

# **PERQ T2**

## **SERVICE GUIDE**

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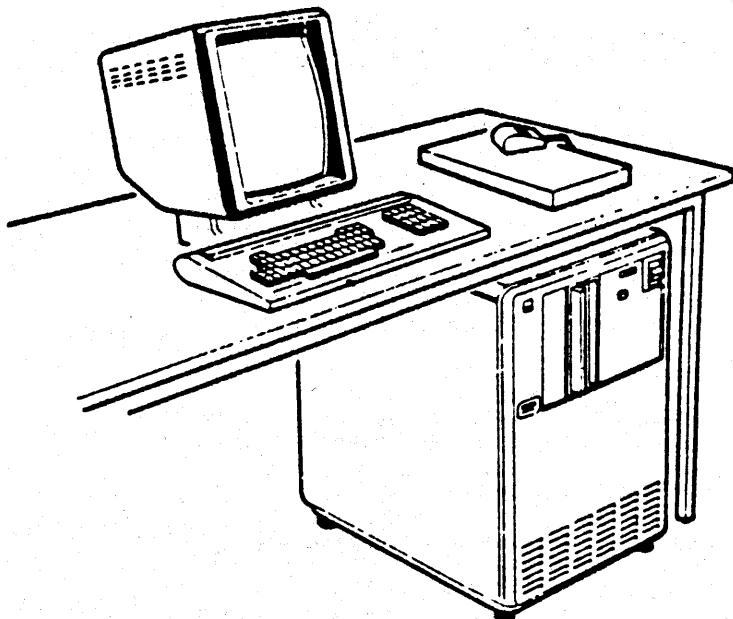
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## Introduction

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## **Introduction**

Distributed by UK Software and  
Literature Supply Sector, International  
Computers Limited  
Registered Office: ICL House, Putney,  
London SW15 1SW  
Printed by ICL Printing Services  
Engineering Training Centre  
Icknield Way West  
Letchworth, Herts SG6 4AS

### **Objectives**

This document is intended as an action guide to help you to maintain the system described within, and to refresh your understanding of the equipment.

The main aim is to present information that will help to solve problems identified by a user. The information should help you to:

- Decide the most likely-needed spares to take when you visit the user's site
- Solve the problem quickly when you arrive on site

For problems that you cannot resolve directly, there are functional drawings and reference information that may assist you into finding the solution.

You may also find helpful the overview technical description; it should remind you of the way the different subsystems work, and how they interconnect.

### **Structure of the guide**

This guide is one of a series of modular engineering service guides that will cover the whole range of ICL systems.

The guides are divided into modules, the system module (A) and a module for each peripheral (B, C and so on). The modules are published under different TP reference numbers, and can be assembled into binders to make the service guide for a complete system.

Each module (system or peripheral) is usually divided into eight sections, as shown on the next page; each section begins with a list of subsections and sub-subsections.

#### How to use the guide

Dividers give rapid access to sections, and numbers at the top edge of each page enable fast location of subsections.

#### Index

The functional index is a handy reference guide to quickly determine the location of the information you require.

#### Problem analysis

To tackle a problem you will generally start with the symptom categories in Section 1, and then use Section 2 to isolate the problem. However, you as the engineer on site, are best able to select the section which can help you.

#### Functional diagrams

Section 3, can sometimes suggest a solution to a problem by identifying the hardware items.  
Overview

Section 4, gives more information on the hardware items identified in Section 3 and is supported by an overview of the equipment.

#### Operating

Section 5, will help you to operate the system, and to use its test facilities.

#### Reference

Section 6, can help with problem isolation and repair by providing you with the detail of a connection or assembly.

#### Procedures

Section 7, the replacements and enhancements information, will help you to change a failing item, and to install the available enhancements.

#### Technical notes

Section 8, is for you to file your personal notes, information sheets, publication notices and so on.

Copies of any fault logging sheets you write can also be filed here.

## **Introduction**

### **Logging failures**

**It is important to log details of failures, and solutions found.**

If the answer to a fault is still being sought, it is important for you to note the symptoms and the actions you have taken to try to solve the problem. The notes will help if specialist assistance is eventually needed.

If you have not managed to solve the problem on your first visit, then any notes you make of the symptoms you found or were told about by the user, and the action you took, may be very useful later, either to you or to a specialist called in to help.

A good way to log these failure reports is to write them up on 3-part stationary (such as ICL self carbon internal A4 memos). One part you can file in Section 8 in this guide, one part you can leave on site with the system, and one part perhaps you could send to us (see below).

### **Useful site contacts**

<b>Name</b>	<b>Where located</b>
-------------	----------------------

Later issues of this guide, and guides subsequently produced for other equipment, will be of more use to other service engineers only if engineers using the guides write to us telling us of:

- Errors or ambiguities
- Other fault symptoms and solutions
- Suggested improvements

The address to write to is:

Engineering Publications Manager,  
ICL Publications Centre,  
Lovelace Road, BRACKNELL,  
Berks. RG12 4SN, UK.

The ICL internal address is:

IPC, BRA 01.

## Index

This index gives you fast access to named subjects within the manual.

It complements the introduction and contents pages for each subject.

Key words for the subjects are listed in alphabetical order, with the section numbers that mention the subject alongside.

Only the terms used in the text have section reference numbers. Other names by which the subject may be known are listed and the used term then given in italics. You should look up the used term in its alphabetical position, for the section number.

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### **Isolating the problem**

### **Functional diagrams**

### **Overview**

### **Operating information**

### **Reference information**

### **Procedures**

### **Technical notes**

This section helps you to analyse a problem and will help you to identify its cause.

The first step is to match the problem with a symptom from the groups below.

The following pages give for each symptom:

- the likely problem causes
- a summary of user guide activities
- the actions to help you find the cause

Use the symptom pages and Section 2 to help you isolate the failing unit.

The functional diagrams in Section 3 and 4 may suggest further actions.

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## Entry to the Problem

### 1.1 AT SWITCH ON

NOTE: Before proceeding, refer to section 2 WARNINGS and CAUTIONS.

#### 1.1.1 No mains ON indication

Problem as seen by the user

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given; remember, there may be others.

Expected checks by the user

These checks are given in the user guide.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Useful references

The system is completely dead at switch ON.

Mains cable not plugged in correctly  
Wall switches OFF  
Fuse blown  
Local power failure affecting peripherals powered from CPU cabinet  
Processor isolator tripped or failed.

