of the standard PERQ system.

Appendix 4 gives information on the causes and effects of static electricity and how the user can prevent static damage to circuit boards.

This guide does not tell you about PERQ software, apart from describing how to log in and log out as part of the section on preparing the system for use. Once you have reached this stage you need to refer to the PERQ software publications, particularly:

For users of the PNX operating system, PERQ Guide to PNX

For users of the PERQ operating system (POS), PERQ System Software Reference Manual

These and other relevant publications are listed below.

Publications

Publications for All PERQ Users (all are supplied with the PERQ)

Installing Your PERQ2

PERQ2 User Guide

Publications for POS Users

The main reference publication for the PERQ operating system (POS) is the publication:

PERQ System Software Reference Manual

If you intend to write Pascal programs while running POS, you need the publication:

PERQ Pascal Extensions

together with a standard text on Pascal, for example:

Jensen, K. and Wirth, N. Pascal User Manual and Report, Springer-Verlag, New York, 1975, ISBN 0-387-90144-2

If you intend to write PERQ FORTRAN 77 programs while running POS, you need the publication:

PERQ FORTRAN

Publications for PNX Users

The main reference publications for the PNX operating system are the publications:

PERQ Guide to PNX

UNIX Programmer's Manual, Volume 1 (7th Ed.)

UNIX Programmer's Manual, Volume 2A (7th Ed.)

UNIX Programmer's Manual, Volume 2B (7th Ed.)

UNIX is a trademark of the Bell Laboratories; PNX is a version of the UNIX operating system for running on the PERQ. The UNIX Programmer's Manual is a Bell Laboratories publication.

If you intend to write C programs while running PNX, you need (in addition to PERQ Guide to PNX and the UNIX Programmer's Manual) the standard text on the C language:

Kernighan, B. W., and Ritchie, D. M., The C Programming Language, Prentice-Hall, Englewood Cliffs, New Jersey, 1978, ISBN 0-13-110163-3

If you intend to write Pascal or FORTRAN programs while running PNX, you need the publications on Pascal and FORTRAN listed above for POS users.

Proper Use of This Equipment

1. Make sure that the equipment has been installed as described in Installing Your PERQ2.

2. WARNING: This equipment must be grounded.

3. IMPORTANT: The main plug shall be connected as follows:

   The wires in the main lead are in accordance with the following code:

BLUE	NEUTRAL	(N)
BROWN	LIVE	(L)
GREEN/YELLOW	EARTH	(E) or ⏚

   As the colors of the wires in the main lead of this equipment may not correspond with the colored markings identifying the terminals in your plug, proceed as follows:

   The wire that is colored BLUE must be connected to the terminal that is marked with the letter N or is BLACK;

   The wire that is colored BROWN must be connected to the terminal that is marked with the letter L or colored RED;

   The wire that is colored GREEN and YELLOW must be connected to the terminal that is marked with the letter E or the symbol ⏚

4. IMPORTANT:

   DO read the operating instructions carefully before you attempt to use this equipment.

   DO ensure that all the electrical connections (including main plugs and any extension leads) are properly made in accordance with the instructions.

   DO ensure that the equipment is unplugged from the main outlet if you go away for an extended period or when the equipment is not in use.

   DO connect all the peripherals you are using with PERQ to the same ring main (same phase) and safety ground.

   DON'T continue to operate the equipment if you have any doubt

about its working normally or if it is damaged in any way. Withdraw the main plug from the main outlet and consult a qualified electrician.

DON'T remove any fixed covers unless you are qualified to do so--and even then withdraw the main plug from the main outlet before you start.

DON'T obstruct any of the ventilation slots in the equipment. Obstruction of these slots may cause overheating and shorten the life of the equipment.

DON'T use this equipment directly connected to IT (impedant neutral) main systems; use an isolation transformer.

DON'T install the PERQ display next to main transformers, induction motors or other sources of strong magnetic fields.

DON'T move the PERQ processor cabinet without reading Section 4.5 and following the procedure it recommends.

DON'T install or use the PERQ in a potentially explosive atmosphere (for example, a paint store).

5. REMINDERS

Keep the installation tool suppled with PERQ in a safe place. You will need it if you move the processor cabinet (see Section 4.5).

Save all the packaging. You will need it if you return any items for servicing.

Floppy Disks on PERQ2

Note that only single density floppy disks, single or double sided, are wholly supported by PQS.

Customer Reply Form

To help us maintain a high standard of service to customers, please complete and return the product service evaluation form supplied with your PERQ.

Useful Information and Telephone Numbers

Use the space below to record:

Serial numbers of your hardware

Names, addresses and telephone numbers of your maintenance authority and other useful contacts

CONTENTS

PART 1

CHAPTER 1

INTRODUCTION

This chapter summarizes the main hardware features of your PERQ system.

Contents

1.1 PERQ System Layout

A typical PERQ system layout is shown in Figure 1. It consists of:

Display

Keyboard

Tablet and three-button puck

Processor cabinet

Optional printer

Connections between units are described in detail in Installing Your PERQ2. Detailed diagrams of the external sockets at the back of the display and the processor cabinet are given in Chapter 2.

Remember that all other equipment connected directly to the processor cabinet must be powered from the same supply phase and must share a common safety ground.

Each of the standard components is described in this chapter, and Appendix 3 gives precise specifications.

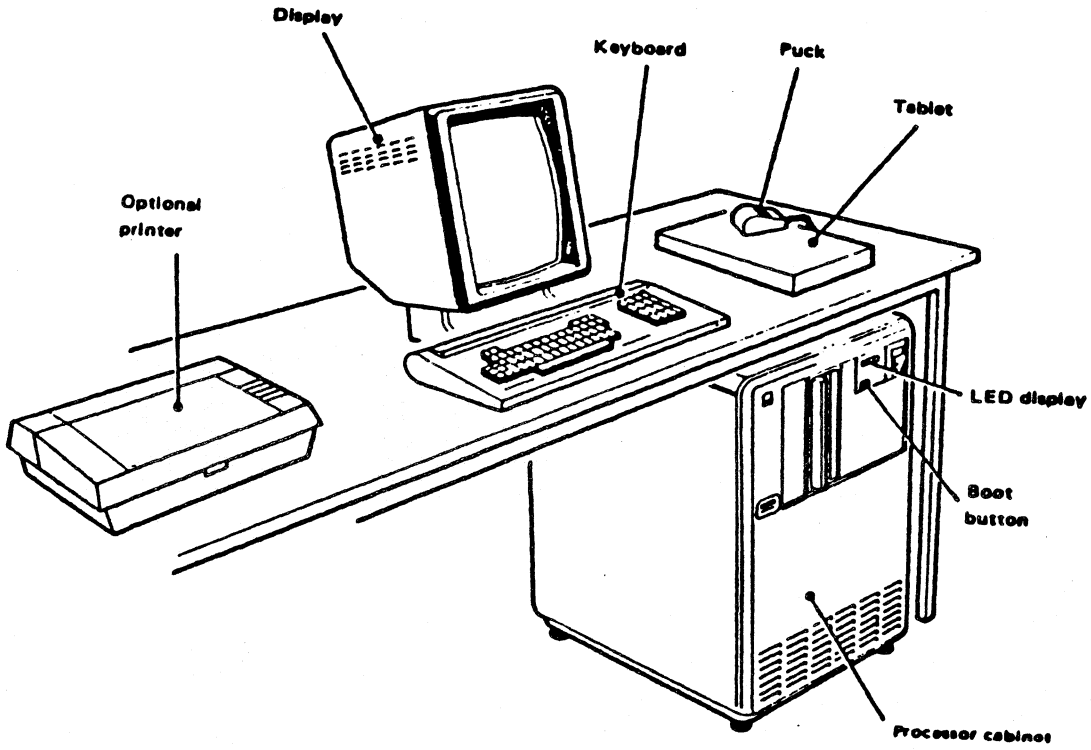

Figure 1. Typical PERQ System

1.2 Display

The PERQ display is a free-standing unit connected to the PERQ processor cabinet by three cables, each approximately ten feet long. The keyboard and the standard tablet both connect to the rear panel of the display. You can adjust the angle of the display by up to fifteen degrees backward or up to five degrees forward to suit your height, and you can adjust the brightness to suit ambient lighting conditions. There is also a volume control on the display to adjust the volume of audible output.

The standard display is 11" high x 8-1/2" wide, with the long side vertical. An optional display referred to as a Landscape display has its long side horizontal and resembles a sheet of 11" x 14" paper.

1.2.1 Raster and pixels

The image on the display is known as a raster and consists of 1024 horizontal lines. Each horizontal line on a standard display contains 768 picture elements, often abbreviated to pixels, each of which can be either black or white. Each pixel is thus approximately .01" square. On a Landscape display each of the horizontal lines contains 1,280 pixels.

The display can provide different fonts (a font is a style of lettering used on the screen) and diagrams, all to such a high resolution that the display resembles the printed page.

1.2.2 Gray shades and patterns

Each pixel can only be black or white. Nevertheless, it is often useful in diagrams to fill in various areas with different shades of gray. Since each pixel is so small, this can easily be achieved by varying the proportions of black and white pixels in different areas of the display. The eye is thus tricked into seeing gray. For example, if you only need one shade of gray, a checkerboard pattern is suitable.

1.2.3 Bit map

One bit (binary digit, the smallest unit of data storage; permitted values 0 and 1 only) in PERQ's main store is used for each

pixel--one setting of such a bit makes the corresponding pixel white, and the other setting makes it black. The area of store containing these bits is known as the bit map and is 96K bytes in size (K=1024; byte, the next smallest unit of data storage = 8 bits). Because it is simply a part of main store, the whole of the bit map is directly accessible to user programs in a very straightforward manner, a feature that is most useful to the specialist programmer.

Software facilities are available to use different fonts, to use different parts of the display for different purposes, etc.

1.2.4 Displaying the bit map

A display controller, which is separate from the PERQ processor, copies the complete bit map onto the display 60 times per second. This is often referred to as a 60Hz refresh rate.

This refresh rate, together with the extremely fast PERQ processor, makes real animation practical. The PERQ processor can execute an instruction called RASTER-OP, implemented by special hardware, which enables programs to alter the bit map very quickly.

1.2.5 Cursors

Two vital PERQ components are a tablet and pointing device (see Section 1.4). These should be positioned so that you can comfortably move the pointing device across the surface of the tablet; usually the best place is to the side of the display. The tablet and pointing device are used to point to any part of the screen image on the display: by positioning the pointing device at a particular place on the tablet, you are effectively pointing at the corresponding place on the screen. This place is indicated on the screen by a cursor. In fact, PERQ has two cursors:

Hardware cursor: This is superimposed on the screen display at each refresh by special hardware. The main purpose of the hardware cursor is to indicate the position on the screen display corresponding to the current position of the pointing device.

The hardware cursor's standard shape is a small arrow pointing diagonally up and left. You can redefine it as any shape up to 56 pixels wide by 64 pixels high using cursor design software.

Software cursor: If you are familiar with ordinary visual display units (typically 25 lines of 80 fixed size characters), you will be used to a character-sized cursor. This is often a flashing underline or a small rectangle. Such a cursor is usually moved about the display by special keys and is used to indicate a particular character before overtyping it or performing a deletion or insertion at that point in the text.

On PERQ such special keys are unnecessary, since the tablet and pointing device can be used to point much more rapidly to a desired character when text is on the display. Once you have chosen a character, it can be marked by a symbol to remind you of your choice. Any such symbol on PERQ is purely a software-implemented facility and is therefore referred to as a software cursor.

1.3 Keyboard

The PERQ keyboard is free-standing and is connected to a serial interface on the rear panel of the display by a cable approximately ten feet long.