Check that:

Mains cable is plugged in correctly  
Wall switches ON  
Mains switches ON  
Other equipment in the area is working  
Try using another mains outlet

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Check mains supply, fuse and cable to processor cabinet. For monitors with integral psu make similar checks

If problem is at processor cabinet and persists, disconnect the disc drives, power unit and fans

The power distribution diagrams in section 4 will help

## 1.1 SWITCH ON

1.1.2 No continuous noise from fans and disc

Problem as seen by the user

A check of the symptoms is worthwhile

There is no noise when the on-off switch is operated.

Possible causes

The more likely causes are given; remember, there may be others.

Bad contact on connectors  
Fans not plugged in  
Power supply failure

Expected checks by the user

These checks are given in the user guide.

Check the on-off switch latches on when operated.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his check will help your analysis

If the fans run when the on-off switch is on, the problem is most likely the power supply unit.

Check the AC distribution circuit

Useful references

AC distribution diagram, in section 4

## Entry to the Problem

### 1.1 SWITCH ON

#### 1.1.3 No sound from disc drives

Problem as seen by the user

A check of the symptoms is worthwhile

Air is being sucked in at the front of the processor cabinet but the fixed disc is not spinning

Possible causes

The more likely causes are given; remember, there may be others.

Disc not being driven due to:  
No power at the fixed disc drive  
Drive motor failure

Disc locked for transit T1

Expected checks by the user

These checks are given in the user guide.

Listen for and report absence of normal sounds from the processor at power ON.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Check power input and motor on the disc drive.

T2 check the plus 5 and plus 12 volt supplies at the disc drive

Useful references

Fixed disc drive in section 4

## 1.1 SWITCH ON

1.1.4 No diagnostic display

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

The fans and disc drive run normally but nothing else happens.

The diagnostic display is not lit at all. See also section 1.2.1 for a display of nought.

**Power supply failure**

Five volts supply not reaching the diagnostic display

Failing diagnostic display.

Faulty interconnecting cables and/or connectors

**Expected checks by the user**

These checks are given in the user guide.

Check interconnecting cables plugged in correctly and not damaged.

Turn up brilliance on the display and see if screen is lit. For monitors with integral psu check mains supply and supply ON/OFF switches

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

If the display is not lit this is most likely to be a power supply problem

If the display is lit the problem is more likely to be the diagnostic display board.

**Useful references****section 2**

## Entry to the Problem

### 1.1 SWITCH ON

#### 1.1.5 Display screen dark

Problem as seen by the user

A check of the symptoms is worthwhile

##### Possible causes

The more likely causes are given; remember, there may be others.

##### Expected checks by the user

These checks are given in the user guide.

##### Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

##### Useful references

The display screen is not lit.

Noise from fans and disc.  
The diagnostic display is lit. (The number is not relevant)

No power to monitor

Brilliance control turned down.  
The interconnecting cable is not plugged in correctly.  
CAUTION switch the processor off before checking.  
You may blow up the memory board by plugging in the display when the power is on.

Faulty display unit, interconnecting cable or memory board.

Check the brilliance is turned up.

Check that the interconnecting cables are correctly plugged in and not damaged. (Before checking this, switch OFF the processor)

For monitors with integral psu, check mains cable is OK.

Check fuse in mains plug.

Switch ON processor and check problem still persists

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Always change the display first, check that replacement is of the correct type i.e. with or without integral psu. If this is successful the original display unit should be removed for repair. If this is not successful then change the memory board.

Display units, section 4  
Memory board, section 4

## 1.2 When Loading

### 1.2.1 Diagnostic display less than 999/255

**Problem as seen by the user**

A check of the symptoms is worthwhile

The system is switched ON, the fans are operational.

The display screen is lit but after two minutes there is no prompt to log in.

The diagnostic display shows a number less than 999 POS or 255 PNX

#### Possible causes

The more likely causes are given; remember, there may be others.

System establishment stopped before completion.

The system being loaded is corrupt

A hardware failure

#### Expected checks by the user

These checks are given in the user guide.

Switch OFF processor and then check that all cables are correctly plugged in and not damaged.

Switch ON processor and if problem persists:

Note the number on the display for all attempts to load the system. Use the boot button to try and load the system again.

Try loading any other systems on the rigid disc including the confidence test software.

Load the installation test floppy and run the tests.

Interpret the diagnostic display using the table in the user guide. Remake boot files or take any other appropriate software action suggested.

#### Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Use the table in section 2 POS or PNX to interpret the diagnostic display numbers shown when attempting to load the system.

If the number displayed is consistently higher than 155 this is likely to be a software problem. If the number is less than 155 the problem is more likely to be in the hardware.

#### Useful references

System load, section 4

## Entry to the Problem

### 1.2 When Loading

#### 1.2.2 No writing on screen

Problem as seen by the user

A check of the symptoms is worthwhile.

#### Possible causes

The more likely causes are given; remember, there may be others.

#### Expected checks by the user

These checks are given in the user guide.

#### Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

#### Useful references

The diagnostic display shows 999 for POS or 255 for PNX.

The display screen is lit but no characters appear on the screen.

Interconnecting cables not plugged in correctly or damaged. Switch the power OFF before checking or the memory board may be damaged.

Faulty display unit or memory board.

Check the display unit cable is correctly plugged in and is not damaged: (switch the power OFF before checking.)

Switch the power on and check there are still no characters displayed on the screen after the diagnostic display reaches 999 for POS or 255 for PNX.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Switch the processor OFF and check the display unit cable.

Determine whether the display unit or the memory board is faulty by substitution.

Always change the display unit first, check that the replacement is of the correct type i.e. with or without integral psu. If this is successful the original display unit should be removed for repair. If this is not successful, change the memory board.

Display units, section 4

Memory board, section 4

## 1.2 When Loading

1.2.3 Wrong system loaded

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

**Useful references**

The version of the operating system loaded is not the one required. The correct or default character key was pressed on the keyboard.

The default system loaded because the key on the keyboard was not seen by the software.

Faulty keyboard, cable or EIO board causing the wrong character code

Press the CAPS LOCK key on the keyboard, alternate presses will light the indicator if power is present at the keyboard.

Check the keyboard and display cables are not damaged or disconnected.

Use the boot button to reload the system. Make sure the keyboard key is held down until the diagnostic display reads more than 151. Load the default or any system you can, or the keyboard confidence test from floppy disc. Check that the key first used reflects the correct character on the screen. See if any other keys give the wrong characters. This information will help the engineer.

Confirm the problem is as seen by the user; the result of his check will help your analysis

Check the keyboard unit cable, display cables and connectors.

Clean the keyboard edge connector inside the keyboard unit. An eraser 8033363 is suitable.

Check the keyboard ROM is pushed fully home with no pins bent under.

Substitute the keyboard unit and then the EIO board.

Keyboards, section 4

Keyboard test, section 5

## **Entry to the Problem**

### **1.2 When Loading**

#### **1.2.4 No response from keyboard**

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible cause**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

**Useful references**

The diagnostic display shows 998/999 POS or 254/255 PNX.