1.3.1 Keyboard layout

The keyboard has the standard QWERTY layout, a pad of numeric keys and extra function keys which are under software control.

1.3.2 Keyboard technology

The keys are all solid state. Auto-repeat is provided; repetition starts after the key has been held down for about half a second and continues at the rate of about 16 per second. A system known as N-key rollover is provided which ensures that a keystroke is not lost even if you have not released previous keys. The keyboard generates ASCII (American Standards Code for Information Interchange) characters.

1.4 Tablet and Three-button Puck

The PERQ tablet is a free standing unit connected to the serial interface socket on the rear panel of the display by an interface cable about ten feet long. The tablet is used with a pointing device called a three-button puck which is connected directly to the tablet by a short flexible cable.

1.4.1 Tablet

The tablet measures approximately 10-1/2" long x 8-1/8" wide x 9/16" high, with an active area of 9-1/2" x 8-1/8". Resolution is possible to 0.01" (one pixel).

1.4.2 Three-button puck

The three-button puck slides over the surface of the tablet, causing the hardware cursor to make corresponding movements on the screen. When you have moved the hardware cursor to the required position, you can press one of the three buttons to send a signal to the software.

The effect of pressing a button is determined by the software and so varies from application to application.

1.4.3 Optional high-resolution tablet

The tablet and three-button puck described above are standard PERQ components, but you may choose instead the optional high-resolution tablet. This tablet is larger that the standard tablet and provides greater control over the movements of the hardware cursor. The high-resolution tablet is therefore more suitable for detailed graphics work.

The high-resolution tablet connects to the general purpose instrumentation bus (GPIB). Note that if the high-resolution tablet is used, it connects to the special purpose cable and becomes the first item in the daisy chain (see Section 1.5.8).

The high-resolution tablet measures 15-1/2" x 15-1/2" x 1-3/4" high and has an active area of 11" by 11". Resolution is possible to 0.005".

The superior performance of the high-resolution tablet in detailed work is complemented by a choice of two more accurate pointing devices. The usual pointing device for the high-resolution tablet is the four-button puck. Each of the four buttons is capable of sending a different signal to the software. Another feature of the puck is that the buttons are set alongside crosshairs to enable you to trace diagrams accurately from the tablet to the screen.

Alternatively, you may use the high-resolution tablet with a stylus as the pointing device. The stylus is a pen-like device with a switch in its tip. As with the four-button puck, movement of the stylus over the surface of the high-resolution tablet causes corresponding movement of the hardware cursor. Light pressure on the stylus works the switch to send a signal in the same way as pressing a button on the four-button puck. The stylus is not as versatile as the four-button puck in that it cannot send four different signals, but it is useful for very detailed graphics work.

The high-resolution tablet has to be magnetically biased with a special magnet supplied with the device. The biasing procedure is described in Installing Your PERQ2. You will find notes on care of the high-resolution tablet in Section 4.4.

1.5 Processor Cabinet

This section describes the main features of the processor cabinet and explains the more important terms.

1.5.1 Reset button and the diagnostic display system

When you switch on a PERQ, its processor contains no software at all. The only action it can perform is to load a small amount of software from a disk. This software is then executed and its main function is to load more software from the disk, until the operating system is fully loaded and ready to use. This process has become known as bootstrapping or booting.

Booting is achieved by pressing the reset button at the front of the processor cabinet. During booting, a number of tests are performed to check that there are no faults in the PERQ. The progress through these tests is shown by the diagnostic display (sometimes referred to as the LED display) on the front of the processor cabinet. The display often stays on a low number for some time during booting, but if this happens for much longer than

usual, consult Chapter 5 for advice on the possible fault.

Re-booting is quicker than booting for the first time after switching on because PERQ does not have to wait for its fixed disk to reach its operating speed.

1.5.2 Main store and control store

The standard PERQ main store consists of either 1Mb or 2MB random access memory (RAM). There is an optional 0.5Mb store board. However, it is possible to use space on the fixed disk to make it appear that the PERQ has a much larger store, known as virtual store.

The standard PERQ control store consists of 16K words (KW) of writable control store. (One word equals six bytes, so the standard control store can also be described as 96Kb). An optional CPU board is available to give a smaller control store of 4KW (24Kb).

1.5.3 Input and output control

PERQ has two systems for handling data: the Input Output (I/O) Channel Controller for fast data streams and I/O Microprocessor for slower data streams.

1.5.4 I/O channel controller

The I/O channel controller has direct access to the main store, a necessity for fast data streams. To this controller is attached the fixed disk controller, the optional enhancement I/O board, and the I/O microprocessor.

1.5.5 I/O microprocessor

The I/O microprocessor, a Z80, controls the slower data streams: keyboard, floppy disk drive, GPIB interface, the two RS232 interfaces, and the tablet.

1.5.6 Fixed disk

The PERQ built-in fixed hard disk is a 5-1/4" Winchester-type disk with a formatted capacity of up to 34Mb.

1.5.7 Floppy disk drive

The PERQ floppy disk drive is set in the front of the processor cabinet. It takes an 8" disk, which you insert at the front of the drive. The formatted capacity is 0.5 Mbyte (single density). Double density is not fully supported on PERQ2.

Detailed advice on care of floppy disks is given in Chapter 4.

The primary purposes of the floppy disk system are the receipt of software, the exchange of programs and data with other systems, and as an archive device for keeping backup copies of important files. Frequently accessed files should be located on the fixed disk.

You should keep the door of the floppy disk drive closed, except when loading or removing a disk, to prevent dirt entering the drive.

1.5.8 General purpose instrumentation bus

The PERQ general purpose instrumentation bus (GPIB) is an implementation of the Institute of Electrical ad Electronic Engineers' 1978 standard number 488. The GPIB permits the connection of most instruments, controls and peripherals which conform to IEEE-488. Connections to the GPIB must be in accordance with limitations defined by the above document. Detailed information for the GPIB is given in Appendix 2.

Connection is made to the GPIB via a D-connector at the back of the processor cabinet. To this connects a special purpose cable providing a standard multi-pin GPIB socket for connection of peripherals. A standard GPIB plug incorporates a socket. This enables a second peripheral device to be connected to the plug of the first device and so on. The maximum distance between the PERQ and the furthest peripheral using this daisy chain method of connection is 20 meters (approximately 65 feet). Note that if one has a high-resolution tablet then connection to the GPIB is made via the tablet.

1.5.9 RS232 Interface

The PERQ has two RS232 interfaces, designed for serial input and output along telephone lines or to neighboring devices. Connection to the RS232 interfaces is made by the multi-pin RS232 sockets at the rear of the processor cabinet. Detailed information for the RS232 interface is given in Appendix 1.

There exists a wide variety of equipment for connection to the RS232 interfaces (for example, character printers and graph plotters). The documentation accompanying such equipment should be adequate to enable you to program for its use.

1.6 Optional Printers For Use With PERQ

The printers available for use with PERQ are:

2281 The 240 dot-per-inch laser printer. This includes a controller board which generates video data to drive the printer at 6 pages per minute. Includes 20' interface cable.

2283 A 40 characters-per-second letter quality printer with 20' RS232 cable.

2284 A 1000 lines-per-minute electrostatic printer/plotter. Resolution is 200 dots per inch. Includes GPIB interface cable.

2285 A 200 characters-per-second dot matrix impact printer with 20' RS232 cable.

Each of these printers is described in its own separate publication, which should be filed in Part 2 of this manual.

1.7 Ethernet

The Ethernet is a communications facility for computers and similar devices usually located within a single building or within a complex of buildings all on one site, and complies with the IEEE 802 standard.

Hardware and software are available for the PERQ to provide a basic Ethernet and thus to link PERQs together.

The heart of an Ethernet is a line of coaxial cable running through the building or building complex. Wherever you want to connect a device into the network, the line is connected into a transmitter/receiver, known for short as a transceiver. The device is then connected to the transceiver. Thus a simple system involving three PERQs would be structured as shown in Figure 2.

The concept of Ethernet is to provide a data highway to which a large number of devices can be attached, all of which can address each other and send packets of information.

Every device on the network has a unique address. Each packet sent contains the address of the destination. Every device monitors every transmission, but only the device to which the packet is addressed reads it into store for processing. If two devices start to transmit at the same time, both stop and prepare to try again after a short random interval.

The maximum length of coaxial cable between transceivers is 500 meters (1,640 feet), or 1,500 meters (4,921 feet) provided a repeater is included between each 500 meter cable segment. The minimum length of coaxial cable between transceivers is 2.5 meters (approximately 8 feet). An Ethernet can in theory support up to 1,024 devices, but no two devices that need to communicate with each other on the network should be separated by more than 2,500 meters (8,202 feet or approximately 1.5 miles) of cable.

For advice on Ethernet hardware, consult your PERQ supplier.

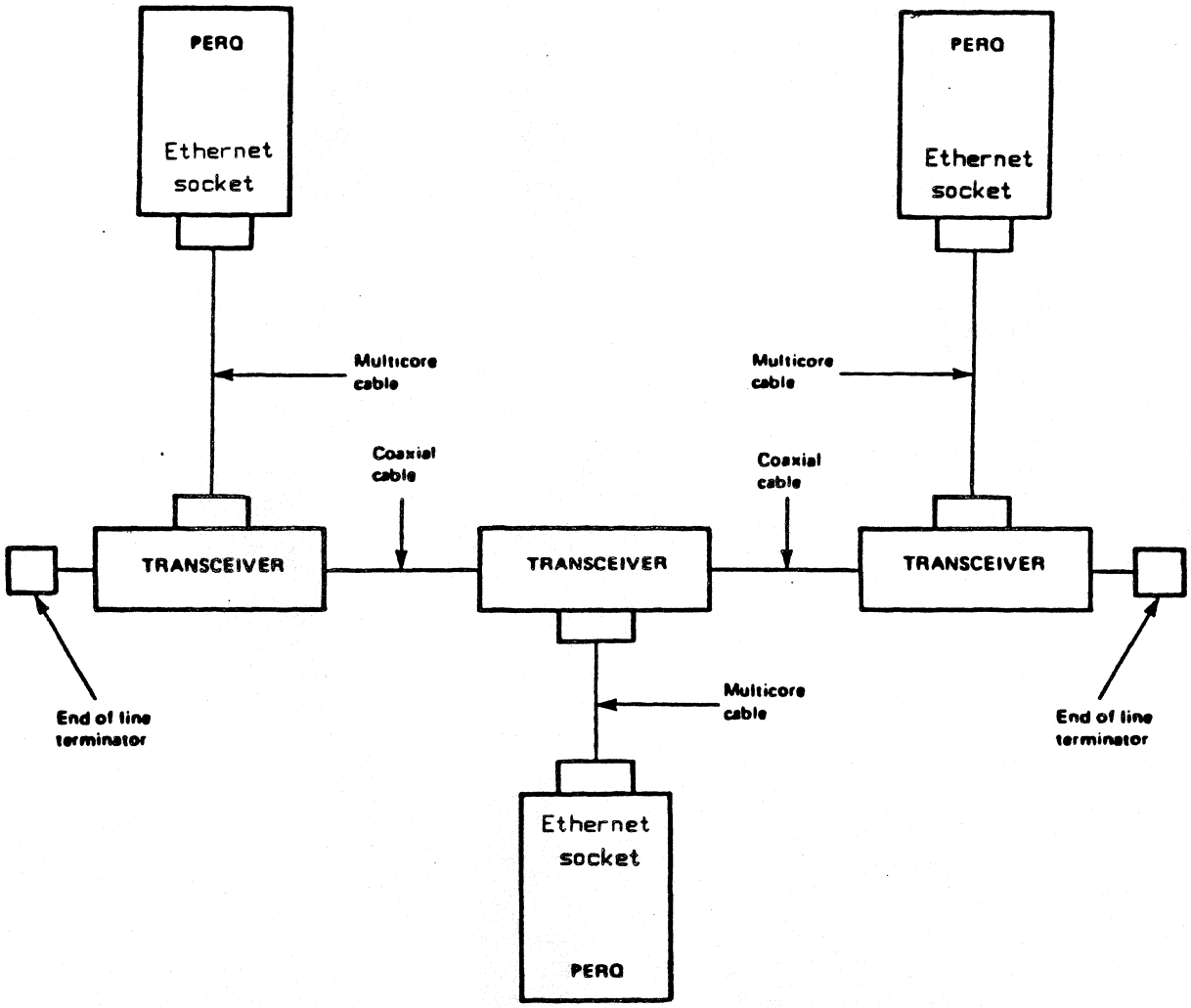

Figure 2. Ethernet Connection of Three PERQs

CHAPTER 2

ESSENTIAL CONTROLS AND INDICATORS

This chapter identifies the essential controls and indicators for the standard components of the PERQ system.