A prompt is displayed on the screen to type the date.

Characters typed on the keyboard do not appear on the screen.

The keyboard unit is not plugged in correctly.

Faulty keyboard, cable or EIO board.

Check the diagnostic display shows 999 or 255.

Check the cables are plugged in correctly and are not damaged.

Try reloading the system.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Check the keyboard and display cables.

Clean the keyboard edge connection inside the keyboard unit. A eraser 8033363 is suitable.

Substitute the keyboard unit, then the EIO board.

Keyboards, section 4

Keyboard test, section 5

## 1.3 When Logging in

1.3.1 Unable to enter date and time

**Problem as seen by the user**

A check of the symptoms is worthwhile

The diagnostic display shows 998 or 999. A prompt is displayed on the screen to type the date. Characters typed on the keyboard do not appear on the screen correctly or not at all. The information entered is rejected.

**Possible causes**

The more likely causes are given; remember, there may be others.

The keyboard or display is not correctly plugged in.

Faulty keyboard, cable or EIO board.

**Expected checks by the user**

These checks are given in the user guide.

Press the CAPS LOCK key on the keyboard, alternate presses will light the indicator if power is present at the keyboard.

Check the keyboard unit cable is plugged in correctly and is not damaged. Try reloading the system. Run the installation test.

If only some characters are wrong try substituting logical alternatives. Note the characters that are wrong. This information will help the engineer.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Check the keyboard unit cable and connectors

Clean the keyboard edge connectors inside the keyboard unit. An eraser 8033363 is suitable.

Check the keyboard ROM is pushed fully home with no pins bent under.

Substitute the keyboard unit, then the EIO board.

**Useful references**

Installation test, section 5

## Entry to the Problem

### 1.3 When Logging in

#### 1.3.2 POS name or password rejected

Problem as seen by the user

A check of the symptoms is worthwhile

##### Possible causes

The more likely causes are given remember, there may be others.

##### Expected checks by the user

These checks are given in the user guide.

##### Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

The date and time or return key default values have been accepted.

Attempts to enter a name or password result in an error message. Name or password rejected, profile file malformed or not found.

The default name does not work.

The name or password used is not recognised by the system.

The system software has been inhibited by entry of incorrect data.

An easily replaced system file has been lost.  
Floppy heads need cleaning.  
No floppy in drive

Try to enter the name or password again. The system associates these with a profile defined when the user's name was added.

When this problem occurs the user will normally follow the course of action outlined below and effect a cure. But YOU may have to do it.

If the name or password is rejected:  
press the return key in answer to name. This logs into the system with the name guest in partition user.

list the users known to the system with the command **USERCONTROL List**

If the name is already there:

check the password by putting the name into **USERCONTROL** again. See section 2 for details.

If the profile file is malformed or not found:  
edit a copy of the default profile file to recreate it. See section 2 for details.

If the default name is not accepted:  
load a new SYS:USERS or DEFAULT.PROFILE file from release floppy disc. See section 2 for details.

Replace EIO board.

## 1.4 During Normal running

1.4.1 POS I/O error message displayed

**Problem as seen by the user**

A check of the symptoms is worthwhile.

**Possible causes**

The more likely causes are given remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

**Useful references**

An error message is displayed on the screen of the form IOEBUN=-1.

User software error.  
Hardware error.

Ensure message is not due to software error.  
Check cables and connectors.

Run the confidence test software. Try the tests directly applicable to the error message first.

Report error message and results of confidence test run.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Check strip-lines and cables inside the processor as well as outside.

Try replacing the EIO board before a disc.

**POS error codes, section 2**

## Entry to the Problem

### 1.4 During normal running

#### 1.4.2 POS Uncaught exception displayed

Problem as seen by the user

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given; remember, there may be others.

Expected checks by the user

These checks are given in the user guide.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out this can be done quickly.

An uncaught exception is reported when running a known working program.

Scrounge was entered automatically and the system invited the operator to DEBUG?

An uncaught exception in a known working program is likely to be the symptom of a hardware failure.

A user with experience of PERO software development will answer DEBUG? with YES and collect detailed information about the cause of the exception report.

A user without experience of PERO software development will answer DEBUG? with NO, and will have noted the address and the procedure that failed. He should have loaded and run the program again. If the program fails consistently, seek advice from someone with software development experience.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Check with the user that the exceptions occur while running known working programs.  
That no changes to programs or the operating system have been made recently.  
Find out if a less likely causes if particular program fails consistently.

Examine apparently inconsistent exception reports for any common link. Look for procedures dealing with a particular peripheral, file or area of store.

1.4 During normal running

1.4.3 POS Store parity error displayed

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

A display of store parity error occurs while running a known working program.

**Faulty memory board.**

Note the failing address.  
Re-run failing program.

If further errors occur run the memory confidence test (ConWtest) and note the result.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Run the memory confidence test (ConWtest).

Replace the memory board even if no fault is shown up by the confidence test.

## **Entry to the Problem**

### **1.4 During normal running**

#### **1.4.4 POS Display broken up**

**Problem as seen by the user**

The display on the screen is an unsynchronised meaningless pattern.

**A check of the symptoms is worthwhile**

#### **Possible causes**

The more likely causes are given; remember, there may be others.

Virtual store failure possibly due to no free segments in the current disc partition.

Faulty CPU board.

Faulty memory board.

#### **Expected checks by the user**

These checks are given in the user guide.

Reload the system and run the utility SCAVENGER.

If the normal load fails to ask for date and time, load the system and SCAVENGER from the FIX BOOT FLOPPY.

#### **Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

If the problem is not cured by SCAVENGER freeing segments in the current disc partition, try replacing the memory board then the CPU board.

#### **Useful references**

The scavenger utility, see section 5

## 1.4 During normal running

1.4.5 POS Unsolicited pop-up menu

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

Automatic selection is made from a pop-up menu which appeared unexpectedly.

Unproven user software.  
Faulty EIO board.

Faulty tablet

Reload and rerun work. Determine whether symptom is random or repeatable.  
Investigate the software if the symptom is repeatable.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

If the symptom is random replace the EIO board.

If the symptom is related to a user program, advise the user to seek ICL product support. (This service is charged for separately.)

**Useful references**

EIO board section 4

## Entry to the Problem

### 1.4 During normal running

#### 1.4.6 POS No response from the keyboard

**Problem as seen by the user**

A check of the symptoms is worthwhile

There is no response to keyboard operation while running a known working program.

The system can be reloaded and works for a while, but again there is no response to keyboard operation, even when running a different program.

#### Possible causes

The more likely causes are given; remember, there may be others.