Contents

2.1 The Display

The display unit is shown below.

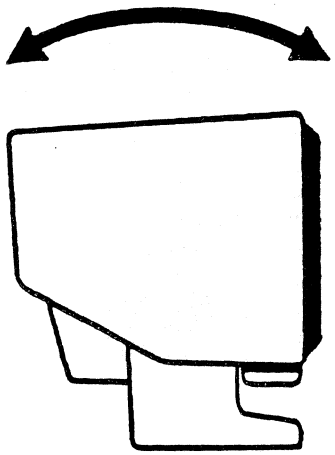

Figure 3. Display

Angle adjustment: you can tilt the display on its base so that the screen is at the most comfortable angle. The range of adjustment is up to fifteen degrees backward or up to five degree forwards.

The rear panel of the display is shown below.

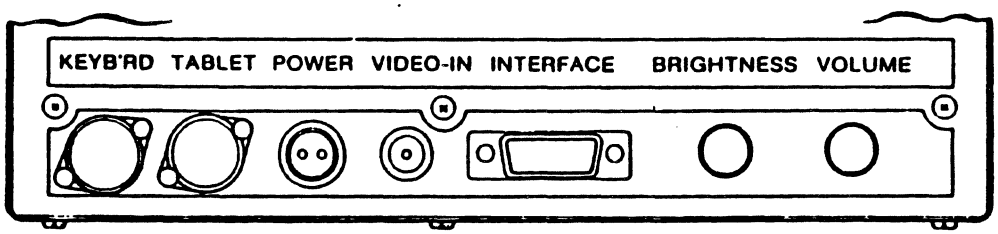

Figure 4. Rear Panel of Display

Brightness control: turn counterclockwise (when facing the rear) to increase the brightness of the display.

Volume control: turn counterclockwise (when facing the rear) to increase loudspeaker volume.

Connections to the keyboard, tablet, power, video in and interface sockets are described in Installing Your PERQ2.

2.2 The Keyboard

The keyboard has the standard QWERTY layout, a pad of numeric keys and extra function keys which are under software control.

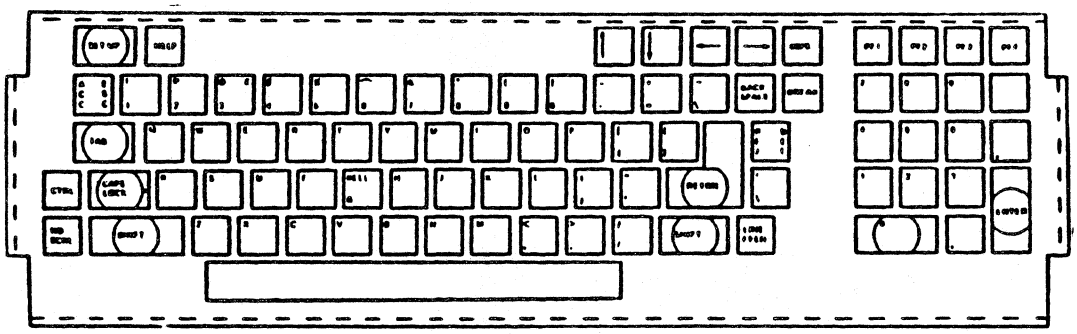

Figure 5. Keyboard

2.3 The Tablet

The standard PERQ tablet and three-button puck have no controls or indicators apart from the buttons on the three-button puck. The effect of pressing the buttons is under software control and so depends on the program being run.

The optional high-resolution tablet has a reset button which sets the tablet to idle. Use of puck or stylus does not then affect the display until the high-resolution tablet is reinitialized. Re-initialization takes place when the command prompt (a right pointing triangle for POS) appears. You should not normally need to use the reset button except possibly at power on.

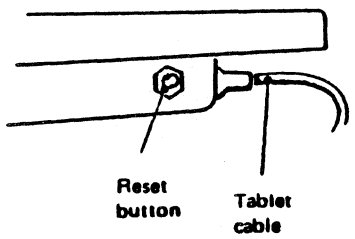

Figure 6. Reset Button on High-Resolution Tablet

2.4 The Processor Cabinet

The front view of the processor cabinet is shown below.

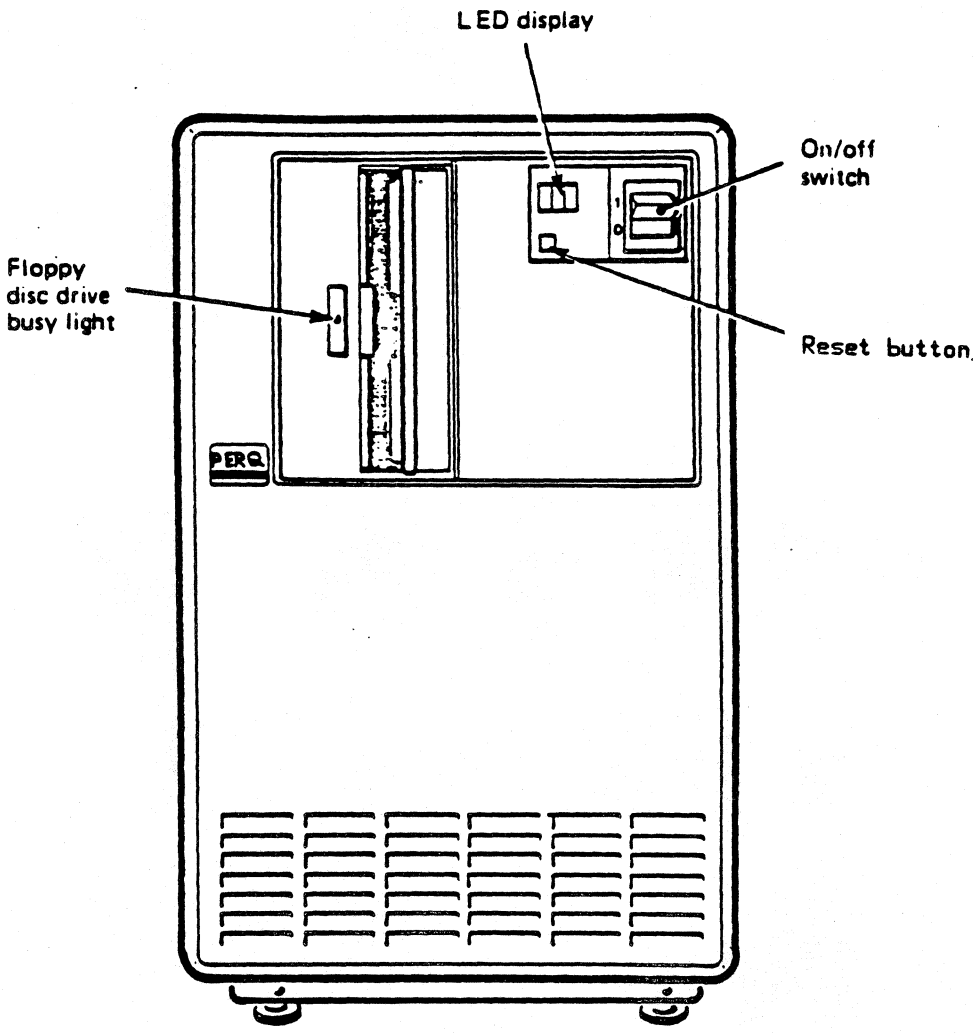

Figure 7. Front View of Processor Cabinet

Floppy disk drive busy light: a red light on the drive door latch. When the light is on, the floppy disk drive is in use. Do not attempt to remove the floppy disk while the light is on. See Chapter 4 for advice on floppy disk care and handling.

Reset button: press once and release to start booting the operating system after you switch on the PERQ.

Diagnostic display: the display indicates the progress of booting or the occurrence of a hardware fault. If you suspect a hardware fault has occurred, see the problem solving advice in Chapter 5.

On/off switch: position 0 is off, position 1 is on. This switches on all items within the processor cabinet as well as the display, keyboard, tablet and puck.

The rear view is shown below.

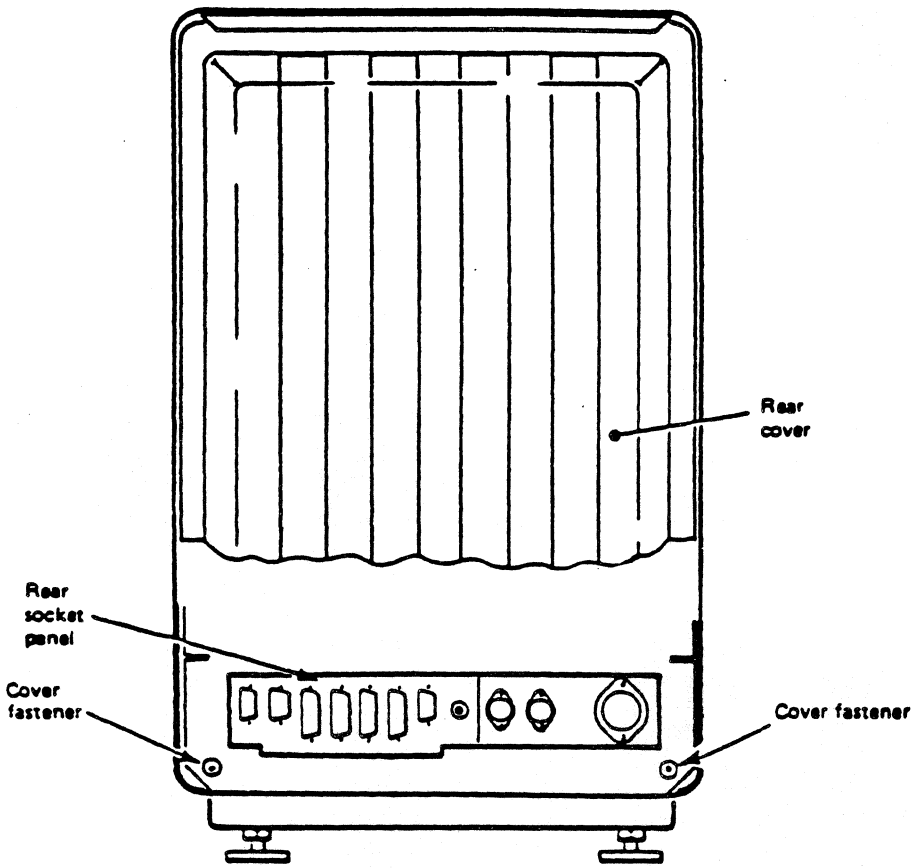

Figure 8. Rear View of Processor Cabinet

Rear cover: a plastic cover that has to be removed for access to the rear socket panel. The cover fits into a slot at the top of the processor box and is held by the two cover fasteners.

WARNING: Before making or changing any connection to the rear socket panel of the processor cabinet MAKE SURE THAT THIS EQUIPMENT IS DISCONNECTED FROM THE MAIN ELECTRICITY SUPPLY.

Rear socket panel: this is arranged as shown below. Cable connections to the sockets are described in Installing Your PERQ2.

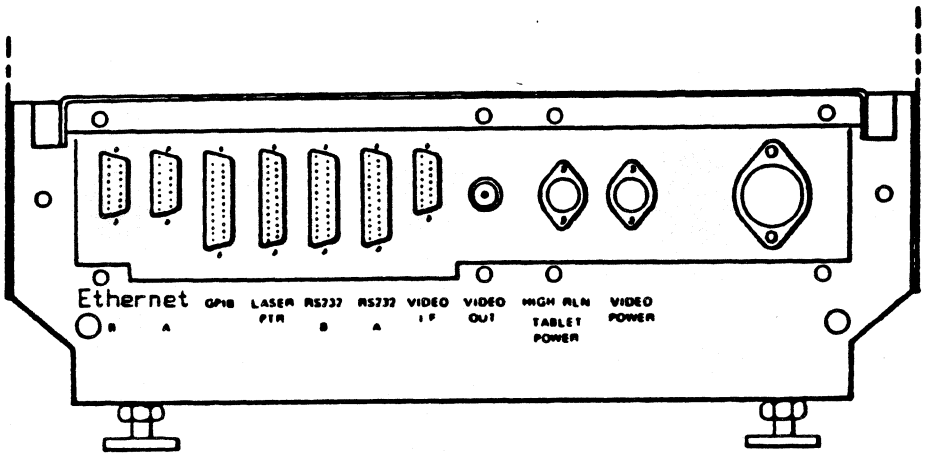

Figure 9. Rear Socket Panel of Processor Cabinet

CHAPTER 3

PREPARING THE SYSTEM FOR USE

This chapter tells you:

What to do immediately after installation of your PERQ in order to prepare it for use, including running the installation test;

How to switch the PERQ on and off for normal daily use;

How to log in and out under both POS and PNX.

Contents

3.1 Procedure After Installation

After your PERQ has been installed, carry out the following steps:

Make sure that the PERQ has been installed correctly as described in Installing Your PERQ2;

Set the power switch on the processor cabinet to ON. You should hear the fans start. If the fans do not start, see the problem solving advice in Chapter 5. If the ambient noise is too high to hear whether the fans have started, check that the diagnostic display has lit up. If it hasn't, see Chapter 5.

Now follow the installation test procedure described in Section 3.4.

If the installation test is completed successfully, you are ready to load the operating system software from floppy disk onto the fixed disk.

3.1.1 Loading the operating system

Loading the operating system software from floppy disk onto fixed disk is a procedure that you only have to carry out once for each version of PERQ operating system software.

The operating system software is supplied on floppy disks. Full instructions for loading are given in the documentation delivered with the operating system software. After loading, remember to keep the documentation with the floppy disks.

When you have loaded the operating system onto the fixed disk as described in the documentation delivered with the operating system software, the PERQ is ready for normal daily use.

3.2 Daily Switching On

Set the power switch on the processor cabinet to ON. The screen display flickers and you should hear the fans start. If the fans do not start, see the problem solving advice in Chapter 5. If the ambient noise is too high to hear whether the fans have started, check that the diagnostic display has lit up. If it has not lit up, see Chapter 5.

Wait about 15 seconds for the fixed disk to spin up to speed. The

operating system should then be booted. Booting is the process by which the PERQ loads software into its processor.

Press the reset button on the front of the processor cabinet to start the booting process.

The logging in procedure depends upon which operating system your PERQ is running--POS or PNX.

3.2.1 Logging in under POS

After switching on and pressing the reset button if necessary:

Wait until a screen message appears giving the date and time. This indicates that the operating system has booted successfully.

If the operating system has not booted one minute after switching on or pressing the reset button, press the reset button again. If the operating system still does not boot, see the problem solving advice in Chapter 5.

Enter username and password. If you have no username, either press RETURN or type GUEST and press return. Both of these responses are default usernames and do not require a password.

Once you have logged in successfully, you are ready to enter commands and run programs.

For a detailed description of logging in and other POS software information, see PERQ System Software Reference Manual (POS).

3.2.1 Logging in under PNX

After switching on and pressing the reset button:

The system enters the filestore integrity check phase (FSCK), details of which can be found in PERQ Guide to PNX.

If FSCK does not complete successfully, the following screen message appears (if you wish to fix the errors reported, see PERQ Guide to PNX):

```
Single user    login:
```

If the operating system has not booted one minute after switching

on and pressing the reset button, press the reset button again. If the operating system still does not boot, see the problem solving advice in Chapter 5.

Either wait one minute for a message prompting you to enter date and time, or press CTRL and z which causes the date and time prompt to appear after a few seconds.

Enter date and time as prompted and press RETURN. You can use upper or lower case for the alphabetic characters. It is not essential to include seconds when entering the time.

PNX then prompts:

```
Are date and time correct?
```

Press RETURN to confirm date and time.

PNX then prompts:

```
login
```

Reply by entering the required username.

If a password is required, the system prompts:

```
password
```

Reply by entering your password, which will not be echoed.

Note that the super-user name is "root," password "root," unless you change them. When creating or updating PNX, the user logs in under username "root."

PNX will prompt # if you are logged in as root; the prompt will be $ for any other user.

PNX is now ready for use.

If necessary, you may re-boot PERQ without switching off by pressing the reset button.

For a detailed description of logging in and other PNX software information, see PERQ Guide to PNX.

3.3 Logging Out and Switching Off

The logging out and switching off procedure depends upon whether your PERQ is running under POS or PNX.

3.3.1 Logging out and switching off under POS

To log out, type BYE in response to the command prompt (a right pointing triangle). The PERQ is then ready for the next user to log in.

To log out and switch off, type BYE WAIT in response to the command prompt. After a message appears telling you to do so, set the power switch on the processor cabinet to OFF. Remember to switch off all printers and other peripherals.

3.3.2 Logging out and switching off under PNX

To log out:

Ensure that there are no background jobs running by using the PS command as described in the Unix Programmer's Manual.

Type BYE (the Bye command will not work if there are background jobs running).

The system outputs the message PNX CLOSED DOWN and the cursor stops flashing.

To log out and switch off, carry out the above procedure and then set the power switch on the processor cabinet to OFF. Remember to switch off all printers and other peripherals.

3.4 The PERQ Installation Test

The rest of this section describes the installation test, which is designed to give you confidence that your PERQ hardware is working correctly after the PERQ system is installed. The test is short (about four minutes). After successful completion you can then load the operating system onto the fixed disk. Another function of the installation test is to "de-install" your PERQ so that it may be moved without damaging the floppy disk drive.

The test diagnoses 90% of faults down to one or two major hardware components. Faults are reported either on the display screen or on the diagnostic display on the front of the processor cabinet.

3.4.1 Booting the test

The test is held on one floppy disk. You must boot the test before it runs. Booting is short for bootstrapping: a technique for getting software into a computer processor by reading in a few instructions which in turn pull a longer routine into store.

Boot the test as follows:

Switch on the PERQ.

Load the installation test floppy disk into the floppy disk drive and close the drive door.

Wait for 30 seconds.

Press the reset button once and then release it.

Booting takes about 60 seconds, during which time the CPU board and memory board are tested.

If a hardware fault is found during booting, the software outputs a failure message to the screen, unless of course the fault is preventing the screen from working. The fault is also reported by the diagnostic display stopping at the appropriate number. You should note this number and contact your maintenance authority.

3.4.2 Running the test

Once the test has booted, a welcome message appears on the screen. You are then asked whether you wish to execute the installation test sequence. Remember to press RETURN after replying yes or no. If you answer no, the de-installation process will begin (see Section 4.5). If you answer yes, the following hardware components are then tested:

Processor cabinet--including CPU and memory boards (already tested), I/O board, floppy disk drive, and fixed disk drive (see below);

Keyboard--During the keyboard test, you are prompted to press

all the keys in order. If you accidentally press the keys in the wrong order, a screen message asks if you would like to repeat the test. The default answer is yes, so simply press the RETURN key to start again. To go on to the next part of the test, type NO and press RETURN.

Display (described on screen as the monitor for the purposes of the installation test)--During the monitor test, a pattern appears on the screen and you are prompted to say whether it was clear and undistorted. Remember to press RETURN after replying yes or no.

Fixed disk--As the fixed disk test starts you are prompted to say if you wish to run the test. It is safe to run this test even if POS or PNX has already been loaded. Unless you wish to omit the fixed disk test, type YES and press RETURN.

The progress of the test is indicated on the screen. A failure message identifies any component at fault. If there is doubt as to the component at fault, two suspected components are identified; for example:

FLOPPY TEST FAILED - SUSPECT FLOPPY DRIVE OR I/O BOARD

3.4.3 Result of the test

Unless a fault is found when the installation test is booting, all of the hardware tests are carried out whether successful or not.

If the test does not find any fault, a screen message tells you that you can proceed to load the operating system onto fixed disk.

If one or more faults are found, a screen message lists the faults and asks you to contact your maintenance authority.

CHAPTER 4

CARE AND HANDLING OF EQUIPMENT

This chapter gives information on:

- how to look after floppy disks;
- the type of floppy disk to use with PERQ;
- how to insert and remove floppy disks;
- general care of your PERQ system;
- how to move the PERQ after installation.

Contents

4.1 Care of Floppy Disks

Floppy disks are supplied in paper dust jackets. The floppy disk itself has a permanent sealed plastic cover. DO NOT ATTEMPT TO REMOVE THE SEALED COVER AS THIS WILL RUIN THE FLOPPY DISK.

The floppy disk within the sealed cover is coated with a magnetic substance onto which the PERQ can record data.

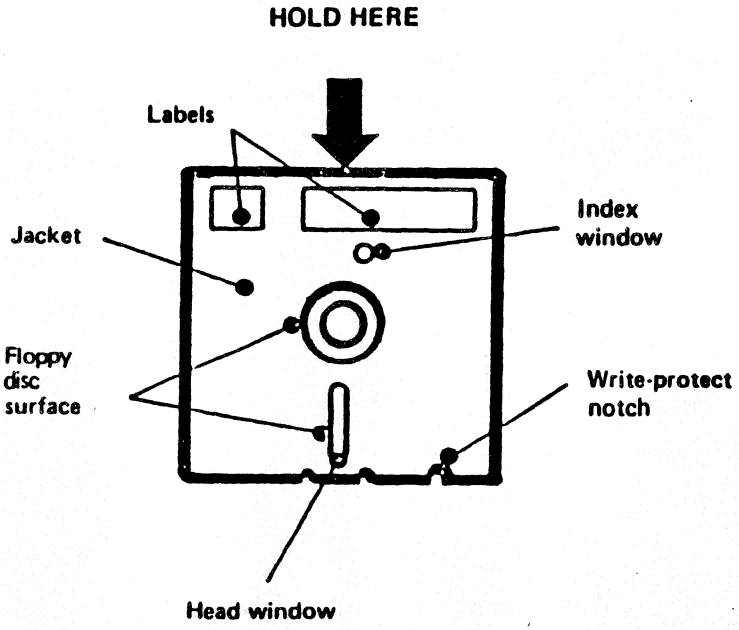

Figure 10. Floppy Disk

Take care to follow these instructions when using floppy disks:

Do not touch the recording surface.

Keep floppy disks away from magnetic fields.

Handle with care. Bending and folding damages floppy disks.