Faulty keyboard cable or connector.

Faulty EIO board.

Faulty keyboard.

#### Expected checks by the user

These checks are given in the user guide.

Check the keyboard unit cable is correctly plugged in and is not damaged.

Run the keyboard confidence test and note any characters that are wrong. This information will help the engineer.

#### Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Check the keyboard unit and connectors.

Clean the keyboard edge connector inside the keyboard unit. An eraser 8033363 is suitable.

Check the keyboard ROM is pushed fully home with no pins bent under.

Replace the keyboard unit.

Replace the EIO board.

#### Useful references

Keyboard, section 4  
EIO board, section 4

## 1.5 Failing peripheral

1.5.1 Fixed disc drive errors

**Problem as seen by the user**

Errors from the fixed disc are reported on the display screen.

**A check of the symptoms is worthwhile**

**Possible causes**

The more likely causes are given; remember, there may be others.

Disc surface deterioration.

Faulty disc drive.

Faulty EIO board.

Faulty interface adapter board.

**Expected checks by the user**

Run the fixed disc drive confidence test. Obtain the results of the bad block scan. Create new bad blocks as necessary.

**Actions you should take**

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

If the problem is outside the limits of acceptable disc surface deterioration, take the following actions.

Check disc drive cables and connectors

Replace the EIO board

Replace the drive

Replace the board interface adapter

**Useful references**

Fixed disc drives, section 4

## **Entry to the Problem**

### **1.5 Failing peripheral**

#### **1.5.2 Floppy disc drive errors**

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

**Useful references**

**Errors from the floppy disc drive are reported on the display screen.**

Poor floppy disc  
Incorrectly formatted floppy disc  
Wrong density selected  
Faulty strip-line, cable or connectors  
Faulty floppy disc drive  
Faulty EIO board

Try using another floppy disc.

See care of floppy discs in section 4 of the user guide.

Run the floppy disc drive confidence test and note the results.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Check the general condition of the drive particularly the heads.

Check the strip-line cables and connectors.

Replace the drive.

**Floppy disc drive section 4**

1.5 Failing peripheral

1.5.3 High resolution tablet not working

Problem as seen by the user

Tablet operation has no effect on known working program.

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given; remember, there may be others.

Power supply to tablet has failed  
Tablet logic requires resetting  
Cables not connected properly or faulty.  
Faulty EIO board  
Faulty tablet

Expected checks by the user

Check interconnecting cables are OK.

Operate the reset button on the side of the tablet, if reset button is fitted. You may need to re-boot after this.

Unplug and reconnect the tablet.

These checks are given in the user guide.

Make sure the interconnecting cables are plugged in correctly and are not damaged.

Run the tablet confidence test.

Check the operation of any other devices on the GPIB and disconnect them.

Try running the tablet confidence test again.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out likely causes if can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Check tablet cables and connectors.

Check the power supplies are reaching the tablet T2 power supply FS3 supplies KRIZ tablets.

Replace units in the order puck/tablet, EIO board.

## Entry to the Problem

### 1.5 Failing peripheral

#### 1.5.4 RS232 connected printer

Problem as seen by the user

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given; remember, there may be others.

Expected checks by the user

These checks are given in the user guide.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Useful references

Printer does not give the expected output from a known working program. Examples for POS systems are PRINT and COPY.

Printer switches are not set for use with PERQ  
Signal cable incorrectly wired  
Faulty connector or cable  
Faulty printer  
Faulty I/O board  
Baud rate of PERQ differs from printer  
Faulty ribbon cable inside PERQ

Check the printer switches are set as defined in the user guide. If the printer has not been used on a PERQ, the internal switch settings may have to be changed.

Check the cable is wired as defined in the user guide, is plugged in correctly and is not damaged.

Run the RS232 loop-back and printer confidence tests. Try another printer if the RS232 loop-back test runs without errors but the printer test fails.

Refer to the printer section of the user guide for actions to isolate basic printer problems.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Printer substitution will isolate printer faults conclusively. Printer faults are covered in the printer service guide. If the printer is not covered by a service contract the customer must agree to an additional charge before you repair the printer.

Check the printer cables and connectors.

Replace I/O board.

I/O board, section 4  
Printer cables, section 6

## 1.5 Failing peripheral

1.5.5 GPIB connected printer

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given; remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

A 6202/02 correspondence printer or 6203 electrostatic printer-plotter does not give the expected output from a known working program. Examples for POS systems are PRINT and COPY.

Printer switches are not set for use with PERQ  
 Faulty cable or connector  
 Faulty printer  
 Faulty I/O board  
 Another device connected to the GPIB is faulty  
 User not running software

Check the printer switches are set as defined in the user guide. Only a qualified person should remove the 6202/02 printer cover to check the internal switch settings. This is necessary if the printer was not last used on a PERQ.

Check the GPIB cables are all plugged in correctly and are not damaged.

Run the printer confidence test.

Check that the high resolution graphics tablet works correctly.

Disconnect any devices other than the tablet and the printer under test from the GPIB.  
 Substitute another printer.

Refer to the printer section of the guide to resolve basic printer problems.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Printer substitution will isolate printer faults conclusively. Printer faults are covered in the printer service guide. If the printer is not covered by a service contract the customer must agree to an additional charge before you repair the printer.

Check the printer cables and connectors.

Replace the I/O board

I/O Board, section 4  
 Printer cables, section 6

**Useful references**

## Entry to the Problem

### 1.5 Failing peripheral

#### 1.5.6 OSLAN connection

Problem as seen by the user

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given; remember, there may be others.

Expected checks by the user

These checks are given in the user guide.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Useful references

Failure to communicate with another PERQ system across the local area network (LAN).

Faulty LAN cable, connector or terminator  
Faulty transceiver cable  
Faulty transceiver unit  
Faulty EIO board  
PERQ not in mode to respond

Check that the correct software is in use at both PERQs and that the LAN addresses are correctly defined.

Check the transceiver cables, LAN cables and terminators are plugged in correctly and are not damaged. Make these checks at both processors and all transceiver units.

Run the OSLAN confidence test and note the results.

Check other devices on the LAN can communicate and/or disconnect them. Try the confidence test again.

Substitute LAN transceiver unit, LAN cable or terminator.

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Confirm ICL contractual obligation to repair LAN hardware. But to isolate a fault to PERQ hardware involvement in LAN hardware substitution is expected.

If the fault appears to be a PERQ:  
Check the transceiver cable  
Replace the EIO board

If EIO is changed then:  
EITHER the LAN address of the substitute board will need defining to all nodes of the LAN,  
OR the ROM defining the LAN address will need to be transferred to the substitute board.