Insert the floppy disk carefully into the floppy disk drive until the back stop is reached.

Always return the floppy disk to its protective dust jacket after use.

Avoid heat and cold. Floppy disks should be stored at 10 degrees C to 52 degrees C (50 degrees F to 125 degrees F).

Do not use paper clips to attach notes or labels to floppy disks.

Do not smoke while handling floppy disks.

Follow the advice on labelling given in Section 4.1.3.

4.1.1 Write-protecting a floppy disk

Write-protecting a floppy disk prevents the PERQ from writing data to it. This ensures that important data cannot be overwritten.

A PERQ floppy disk is write-protected when the write-protect notch is uncovered. To enable data to be written to a floppy disk, cover the write-protect notch with one of the special adhesive tabs supplied with blank floppy disks.

Remember:

Write-protect notch uncovered = write-protected.

Write-protect notch covered = write-enabled.

4.1.2 Inserting and removing floppy disks

To insert a floppy disk into the PERQ's floppy disk drive:

Open the drive door.

Insert the floppy disk squarely into the drive, oriented as shown.

Close the drive door.

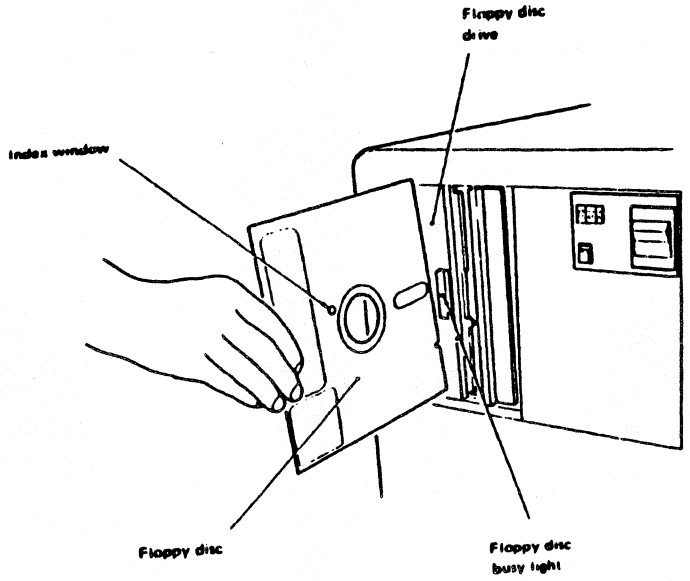

Figure 11. Inserting a Floppy Disk

To remove a floppy disk from the PERQ's floppy disk drive:

Check that the drive busy light is out.

Open the drive door.

Remove the floppy disk and return it to its paper dust jacket.

Close the drive door.

Keep the floppy disk drive door closed except when inserting or removing a floppy disk, in order to prevent dirt from entering the drive.

4.1.3 Labelling floppy disks

Always label your floppy disks to show the information they hold.

Write on the label before you stick it to the floppy disk. (If you have to write on the label after sticking it to the floppy disk, use a felt tip pen to avoid damaging the disk surface beneath the sealed cover.)

Labels must not cover the index window.

When applying a label, make sure the adhesive side does not come into contact with the exposed magnetic surface.

4.1.4 Security copying and safe storage

As PERQ uses a single Winchester-type fixed disk system, you should consider archiving all important files held on fixed disk. You should also keep backup security copies of important files that are held on floppy disk.

See either PERQ System Software Reference Manual (POS) or PERQ Guide to PNX for information on copying the contents of the fixed disk to a floppy disk or the contents of a floppy disk to another floppy disk.

Keep security copies well away from the work area, preferably locked in a drawer, cabinet, or safe. Remember the advice on care of floppy disks in Section 4.1.

4.1.5 Recommended floppy disks

Certain types of floppy disks are unsuitable for use with PERQ, as their use leads to a buildup of oxide on the drive heads. PQS recommends the use of CDC 1225 diskettes and routine cleaning with Scotch 7400 head cleaning kit.

4.2 External Cleaning of PERQ Hardware

Use a soft, damp lint-free cloth to wipe clean the external surfaces of the PERQ system. The screen may be cleaned with ammonia "D." Cleaning of printers is described in the separate publications supplied with each printer.

WARNING: BEFORE CARRYING OUT ANY CLEANING MAKE SURE THAT THIS EQUIPMENT IS DISCONNECTED FROM THE MAIN ELECTRICITY SUPPLY.

4.3 Disconnecting Cables

When disconnecting any cables from the equipment:

> WARNING: BEFORE DISCONNECTING ANY CABLES, MAKE SURE THAT THIS EQUIPMENT IS DISCONNECTED FROM THE MAIN ELECTRICITY SUPPLY.
>
> Hold the cable by the plug or socket at the end you are disconnecting--do not pull on the cable itself.

4.4 Care of the Optional High-Resolution Tablet

Once you have magnetically biased the high-resolution tablet as described in Installing Your PERQ2:

> Do not place any magnetic materials (for example, floppy disks) on or near the high-resolution tablet.
>
> In particular, store the magnet used for biasing well away from the high-resolution tablet.
>
> If the high-resolution tablet is accidentally affected by magnetic materials, repeat the biasing procedure described in Installing Your PERQ2.

4.5 Moving the PERQ after Installation

If you have to move the PERQ after it has been installed, you must be careful not to damage the fixed disk inside the processor cabinet. Move the PERQ as follows:

Log out as described in Section 3.3.1 (POS) or Section 3.3.2 (PNX).

Load the installation test disk as described in Section 3.4.

You will be asked if you wish to execute the installation test sequence; type NO and press RETURN. The de-installation process will start and continue until the floppy heads are positioned at track 76, where least damage can occur to them during a move. The progress of the de-installation is shown on the screen. If a failure message appears, run the test again.

Switch off the PERQ when the screen display asks you to (refer to Section 3.3.1 [POS] or Section 3.3.2 [PNX]).

WARNING: BEFORE DISCONNECTING ANY CABLES OR TAKING ANY FURTHER ACTION, MAKE SURE THAT THIS EQUIPMENT IS DISCONNECTED FROM THE MAIN ELECTRICITY SUPPLY.

Remove the rear cover of the processor cabinet. If you are not sure how to do this, see Section 2.4 which identifies the two rear cover fasteners.

Disconnect the display and any peripherals from the processor cabinet.

Disconnect the keyboard and the tablet from the display.

Move all items of hardware except the processor cabinet into their new position together with their cables.

Move the processor cabinet carefully to its new position. Check that it is level and steady. Use the spanner-shaped end of the special tool to adjust the feet of the processor cabinet as necessary.

Reconnect the keyboard and the tablet to the display. If you are not sure how to do this, consult Installing Your PERQ2.

Reconnect the display and any peripherals to the processor cabinet. If you are not sure how to do this, consult Installing Your PERQ2. If the peripheral is a printer,

consult the appropriate printer manual.

Reconnect the power cable to the processor cabinet, but not yet to the main electricity supply.

Check that all connections are correctly and securely made and then replace and fasten the rear cover.

Reconnect the processor cabinet and peripherals to the main electricity supply.

Note: Your system has the optional high-resolution tablet instead of the standard tablet, you will have to disconnect the optional tablet from the processor cabinet, not from the display. Detailed instructions for reconnecting the optional high-resolution tablet are given in Installing Your PERQ2.

CHAPTER 5

PROBLEM SOLVING

This chapter helps you to identify the causes of problems that may affect the standard PERQ system. Try to match the problem with the symptoms given in this chapter. For each set of symptoms, possible causes are given together with actions to correct or identify the fault.

Keep to the actions suggested and carry them out in the order given. If those actions do not solve the problem, contact your maintenance authority. The maintenance authority will expect you to have carried out the actions specified, so be prepared to report the results.

WARNING: BEFORE CHECKING, DISCONNECTING OR RECONNECTING ANY CABLES, MAKE SURE THAT THIS EQUIPMENT IS DISCONNECTED FROM THE MAIN ELECTRICITY SUPPLY.

Contents

5.1 Problems at Switch On

Symptoms	Possible causes	Actions required
The system is completely dead at switch on	Main cable not plugged in correctly.	Check that the main outlet switch is on.
	Main outlet switch off	Check that other equipment in the area is working.
	Fuse blown in the main plug	Try using another main outlet.
	Local power failure	Get an electrician or equivalent trained person to change the fuse in the main plug. If it continues to blow, please contact your maintenance authority.
Air is being sucked in at the front of the processor cabinet but the fixed disk is not spinning	Fixed disk not spinning due to DC power failure	Contact your maintenance authority.
Fans and disk drive run normally but nothing else happens. The diagnostic display is not lit at all.	Failure in PERQ's power supply	Contact your maintenance authority.

(continued next page)

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

Symptoms	Possible causes	Actions required
Display screen remains dark but there is noise from the fans and fixed disk. The diagnostic display is lit.	Brightness control turned down	Check that brightness control is turned up.
	Display cables not plugged in correctly	WARNING: BEFORE THE FOLLOWING ACTIONS, SET THE POWER SWITCH TO OFF AND DISCONNECT THE EQUIPMENT FROM THE MAIN ELECTRICITY SUPPLY--FAILURE TO DO SO WILL RESULT IN DAMAGE:
	Faulty display, cable or memory board	Check that the display cables are correctly plugged in and not damaged.
		Reconnect to main electricity supply, set the power switch to ON and see if the screen is still dark.

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

5.2 Problems When Booting the Operating System

Symptoms	Possible causes	Actions required
The system is switched on and the fans come up to speed. You have pressed the reset button. The screen is lit but no login prompt appears. The diagnostic display shows a number less than 999 (POS) or 255 (PNX).	Booting process stopped before completion The system being loaded is corrupt A hardware failure	Note the number shown on the diagnostic display for all attempts to load the system. Press the reset button to try to load the operating system. Try to load any other system held on fixed disk (for example, confidence tests). Load the installation test floppy disk and run the tests (see Chapter 3).
The diagnostic display shows 999 (POS) or 255 (PNX). The display screen is lit but no characters appear on the screen	Display cable not plugged in correctly or damaged	WARNING: BEFORE THE NEXT ACTION, SET THE POWER SWITCH TO OFF AND DISCONNECT THE EQUIPMENT FROM MAIN ELECTRICITY SUPPLY--FAILURE TO DO SO WILL CAUSE DAMAGE: Check that the display cables are plugged in and not damaged. Reconnect to main electricity supply and set the power switch to ON. Press the reset button and see if characters appear on the screen after the display shows 999 (POS) or 255 (PNX).

(continued next page)

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

Symptoms	Possible causes	Actions required
The version of the operating system loaded is not the one required. The correct character key was pressed or defaulted.	The default system loaded because the key was not held down long enough Faulty keyboard, cable or I/O board	Check that the keyboard cable is correctly plugged in. Reboot the operating system. Load the default system or any other system. Check that the key first used produces the correct character on the screen. See if any other keys give the wrong characters. Run the installation test (see Chapter 3) to check the keyboard.
The diagnostic display tells you that the operating system has booted. A prompt is displayed telling you to enter date and time but characters typed on the keyboard do not appear on the screen.	The keyboard cable is not connected properly Faulty keyboard, cable or I/O board	Check that the display shows 999 (POS) or 225 (PNX). Check that the keyboard cable is plugged in correctly and is not damaged. Try to reboot the system. Run the installation test (see Chapter 3) to check the keyboard.

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

5.3 Problems When Logging In

Symptoms	Possible causes	Actions required
The diagnostic display tells you that the operating system has booted. A prompt is displayed telling you to enter date and time, but characters typed on the keyboard do not appear on the screen correctly	The keyboard cable is not connected properly	Check that the keyboard cable is plugged in correctly and not damaged.
	Faulty keyboard, cable or I/O board	Try to reboot the system.
		Run the installation test to check the keyboard.
		If only some characters are wrong, try logical alternatives. Note the characters that are wrong.