OSLAN, section 4

## 1.6 Quality

1.6.1 Display screen

**Problem as seen by the user**

A check of the symptoms is worthwhile

**Possible causes**

The more likely causes are given remember, there may be others.

**Expected checks by the user**

These checks are given in the user guide.

**Actions you should take**

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

**Useful references**

The picture displayed on the screen is of poor quality. There is a lack of brightness or contrast. The picture is out of focus or streaked.

Brightness control set incorrectly

Faulty display unit

Faulty memory or CPU board

Loose interconnecting cables

TTL board on large screen

Try adjusting the brightness control to improve the display quality.

See if the poor quality is due to faulty characters with parts missing or added. Is the display broken up by a pattern.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Adjustments within the monitor to improve brightness, contrast, focus or streaking are unlikely to be the cure. In practice improvements do not usually last. The display unit should be replaced.

Parts of characters missing or added is usually due to faulty video amplifiers on the memory board.

Patterning is often caused by the CPU board, but it can be caused by the memory board.

**Display units, section 4**

1.6 Quality

1.6.2 Bitpad dead areas

Problem as seen by the user

A check of the symptoms is worthwhile

Possible causes

The more likely causes are given remember, there may be others.

Expected checks by the user

These checks are given in the user guide.

Actions you should take

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Tablet dead areas

Parts of the high resolution graphics tablet surface do not respond correctly to puck movements. The cursor on the display screen stops and jumps instead of moving smoothly.

The magnetic bias of the tablet surface has been disturbed

Faulty tablet, cable or EIO board

Check the tablet unit cables are plugged in correctly and are not damaged.

Bias the tablet surface using the bar magnet provided. The installation card gives instructions for doing this.

Confirm the problem is as seen by the user; the result of his checks will help your analysis

Check the tablet unit cables and connectors.

Try biasing the tablet surfaces again. See section 7 for details.

Substitute the tablet then the PERQ1 EIO board.

Replace Tablet

## 1.6 Quality

### 1.6.3 Printers

**Problem as seen by the user**

Print quality has deteriorated on a job previously run.

**A check of the symptoms is worthwhile**

**Possible causes**

Worn or damaged ribbons, heads, tractors

Exhausted toner

Non approved paper or ribbon

Out of adjustment or faulty printer

**Expected checks by the user**

Ensure the actions in the printer user guide have been carried out.

These checks are given in the user guide.

Run the printer confidence test and make a further judgement on print quality.

**Actions you should take**

Confirm the problem is as seen by the user; the result of his checks will help your analysis.

Depends on the information you have gathered. It may be worthwhile checking out less likely causes if this can be done quickly.

Printer faults will be covered in the appropriate printer service guide.

**Useful references**

Printer test programs, section 5

## Entry to the problem

### Isolating the problem

#### Functional diagrams

#### Overview

#### Operating information

#### Reference information

#### Procedures

#### Technical notes

This section contains information to help you find the cause of the problem.

Additional problems may be introduced if the WARNINGS and CAUTIONS are not observed.

<u>Section</u>	<u>Heading</u>
2.1	<b>WARNINGS and CAUTIONS</b>
2.1.1	Warnings
2.1.2	Cautions
2.2	<b>PERQ2 Power</b>
2.2.1	AC distribution
2.2.2	DC distribution
2.3	<b>POS Diagnostic display</b>
2.4	<b>PINX Diagnostic display</b>
2.5	<b>POS Error codes</b>
2.6	<b>POS Login</b>

## Problem isolation

### 2.1 WARNINGS and CAUTIONS

#### 2.1.1 Warnings

##### Dangerous voltages within video terminals

Extra high voltages are generated for the CRT within video terminals and mains voltages can be present even when power is switched off at the terminal mains switch. The surest way of removing power from a unit to be worked on is by withdrawing the mains input plug. However, even when the plug has been withdrawn, a high potential may still exist on the p.d. anode near to the front of the tube

##### Adjusting CRT displays

Some adjustments to CRT displays have to be done with the circuits exposed and power switched on. Such adjustments should be carried out only by trained engineers who must observe good engineering practices to avoid injury and to ensure their survival in the event of accidental shocks.

##### Residual EHT charges - p.d. anode

It has been found that a very high voltage charge can be present on the EHT connector of a CRT even though mains power is removed and the terminal has been repeatedly earthed. At all times avoid touching the terminal on the tube either directly, or through metallic tools.

##### Glass hazard

Mechanical shock to a cathode ray tube may cause the tube to implode violently. Take extra care when handling tools near to the CRT and shield the glass with a cloth or felt restraining medium. An implosion could severely injure you and colleagues nearby.

##### Processor cabinet

Take particular care to avoid contact with high voltages in these areas.

- The wiring on the 120/240 volts AC mains input panel which is not completely enclosed.
- The processor power supply adjustment which is among switching components carrying hundreds of volts.
- Tablet power units which have a separate 120/240 volts AC mains supply.
- Display monitor units which have an integral psu with a 120/240 volts mains input.

## **Problem isolation**

### **User programs**

**These may contain errors which produce hardware fault symptoms. Run or have the user run the confidence tests first. See section 5**

### 2.1.2 Cautions

#### **Electrostatic damage**

Some components on printed circuit boards can be damaged by excessive voltages, regardless of current flow. Such components are referred to as electrostatically sensitive devices (ESDs). To avoid damage to such devices from movement generated charges on the body:

- avoid unnecessary handling of boards
- wear an earthed wrist strap when handling boards
- always transport boards in an authorised container
- keep board in container until required
- slit the container with a knife; do not tear it open
- if they are supplied, carefully remove edge connector shunts and reapply to the replaced board.

#### **Screen optical coatings**

Some video terminals have a special anti-glare coating applied to their screens. Try to avoid fingering these screens. If a screen is contaminated by oils from the skin, use only the recommended cleaning pads to remove the oils and wipe the screen dry with a soft paper tissue or a lint-free cloth.

#### **Field repair strategy**

Board or whole unit replacements are the expected methods of on-site repairs to equipment covered by this guide. Sub-unit replacements will normally be done by service centres; only in unusual situations will subunits like mains transformers and cathode ray tubes be replaced on site.

#### **Fixed disc damage**

On T1 machines lock the disc heads before moving the processor be careful not to jar the unit if it has to be moved to gain access to the locking mechanism at the rear of the unit. On T2 machines the 5.25 inch disc heads are not locked manually.

#### **Data corruption**

Failure to observe the following can result in system data being corrupted.

- Do not rest flexidisc cartridges on the tablet surface
- Do not stand the display unit on top of the processor.
- Do not place the tablet biasing magnet on or near flexidisc cartridges or the rigid disc.
- Do not leave the flexidisc drive door open when not in use.
- Do not input multiple control and C characters on the keyboard indiscriminately.