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

5.4 Poor Quality Performance

Symptoms	Possible causes	Actions required
Poor quality screen image; lack of brightness or contrast, or the image is out of focus or streaked	Brightness control set incorrectly	Adjust brightness control.
	Faulty display	Check if there is an incorrect display of characters with parts missing or added. See if the screen image is broken up by a pattern.
	Faulty memory or CPU board	
	Loose display cables	WARNING: BEFORE THE NEXT ACTION, SET THE POWER SWITCH TO OFF AND DISCONNECT THE EQUIPMENT FROM THE MAIN ELECTRICITY SUPPLY -- FAILURE TO DO SO WILL CAUSE DAMAGE: Check that the display cables are plugged in and not damaged.
Parts of the optional high-resolution tablet surface do not respond to puck movements. The cursor on the display screen stops and jumps instead of moving slowly.	The magnetic bias of the tablet has been disturbed.	Check that the tablet cables are plugged in correctly and not damaged.
	Faulty tablet, cable or I/O board.	Bias the tablet using bar magnet provided. Follow carefully the instructions for this procedure in Installing Your PERQ2.

WARNING: Before checking, disconnecting, or reconnecting any cables, make sure that this equipment is disconnected from the main electricity supply.

PART 2

OPTIONS

Use this section to file publications or manuals on printers or other optional peripherals in use at your facility.

APPENDICES

APPENDIX 1

THE RS232 INTERFACE

This appendix gives detailed information on the RS232 interface of the PERQ.

Contents

A1.1 Introduction

The PERQ uses the RS232 interface for transferring data between its input/output board and peripherals.

RS232 is the recommended standard of the US Electronic Industries Association. The standard defines a set of interchange circuits by which a computer terminal (or in this case the PERQ) communicates with a modem or a peripheral. Each interchange circuit represents a particular function. Each interchange circuit is held in either:

> A positive voltage, signifying a control value ON or a data value 0, or
>
> A negative voltage, signifying a control value OFF or a data value 1.

For example, when the PERQ is ready to send data to a printer, it turns ON the Request to Send circuit. When the printer is ready to receive the data, it turns on the Ready for Sending (or Clear to Send) circuit. The PERQ can then output data to the printer on the Transmit Data circuit.

The RS232 interface allows the ordered interchange of serial binary data at rates up to 9600 baud between units up to 15 meters (approximately 49 feet) apart. It can be operated synchronously or asynchronously in full duplex or half-duplex modes.

A1.2 Pin Connections and Assignments

Twenty-five way D-type connectors are used to interconnect units using the interface. The pin numbers have been assigned to the signals listed below. In the Category column, C indicates a control signal, D is for data, E is for earth (ground) or common return and T indicates timing. PERQ does not use all the pin connections of the RS232 interface. The pins used are described in the table below.

Name	Category	Pin	
Protective ground	E	1	
Transmitted data	D	2	
Received data	D	3	
Request to send	C	4	
Clear to send	C	5	View at exposed male connectors
Signal ground	E	7	
Receive line signal detector	C	8	
Tx signal element timing	T	15	
Rx signal element timing	T	17	
Data terminal ready	C	20	

A1.3 Signal Line Interconnections

For connections to modems, the sending lines and the receiving lines on the RS232 interface are exactly mirrored at both equipment and modem.

For connections to peripherals, the sending line becomes the receiving line at opposite ends of the interface.

When the PERQ's Z80 microprocessor is driving the RS232 interface, it checks that clear to send (pin 5) is true before sending data down the line.

This means that printers that do not normally use XON/XOFF protocol or ACK/NACK protocol by sending data on the printer transmit line (pin 2) can be controlled by connecting the printer's busy line to pin 5 on the PERQ. The following diagram shows suitable pin connections for asynchronously connecting such printers.

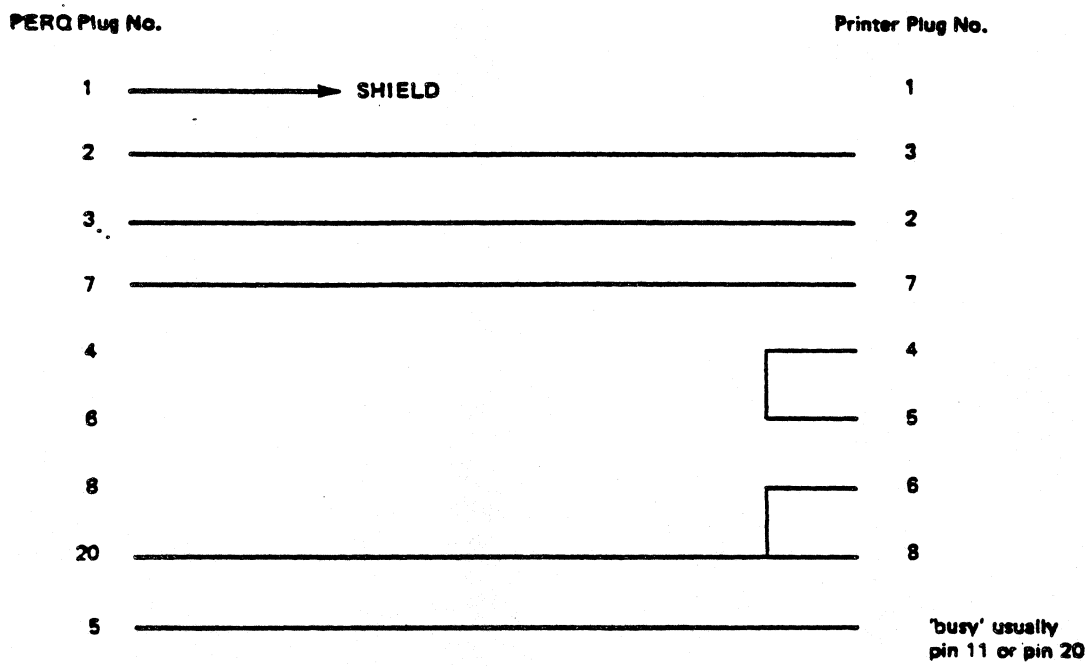

Figure A1-1. Suitable Pin Connections for Asynchronous Connections

The following diagram shows suitable connections for connecting two PERQs together via their RS232 interfaces.

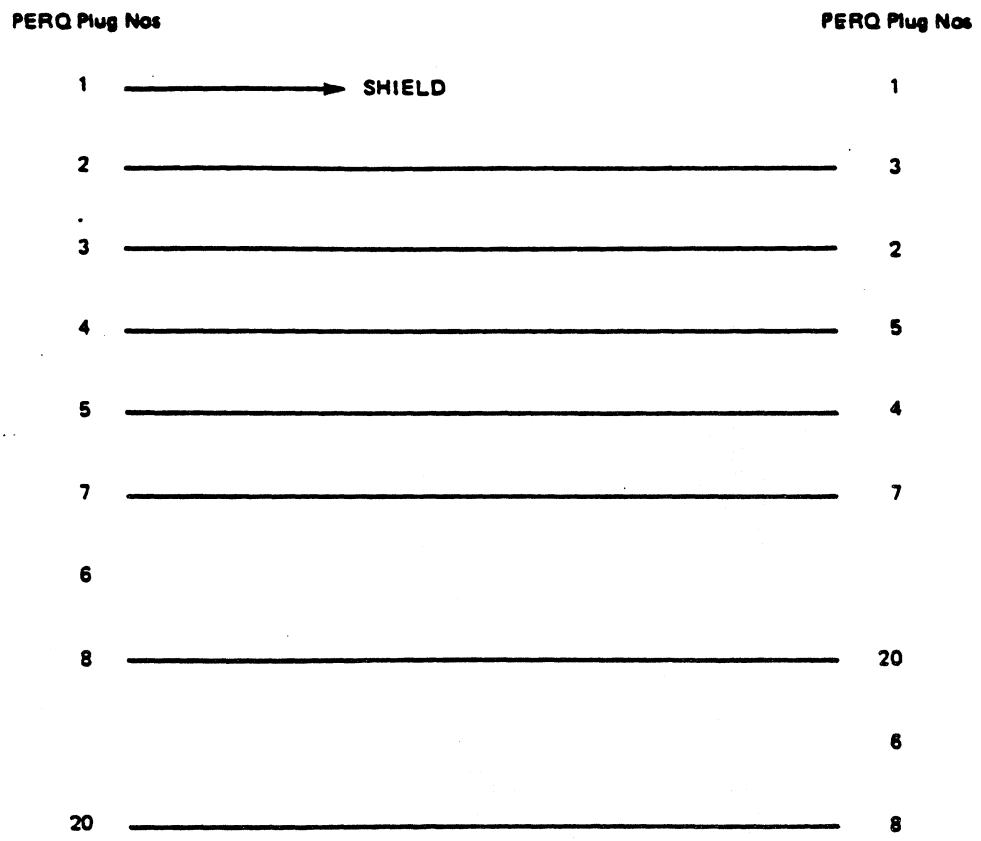

Figure A1-2. Suitable Connections for Connecting Two PERQs

A1.4 Usage of Lines

The Consultative Committee for International Telegraphy and Telephony (CCITT) equivalent circuit number is given in parentheses at the start of each entry.

	Terminal Equipment	Modem or Peripheral
(108.2) This circuit controls the switching of the modem. The on state prepares the modem to be connected and helps maintain the connection when it is established. In auto answering mode, connection to line occurs when DTR is on and a ringing tone is received at the modem. Usually DTR may be present whenever the terminal is ready to transmit or receive data. For switched networks, when DTR is switched off, it should not be set on again until the modem switches Data Set Ready off.	Data Terminal Ready DTR	
(105) When on this signal indicates that the terminal equipment has data for transfer. In duplex mode the modem is kept in the transit state when RTS is on and in the non-transmit state when RTS if off. Transition to on causes the modem to prepare for transmit and it raises CTS when it is prepared for TxData. Transit to off causes the modem to complete transmission of all previously transferred data before assuming the non-transit mode and lowering CTS. The RTS signal should not transmit on unless CTS is off.	Request to Send RTS	

(113) When the terminal provides clock pulses, each negative transition on this circuit should occur at the center of each data element on the TxData line. When used, the signals normally run while the terminal is switched on but they may be suspended for test purposes.	Transmit Signal Timing Element TSET
(103) Serial binary data (space=0, mark=1) can be transmitted on this circuit only when RTS, CTS, DSR and DTR signals are all on. At other times, and during intervals between characters, the mark state is maintained.	Transmitted Data TxD
(101) A line connected electrically from the power earth (ground) line to the frames of all system equipment.	Protective Earth
(102) This line provides a 0-volt reference point for all interface signals except the safety ground. It may be connected to safety ground, but at only one point and should be within the terminal.	Signal Ground or Common Return 0V
(104) Serial binary data from the remote terminal is carried on this line when RLS is on; at other times RxD is held at mark (binary 1). For half-duplex working the mark state is held when RTS is on and while transmission ends after RTS goes off.	Received Data RxD
(115) When timing is provided by the modem, negative signal transitions on this line indicate the center of the signal element on RxD when RLS is present.	Receiver Signal Element Timing RxSet

Data Set Ready
DSR

(107) This circuit indicates the status of the local data set. The on condition indicates the data set is connected to a data channel (off-hook), and the local equipment is not under test or in voice or dial mode, and any data set turn-around time has elapsed.

Clear to Send
CTS

(106) This circuit indicates the readiness of the modem to transmit data. When RTS and DSR (and DTR if appropriate) are on then CTS on indicates that TxData will be sent over the communications channel. The off state indicates that the terminal equipment should not transfer data over TxData.

APPENDIX 2

THE GENERAL PURPOSE INSTRUMENTATION BUS

This appendix gives detailed information on the general purpose instrumentation bus (GPIB) of the PERQ.

Contents

A2.1 Introduction

IMPORTANT: If you intend to connect OEM equipment not supplied by PQS to the GPIB of the PERQ, it is your own responsibility to provide suitable electrical protection equipment to maintain adequate electrical protection.

The PERQ uses the GPIB for transferring data from the tablet (the talker) to PERQ (the listener).

The GPIB is an implementation of the IEEE Standard 488.

The bus allows the ordered interchange of byte-serial, bit-parallel asynchronous data. A maximum of 15 instruments can be attached to the bus in a linear configuration, over a total distance of up to 20 meters (approximately 65 feet) in total transmission path length.

The maximum data rate is 1000 kilobytes per second over limited distances, and 250 to 500 kilobytes per second typical maximum over a full transmission path. The actual data rate is determined by the devices in communication at the time.

A2.2 Concepts

The GPIB interface system uses a bus structure in which all instruments share the same signal lines. Sixteen signal lines and eight ground lines are used to interconnect devices in a parallel arrangement and maintain an orderly flow of device and interface related information. Every GPIB device must be capable of operating in one or more of the following interface modes:

LISTENER -- An acceptor device capable of receiving data over the interface when addressed (for example, printers, display devices, programmable power supplies and programmable signal sources). There can be up to 14 active listeners simultaneously on the interface.

TALKER -- A source device capable of transmitting data over the interface when addressed (for example, tape readers, voltmeters and counters that are outputting data). There can only be one active talker on the interface at any time.

CONTROLLER -- An acceptor device capable of specifying which of the instruments on the interface shall be the talker and listeners for any given information transfer. Typical examples are a computer or desk calculator with an appropriate

interface card. There can be only one active controller on the interface at any time. In multiple device systems only one can be active at any time as a system controller.

A2.3 GPIB Operation

The interface function circuits provided at a device will be dependent on the kind of device. Selections of interface function capabilities can be chosen from the following repertoire of interface functions:

Function	Acronym	Use
Source Handshake	SH	Allows a device to transfer multiline messages
Acceptor Handshake	AH	Allows a device to receive multiline messages
Talker or Extended Talker	T or TE	Allows a device to send device-dependent data over the interface.
Listener or Extended Listener	L or LE	Allows a device to receive device-dependent data over the interface.
Service Request	SR	Allows a device to asynchronously request service from the controller
Remote - Local	RL	Allows a device to select between two sources of input information (local or remote)
Parallel Poll	PP	Allows the device to present one bit of information during a parallel poll to indicate the request for service
Device Clear	DC	Allows the device to be cleared or initialized either individually or as a member of a group of devices
Device Trigger	DT	Allows the device to have its operation started either individually or as a member of a group of devices
Control	C	Allows a device to initiate device addresses

More than one interface function can be in progress or active within a device at the same time.

Communication between an interface function and its intimate device is referred to as a local communication, which causes changes of states in the progress of a function.

Communications between interface functions in different devices go over the interface lines and are referred to as remote messages. These remote messages may be sent to cause changes of states in the progress of a function in the remote device (an interface message) or they may be device messages to which the function circuits are transparent.

The interface lines consist of eight input-output data lines, D101 to D108, three byte transfer control (handshake) lines, and five interface management (control) lines.

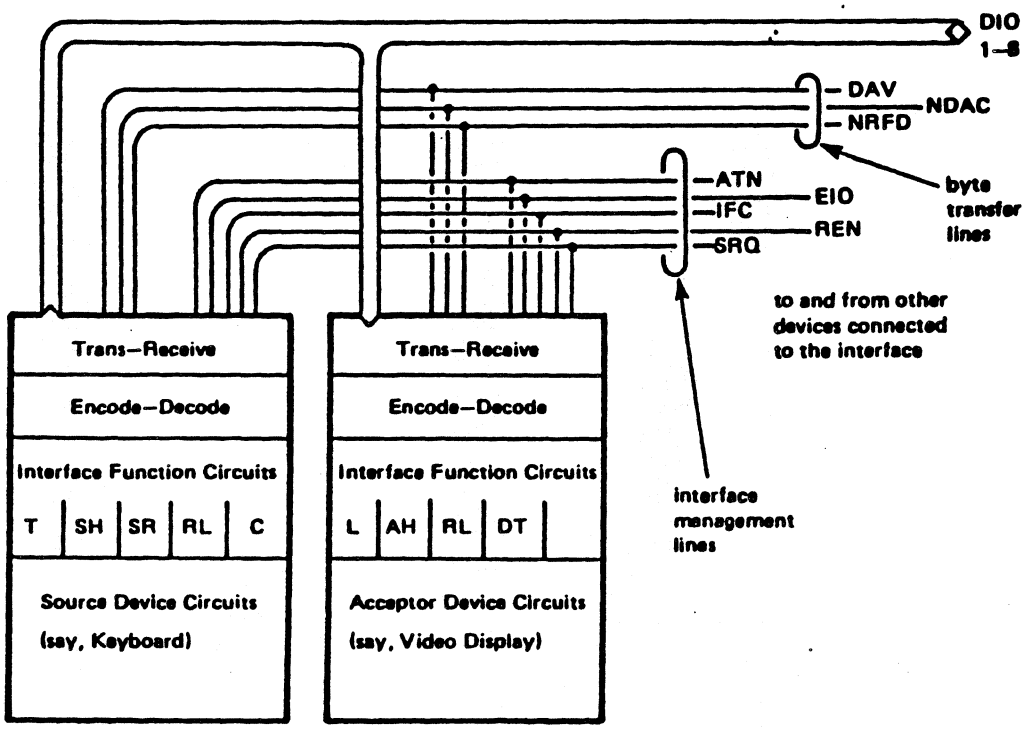

Figure A2-1. Interface Lines

Remote messages are transferred by the handshaking method illustrated below.

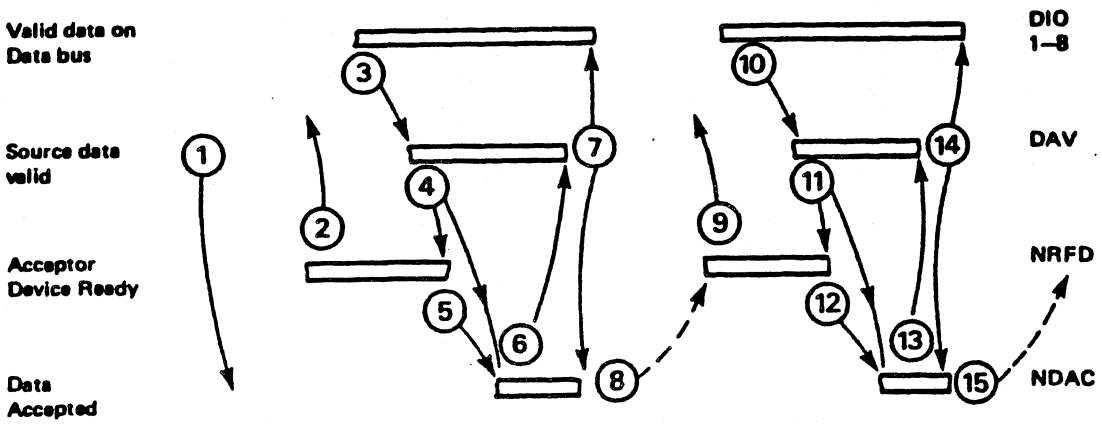

Figure A2-2. Handshaking

Some time after a byte of source data has been accepted and the valid signal is removed, the acceptor(s) remove the data accept indication (1). When the acceptor circuit(s) are ready to accept more data, the fact is made known to the source (2) which can then present the data on the data bus (3). After allowing time for the bus lines to stabilize, the source indicates that the data is valid (4) and the acceptor becomes unready to accept more data (5) until it has accepted the present byte. When the acceptor has taken the data from the bus, it signals its acceptance (6) and the source can then remove the data valid signal (7) and allow data on the bus to change. The acceptor can remove the data accepted signal when data valid is removed and, when the acceptor circuits are settled, it can indicate its readiness for more data (8). A succeeding byte is transferred in the handshake sequence (9) to (14) and so on.

Every GPIB device has at least one address. Device addresses are used by the active controller in the command mode to specify who talks (via a talk address) and who listens (via listening addres-

ses). The address of a device is usually preset, but is resettable during system configuration by an address switch, which is normally locatable on the outside rear panel of a device. The decimal equivalent of the five least significant bits of this switch determines the device's address on the interface and may be from 0 to 30 inclusive. Any given device address can specify two corresponding address codes on the data lines (although it may actually only respond to one):

a talk address

a listen address

The sixth and seventh bits (D106 and D107) are used to distinguish between the talk and listen address characters of a device. Changing a device's address switch changes both.

A2.4 Signal Levels

Within devices attached to the bus the relationship between the signal voltage level (high - or more positive, and low - or less positive), and the binary value assigned to a signal (0, absent, false; and 1, present, true), is dependent on the hardware implementation. However, on the GPIB, the convention high = 0 and low = 1 must be followed to ensure compatibility between interchange devices. This convention is also followed throughout this appendix.

The high and low states are based on transistor-transistor logic (TTL) levels for which the power source does not exceed 5.25 volts relative to the signal 0-volt level.

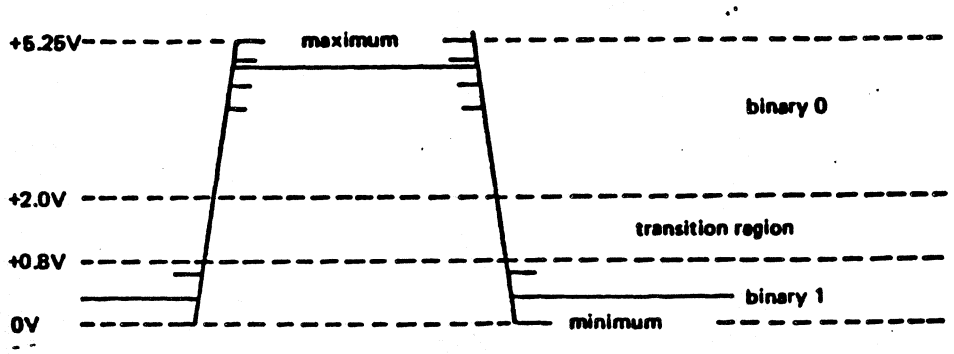

Figure A2-3. Signal Levels

A signal at either binary level enters the transition region only as it transits to the opposite binary level; the opposite binary level is adopted only when the signal level emerges from the transition region.

A2.5 Pin Assignments

Twenty-four way connectors are used to interconnect units on the GPIB (see list on the next page).

Shrouded male sockets are fixed to the devices for interconnection and the preferred orientation is with the exposed pin 12 at the upper righthand corner.

For ease of interface extension, it is desirable for the termination on the interconnecting cables to be stackable. That is, each cable terminator should have a female plug surmounted by a male socket with their pins connected one-to-one.