## 2.2 PERQ2 Power

This subsection should help you to isolate problems to do with the power distribution.

### 2.2.1 AC distribution

If power is present at the processor unit and the circuit breaker is closed, the fans will be running.

If the fans run but DDS is not lit, check the a.c. power connection to the PSU.

Consider that some monitor units have an internal PSU and will therefore have a separate mains input requirement.

### 2.2.2 DC distribution

Take off the rear panel of the processor cabinet. Measure the DC voltages at the supply except +24V and +55V which are measured at the bulkhead.

A circuit diagram of the DC distribution is provided in section 3.

## Problem isolation

### 2.3 POS Diagnostic display

This section will help you translate the numbered DDS steps into possible fault causes.

The 3 digit decimal display gives a readout of the progress of the establishment steps carried out every time the system is loaded. If POS establishment is completed satisfactorily, the display will reach 999; a number less than 999 indicates that one of the steps has failed and establishment has been halted.

The list below shows the establishment step for each number, and the possible fault if the process halts at that step.

Section 4 gives an outline of the system establishment process.

#### CAUTION

The DDS hardware has a fault in it, which sometimes causes the number displayed to be 1 less than it should be. When PERQ and DDS are working correctly, DDS pauses at 10 before PERQ loads the bootstrap; if the DDS bug is active, DDS will pause at 9.

In practice this means that when you establish the system-either by switching ON or by pressing the boot button-you should watch the DDS display. If it pauses at 9, then when DDS halts due to a fault, add 1 to the displayed number before you look up the possible cause in the table below.

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
Under control of micro-code in CPU ROM:		
0	incrementing DDS to show that CPU ROM micro code has been entered and that an instruction can be executed	CPU board Keyboard Keyboard cable
1	testing following functions of 2910:  NEXT, GOTO (various locations), simple conditional GOTO, subroutine CALL and RETURN, two level subroutine CALL and RETURN.	CPU board
2	writing to and reading from registers	CPU board
3	testing register X addressing	CPU board
4	testing register Y addressing	CPU board
5	further testing of Y addressing; verifying ALU and carries.	CPU board
6	Checking following functions of ALU:  . AND, OR, XNOR, NOT  . Carry on all five ALU chips	CPU board
7	checking conditional branches needed by the boot PROM - GTR, GEO, LEO, C19	CPU board
8	testing 2910 LOAD S and REPEAT functions	CPU board
9	testing control store	CPU board

## 2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
10	Loading a boot file. The system selects, the link, a boot floppy or the fixed disc in that order.	floppy disc drive fixed disc drive I/O board memory board CPU board Link
	To narrow down the choice: if you are trying to load from fixed disc, try starting the whole process again by pressing the boot button. If that does not work, try loading a boot floppy, then pressing boot button. If that moves DDS past 10, then fault(s) could be the EIO board or fixed disc drive	
	If the DDS still sticks at 10, try taking off the front panel of the cabinet and checking that EIO, memory and CPU boards are all firmly seated.	
	The microcode in the CPU ROM now initiates a read transfer from a disc. Two microcode modules are read into the control store RAM:	
	VFY-additional CPU and memory tests	
	SYSB-system boot loader	
	The transfer is from the flexidisc drive if a 'Boot Floppy' is loaded. The fixed disc drive is selected if a 'Boot Floppy' is not identified. Attempts are made to read the microcode from both track 0 head 0 and track 1 head 1 on the fixed disc.	
	An unexpected interrupt from another source will cause a halt with a number between 15 and 21 on the DDS.	
	If the transfer is successful the DDS is incremented to 29 and control passed to VFY.	
11	memory data error	memory board
12	memory addressing error. Retry using 'Boot Floppy'	memory board
13	disc not ready (check belt) EIO board	fixed discdrive
14	could not read disc	fixed disc drive EIO board memory board
15	unexpected interrupt	EIO board CPU board
16	unexpected disc interrupt	EIO board CPU board
17	unexpected network interrupt	Retry using fresh 'Boot Floppy' or fixed disc EIO board CPU board
18	unexpected x80 output interrupt	
19	unexpected video interrupt	
20	unexpected Ethernet interrupt	
21	unexpected memory parity interrupt	

## 2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
29	disabling the CPU ROM	CPU board
30	incrementing the DDS up to 50	CPU board
50	error reporting mechanism in VFY has not worked	CPU board
51	'stack empty' bit in micro-state register not set after a stack reset	CPU board
52	could not load TOS, or bit 0 not working	CPU board
53	could not load item onto stack or bit 1 not working	CPU board
54	'stack empty' bit still set	CPU board
55	one of 2 to 14 of the stack not working	CPU board
56	'stack empty' bit set after only 15 loads	CPU board
57	bit 15 not working	CPU board
58	'stack empty' bit set after 16 loads	CPU board
59	error reporting mechanism in VFY not working	CPU board
60	data error after unloading bit 14 from TOS word	CPU board
61	data error after unloading bit 13 from TOS word	CPU board
62	data error after unloading bit 12 from TOS word	CPU board
63	data error after unloading bit 11 from TOS word	CPU board
64	data error after unloading bit 10 from TOS word	CPU board
65	data error after unloading bit 9 from TOS word	CPU board
66	data error after unloading bit 8 from TOS word	CPU board
67	data error after unloading bit 7 from TOS word	CPU board
68	data error after unloading bit 6 from TOS word	CPU board
69	data error after unloading bit 5 from TOS word	CPU board
70	data error after unloading bit 4 from TOS word	CPU board
71	data error after unloading bit 3 from TOS word	CPU board
72	data error after unloading bit 2 from TOS word	CPU board
73	'stack empty' bit set after only 13 reads	CPU board
74	data error after unloading bit 1 from TOS word	CPU board
75	data error after unloading bit 0 from TOS word	CPU board
76	stack empty bit not set after 15 reads	CPU board
77	2910 call stack failure	CPU board
78	odd did not jump on a 1	CPU board
79	odd jumped on a 0	CPU board
80	byte sign did not jump on 200	CPU board
81	byte sign jumped on 0	CPU board
82	C19 did not jump when it should have	CPU board

## 2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
83	BPC[3] did not jump when it should have	CPU board
84	C19 jumped when it should not have	CPU board
85	BPC[3] jumped when it should not have	CPU board
86	GTR did jump when it should not have	CPU board
87	GTR jumped when it should not have	CPU board
88	GEO did not jump when it should have	CPU board
89	GEO jumped when it should not have	CPU board
90	LSS did not jump when it should have	CPU board
91	LSS jumped when it should not have	CPU board
92	LEQ did not jump when it should have	CPU board
93	LEQ jumped when it should not have	CPU board
94	GEO did not jump when it should have	CPU board
95	GEO jumped when it should not have	CPU board
96	Carry did not jump when it should have	CPU board
99	Overflow jumped when it should not have	CPU board
97	Carry jumped when it should not have	CPU board
98	Overflow did not jump when it should have	CPU board
100	ALU AND NOT function failed	CPU board
101	ALU OR function failed	CPU board
102	ALU or NOT function failed	CPU board
103	ALU AND function failed	CPU board
104	ALU OR NOT function failed	CPU board
105	ALU NOT A function failed	CPU board
106	ALU NOT B function failed	CPU board
107	ALU XOR function failed	CPU board
108	ALU XNOR function failed	CPU board
109	ALU old CARRY ADD function failed	CPU board
110	ALU old CARRY SUBTRACT function failed	CPU board
111	ALU old CARRY ADD with old CARRY = 0 failed	CPU board
112	Fetch error on force bad parity	memory board see note 2
113	unexpected parity error	memory board
114	no parity errors on force bad parity	memory board see note 2
115	parity error detected on force bad parity but address given was wrong	memory board see note 2
116	micro-state registers bit 12 to 15 (BMUX 16 to 19) not showing correct value	CPU board

**Problem isolation**

**2.3 POS Diagnostic display - continued**

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
117	MDX test failed	memory board CPU board
118	upper 4 bits of stack failed	CPU board
119	dual Address/Fetch4 test failed	memory board
120	unexpected Refill	CPU board
121	BPC test failed	CPU board
122	Fetch4 test failed	CPU board Memory board
123	Fetch4 test failed	CPU board Memory board
124	Stored test failed	CPU board Memory board
125	Fetch2 test failed	CPU board Memory board
126	Store2 test failed	CPU board Memory board
127	nextop test failed	CPU board Memory board
128	overlapping Fetch and Store cycles failed	CPU board Memory board
129	bad interrupt	CPU board EIO board
130	unexpected network interrupt	CPU board EIO board
131	unexpected Z80 output interrupt	CPU board EIO board
132	unexpected Ethernet interrupt	CPU board EIO board
133	data error on memory sweep	Memory board
134	address error on memory sweep	Memory board
135	Field did not work	CPU board
136	Dispatch did not jump	CPU board
137	wrong Dispatch target	CPU board
150	If all tests in VFY are successful, the DDS is incremented to 150 and control is passed to SYSB, which loads the Q code interpreter and PERQ operating system.	boot area not written properly try another bootstrap
151	SYSB not loaded properly	Under control of SYSB microcode: Use MAKEBOOT to write another bootstrap

Under control of SYSB microcode:

151 SYSB did not complete

## 2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
152	Illegal boot key	Make sure that right key is held down. The default is a
153	Could not restore heads on fixed disc	fixed disc drive (check belt) EIO board
154	No boot file for key that is being held down	keyboard
155	No interpreter for the key	Make sure that right key is down
156	Interpreter file is empty	Make sure that a bootstrap exists (by using MAKEBOOT on appropriate device)
157	Fixed disc error	Use MAKEBOOT write a new bootstrap
158	Floppy disc error	Use MAKEBOOT to write a new bootstrap
159	Malformed boot file	fixed disc drive EIO board
160	Checksum error in microcode	floppy disc drive EIO board
161	Checksum error in Q code	Use MAKEBOOT to write a new bootstrap
162	Bad interrupt	Use MAKEBOOT to write a new bootstrap
163	Unexpected disc interrupt	CPU board
164	Unexpected network interrupt	EIO board CPU board
165	Unexpected X80 output interrupt	EIO board CPU board
166	Unexpected video interrupt	CPU board Memory board
167	Unexpected Ethernet interrupt	CPU board EIO board
168	Unexpected memory parity error interrupt	Memory board CPU board

Once Q code has been successfully loaded SYSB increments the DDS to 198 and starts executing Q code.

## 2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
198	Q code interpreter not entered correctly	Use MAKEBOOT to write another bootstrap
	Once Q code initialisation has been carried out the display is incremented to 199 and control passed to the PERQ operating system initialisation routines.	
199	System not entered-calls or assignments did not work see note 1	
	Under control of POS initialisation routines:	
200	System entered, Init Memory to be called	see note 1
201	SAT and SIT pointers not set	see note 1
203	Stack segment number not set	see note 1
204	Reading boot block	see note 1
205	Setting system version number	see note 1
206	Setting head of free segment number list	see note 1
207	Setting first system segment number	see note 1
208	Setting system boot disc	see note 1
209	Setting system boot character	see note 1
210	Reading boot block	see note 1
211	Setting default heap segment number	see note 1
212	Setting first used segment number	see note 1
213	About to set free lists of data segments	see note 1
214	Setting free lists of data segments	see note 1
215	Allocating a segment number	see note 1
216	Temporary segment number allocated	see note 1
217	Reading to enter loop to find memory size	see note 1 CPU board Memory board
218	Exited from memory size loop	see note 1
219	Restoring mangled word	see note 1
220	Releasing temporary segment number	see note 1
221	Locating segment adjacent to the EIO segment	see note 1
222	Modifying the location of EIO segment	see note 1
223	Adjusting free memory	see note 1
224	Setting the free lists of data segments	see note 1
225	Setting the screen segment	see note 1
226	Allocating the header buffer for swapping	see note 1
227	Allocating the status buffer for swapping	see note 1
228	Swapping Allowed set to false	see note 1

## 2.3 POS Diagnostic display -continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
229	All boot loaded segments set Unswappable (if booted from floppy), Init Memory complete, ready to return to system	see note 1
230	Starting to increase number of segments allowed (because memory is larger than 1/4 megabyte)	see note 1
231	Changing maximum of SITSeg	see note 1
232	Changing size of SITSeg	see note 1
233	Changing maximum of SATSeg	see note 1
234	Changing size of SATSeg	see note 1
235	Creating new unallocated segment numbers	see note 1
236	Init Memory finished	see note 1
300	Calling init EIO	see note 1
301	Setting 'Key enable' to FALSE	see note 1
302	Allocating buffers	see note 1
303	Allocating buffers and setting some variables	see note 1
310	Initialising interrupt vectors	see note 1
320	Initialising device tables	see note 1
322	Initialising Ethernet	see note 1
325	Ethernet initialised	see note 1
330	Initialising screen, calling Init Tablet	see note 1
340	Initialising tablet, calling Init Cursor	see note 1
350	Initialising cursor	see note 1
360	Initialising Z80	see note 1
361	Interrupt now off; about to send device table to microcode	see note 1
363	Got control block for Z80 speech	see note 1
364	Setting up video registers	see note 1
365	Starting screen	see note 1
366	Got control blocks for keyboard, RS232 and GPIB	see note 1
368	Returning microcode	see note 1
369	Turning on interrupts	see note 1
370	Entering Locate Disk Heads, allocating buffers	see note 1
371	Moving disc heads to track 0	EIO board fixed disc drive
373	Track 0 bit not set	EIO board fixed disc drive
374	Setting current head position to cylinder 0	see note 1
375	Doing a dummy read from the fixed disc cylinder 0 sector 0	EIO board fixed disc drive
376	Disposing of buffers, calling Find Size	see note 1