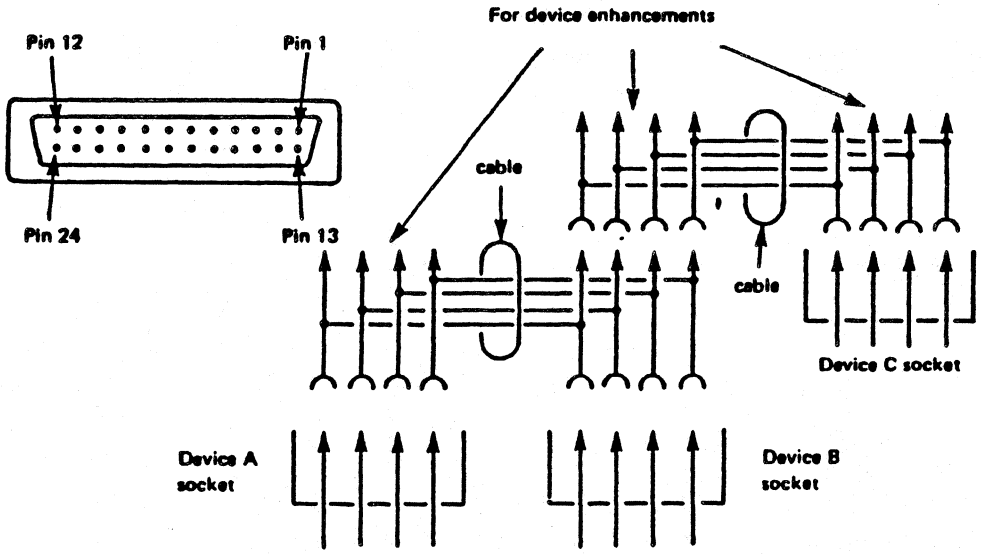

Figure A2-4. Pin Assignments

Name	Pin	
Data In-Out 1	DIO1	1
Data In-Out 2	DIO2	2
Data In-Out 3	DIO3	3
Data In-Out 4	DIO4	4
End or Identify (24)	EOI	5
Data Available	DAV	6
Not Ready for Data	NRFD	7
Not Data Accepted	NDAC	8
Interface Clear	IFC	9
Service Request	SRQ	10
Attention	ATN	11
Sheath	Earth	12
Data In-Out 5	DIO5	13
Data In-Out 6	DIO6	14
Data In-Out 7	DIO7	15
Data In-Out 8	DIO8	16
Remote Enable (24)	REN	17
OV Return (DAV)	OV	18
OV Return (NRFD)	OV	19
OV Return (NDAC)	OV	20
OV Return (IFC)	OV	21
OV Return (SRQ)	OV	22
OV Return (ATN)	OV	23
OV Return (EOI or REN)	OV	24

A2.6 Usage of Lines

The GPIB interface bus signal lines are grouped into three sets as follows.

A2.6.1 Data (DIO) lines

Eight lines are used to carry input/output data (DIO1 to DIO8). An 8-bit bidirectional data bus is used to carry information between devices on the interface. The information transferred includes interface commands, addresses and device dependent data.

A2.6.2 Data transfer (handshake) lines

Three lines are used to control automatically the transfer of data over the data bus from a source (an addressed talker or controller) to an acceptor (an addressed listener). The three lines are as follows:

DAV (Data Valid) -- This line is controlled by the source and is asserted to indicate the availability and validity of information on the DIO lines. DAV = true indicates that the message is correct and suitable for acceptance.

NRFD (Not Ready for Data) -- This line is used by devices to indicate their readiness to accept data. NRFD = false indicates that all devices are ready to accept data.

NDAC (Not Data Accepted) This line is used by devices to indicate acceptance of data from the DIO lines. NDAC = false indicates that all listening devices have accepted data.

A2.6.3 Interface control lines

Five supervisory lines are used to control the flow of information through the interface. They are direct lines which are output commands set by the controller with the exception of SRQ which is an input interrupt request:

ATTENTION (ATN) -- This line causes all devices to interpret data on the bus as a controller command and activates their acceptor handshake function. All devices must monitor ATN at all times and respond within 200 nanoseconds. When true, ATN

places the interface in command mode, where all devices accept data on data lines and interpret it as a command. When false, ATN places the interface in data mode, where the active talker sends device dependent data to all listeners.

INTERFACE CLEAR (IFC) -- This line initializes the GPIB interface to an idle state (no activity on the bus). The line is used only by the system controller to halt all current operations on the bus (that is, unaddress all talkers and listeners and disable the serial poll). All devices must monitor IFC at all times and respond within 100 microseconds.

SERVICE REQUEST (SRQ) -- This line informs the controller that a device needs attention and can act as an interruption of the current sequence of events. Typically SRQ indicates that data is ready for transmission and/or that an error condition exists (for example, syntax error, overload, trigger too fast). The controller can mask the SRQ interrupt and must perform a serial poll of devices to determine who requested service and why.

REMOTE ENABLE (REN) -- This line enables devices to respond to remote program control when addressed. When REN = true, all devices capable of remote operation are placed in the remote condition when addressed to listen. When false, all devices return to local operation. All devices capable of both remote and local operation must monitor REN at all times and respond with 100 microseconds.

END OR IDENTIFY (EOI) -- This line has two functions in combination with ATN. When ATN = false, in the data mode EOI can indicate the end (last byte) of data in a multibyte sequence. When ATN = true, in the command mode EOI is used by a controller for asking devices to identify themselves in a parallel poll operation.

APPENDIX 3

PERQ HARDWARE SPECIFICATIONS

This appendix gives hardware specifications for the standard components of the PERQ system.

Contents

A3.1 Processor Cabinet

Power requirements	-10 Models 110-120 V 60 Hz single phase at 8A -00 Models: 220-240V, 50 Hz single phase supply at 5A. Direct connection to IT systems (impedant neutral systems) is not supported; an isolation transformer is necessary.
Dimensions	Height: 660 mm Width: 390 mm Depth: 720 mm (including rear cover)
Interfaces	2 x RS232, GPIB, Ethernet, Canon laser printer (optional)
Main power cable length	3 m
Weight unpacked	75 Kg
Operating environment	10 degrees to 35 degrees C, 20% to 80% RH, non-condensing

A3.2 Floppy Disk Drive

Disk capacity (formatted)	0.5 Mb (single density)
Transfer rate	31.2 Kb per second
Average latency	83.3 mS
Number of surfaces	2
Tracks per surface	77
Tracks per diskette	154
Sectors per track	26

Sector size	128 bytes
Track density	1.89 tracks/mm
Seek time	Single track maximum 3 milliseconds 76 tracks maximum 228 milliseconds
Head settling time	Maximum 20 milliseconds
Head load time	50 milliseconds
Start time	Maximum 2 seconds
Speed	360 rpm + or - 3.5%
Head life	Minimum 400,000,000 track passes
Start time	Maximum 2 seconds
Speed	360 rpm + or - 3.5%
Head life	Minimum 400,000,000 track passes
Floppy disk type	8 in. floppy disk, single or double sided, single density
Write protection	Write electronics disabled when write-protect notch is uncovered

A3.3 Fixed Disk

Disk type	5-1/4 in. Winchester type
Capacity	Up to 34 Mb (formatted)
Transfer rate	Instantaneous: 5Mbits/sec
Number of data surfaces	5
Tracks per surface	830
Sectors per track	16
Bytes per sector	512

Access time:	
Track to track	6 milliseconds
Average 1/3 stroke	33 milliseconds
Full stroke	60 milliseconds
Average latency	8.33 milliseconds
Speed	3600 rpm

A3.4 Display and Keyboard

Display dimensions	Height: 430 mm (450 mm with maximum reverse tilt) Width: 325 mm Depth: 373 mm (420 mm with maximum reverse tilt)
Display weight	15.9 Kg
Screen dimensions	280 mm x 210 mm
Interfaces	Two private serial interfaces for keyboard and tablet
Keyboard character set	ASCII
Key repeat second	Auto repeat: approximately 10 per
Key roll over	N-key rollover

A3.5 Standard Tablet

Dimensions	208 mm x 268 mm x 15 mm
Active area	180 mm x 240 mm
Resolution	0.27 mm (one pixel)
Pointing device	Three button puck

A3.6 High-Resolution Tablet

Dimensions	395 mm x 395 mm x 45 mm high
Active area	280 mm x 280 mm
Resolution	0.127 mm
Pointing devices	Four button puck; stylus

APPENDIX 4

AVOIDING DAMAGE FROM STATIC ELECTRICITY

This appendix gives general information about the causes and effects of static electricity and specific advice on how to avoid damage to circuit boards.

CONTENTS

A4.1 Introduction

CAUTION - Static electricity can damage electronic components.

The information in this appendix is provided for your convenience and general guidance. Similar information should be included with any hardware and enhancement that you order from PQS for your PERQ; in case any details have changed since this User Guide was published, please follow the publication that arrives with your enhancement.

A4.2 Causes and Effects

Static electricity is generated by friction, causing electrostatic charges to build up on non-conductive materials such as your skin, clothing, furniture and furnishings. Everyday actions such as walking across a carpet generate these charges, which tend to be higher when the atmosphere is dry.

Static electricity usually presents no hazard to people, although it can appear as a spark or slight shock when you touch a conductive object such as a metal cabinet.

Electronic components such as integrated circuits, transistors and other semi-conductor devices, however, can be damaged by static electricity. Sometimes this damage cannot be detected by a simple test, but makes a component unreliable or shortens its life. Modern components are particularly sensitive and can easily be damaged by the amounts of charge commonly found in offices or computer rooms. Damage can even occur when the charge is too low for you to notice.

A4.3 What You Can Do to Help

It is best if you can prevent charges building up, if possible, by avoiding dry atmospheres and man-made fibers in clothing and furnishings. Anti-static sprays can also be of help, but you must use them repeatedly.

A4.4 Precautions

If you need to handle printed circuit boards (PCBs) or remove equipment covers for any reason, it is important to adopt these simple precautions:

DO wear a conductive wrist strap, if supplied, connected to the frame of the equipment. Alternatively, grasp the frame with both hands, and repeat this action from time to time.

DO handle PCBs only by their edges, but avoid the edge connectors.

DO place removed PCBs on a conductive surface (for example, metal) with the component side face upwards.

DO check that the seal on new PCB bags is unbroken.

DO slit the seal on PCB bags carefully with a knife.

DO return PCBs to their bags as soon as possible.

DO reseal PCB bags with the original seal or a paper label.

DO write "Static Sensitive Devices" on any outer packing for returned PCBs, and on the advice note or travel documents.

DON'T open a PCB bag until the PCB is required for use.

DON'T touch any component unnecessarily.

DON'T put PCBs on non-conductive surfaces (for example, the floor).

DON'T rip the seal on PCB bags.

DON'T put documents inside PCB bags.

DON'T reseal PCB bags with plastic tape.

INDEX

CUSTOMER _____ PERQ Serial No. _____

CUSTOMER'S REPORT ON CONDITION OF EQUIPMENT

Packing

What was the condition of the packing when you received your PERQ? Please be specific.

_____

_____

Missing Materials

What (if anything) was listed on the packing slip but not received?

_____

_____

PERQ's Overall Condition

Please describe any damage(s) to the PERQ system when received. Be specific.

BASE _____

_____

DISPLAY _____

_____

KEYBOARD _____

_____

TABLET (BITPAD) _____

_____

OTHER _____

_____

Clarity of Installation Instructions

Were you able to easily unpack and install the system? Yes__ No__
If not, please specify the problem(s).

_____

_____

(over)

Please note below any suggestions or comments which you feel may be beneficial to us in better serving our customers.

_____

_____

_____

Please designate below a software and hardware person in your organization whom we can contact for information or in case of problems.

SOFTWARE CONTACT

_____ Name _____ Title

_____ Company/Organization _____ Telephone Number

_____ Address

_____ Address

HARDWARE CONTACT

_____ Name _____ Title

_____ Company/Organization _____ Telephone Number

_____ Address

_____ Address

This form was completed by:

_____ Name _____ Date

_____ Title

Thank you

Product Management
PERQ Systems Corporation
2600 Liberty Avenue
P. O. Box 2600
Pittsburgh, PA 15230

(412) 355-0900

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