Problem isolation

2.3 POS Diagnostic display - continued

<u>Display</u>	<u>Meaning of display</u>	<u>Possible faults</u>
380	Entering Find Size, allocating buffers	see note 1
381	Doing a 'DIAGREAD' to find size of rigid disc	EIO board fixed disc drive
382	Disc access attempt returned	EIO board disc drive
383	Completing Find Size, disposing of buffers	see note 1
390	Setting keyboard status buffer	see note 1
400	Could not pause	see note 1
410	Entering Init GPIB, allocating buffers	see note 1
411	Building first GPIB command	see note 1
412	Sending first command to 280	EIO board
413	Building second GPIB command	see note 1
414	Sending second command to 280	EIO board
415	Disposing of buffers, exiting Init GPIB	see note 1
420	Zeroing block	see note 1
499	Exiting INIT EIO, calling InitStream	see note 1
500	Failure in InitStream, calling PS Init	see note 1
600	Failure in PS Init	see note 1
700	Operating console, calling Init Exceptions	see note 1
800	Failure in Init Exceptions	see note 1
810	Setting system version number	see note 1
820	Reading time from 60 Hz clock	see note 1
822	Setting 60 Hz reference time	see note 1
824	Initialising Time Stamp value	see note 1
900	Calling PS Set up System	see note 1
950	PS Set Up System complete, enabling swapping	see note 1
951	Enabling swapping	see note 1
952	Enabling swapping	see note 1
999	System fully initialised, printing system title no faults line	no faults

Notes:

- 1 These failures are unlikely to be caused by hardware; they are most probably due to corrupt software.
- 2 DDS should not halt on these numbers during establishment, they occur only when VFY is being used as a test program

## 2.4 PMX Diagnostic display - continued

<u>Display</u>	<u>Next event/failure</u>	<u>Possible faults</u>
014	Counldn't read disc	Disc drive EIO board Memory board
015	<u>Boot from floppy</u> Unexpected interrupt while reading floppy	EIO board
016	Unexpected disc interrupt while reading floppy	CPU board
017	Unexpected network interrupt while reading floppy	EIO board
018	Unexpected Z80 output interrupt while reading floppy	CPU board
019	Unexpected video interrupt while reading floppy	EIO board CPU board EIO board
020	Unexpected 3 Hz Ethernet interrupt while reading floppy	Memory board CPU board
021	Unexpected memory parity interrupt while reading floppy	EIO board CPU board EIO board Memory board CPU board
	Having successfully loaded code from either the floppy or fixed disc the Boot PROM increments the DDS until it reaches 029 and then passes control to VFY	
	<u>VFY</u>	
029	Disable the Boot PROM	CPU board
030	Bump the DDS up to 50	CPU board
050	Error reporting mechanism in VFY has not worked	CPU board
051	Stack empty bit in USTATE register not set after a Stack reset	CPU board
052	Could not load TOS or Bit 0 not working	CPU board
053	Could not push a value or bit 1 not working	CPU board
054	Stack empty bit stills et after a push	CPU board
055	One of bits 2 to 14 working	CPU board
056	Stack empty bit set after only 15 pushes	CPU board
057	Bit 15 not working	CPU board
058	Stack empty bit not set after 16 pushes	CPU board
059	Error reporting mechanism in VFY not working	CPU board
060	Data error after Pop. Bit 14	CPU board
061	Data error after Pop. Bit 13	CPU board
062	Data error after Pop. Bit 12	CPU board
063	Data error after Pop. Bit 11	CPU board
064	Data error after Pop. Bit 10	CPU board
065	Data error after Pop. Bit 9	CPU board
066	Data error after Pop. Bit 8	CPU board
067	Data error after Pop. Bit 7	CPU board
068	Data error after Pop. Bit 6	CPU board
069	Data error after Pop. Bit 5	CPU board
070	Data error after Pop. Bit 4	CPU board
071	Data error after Pop. Bit 3	CPU board
072	Data error after Pop. Bit 2	CPU board
073	Stack empty bit set after only 13 Pops	CPU board
074	Data error after Pop. Bit 1	CPU board
075	Data error after Pop. Bit 0	CPU board
076	Empty bit not set after 15 Pops	CPU board
077	2910 call stack failure	CPU board
078	Odd didn't jump on a 1	CPU board
079	Off jumped on a 0	CPU board
080	Byte sign didn't jump on 200	CPU board
081	Byte sign jumped on 0	CPU board
082	C19 didn't jump when it should have	CPU board
083	BPC[3] didn't jump when it should have	CPU board
084	C19 jumped when it shouldn't have	CPU board
085	BPC[3] jumped when it shouldn't have	CPU board
086	GTR didn't jump when it should have	CPU board
087	GTR jumped when it shouldn't have	CPU board
088	GEO didn't jump when it should have	CPU board
089	GEO jumped when it shouldn't have	CPU board
090	LSS didn't jump when it should have	CPU board
091	LSS jumped when it shouldn't have	CPU board
092	LEQ didn't jump when it should have	CPU board

## Problem isolation

### 2.4 PNX Diagnostic display - continued

<u>Display</u>	<u>Next event/failure</u>	<u>Possible faults</u>
156	No system	Wrong button pressed during booting
157	Fixed disc error	Fixed disc
158	Floppy read error	Floppy disc
160	Checksum error in microcode	Microcode file
161	Checksum error in C-code	PNX file
162 to 168	Bad channel interrupts	Processor
180	Floppy seek error	Floppy disc
255	Loading successfully completed	None

#### Note 1

These failures are unlikely to be caused by hardware. It is much more likely that the software has for some reason been corrupted. Try to cure the fault by booting from a boot floppy and then recreating the fixed disc bootstrap.

## Problem isolation

### 2.6 POS Login

#### Name or password rejection

This information will help you to:

- Check or alter user names and passwords
- Recreate malformed or not found profile files
- Reload missing system files

#### User names and passwords

The following steps will allow you to check or alter user names and passwords. If the default name is not accepted, reload the missing system file first.

Load the system, enter date and time.

Press the return key when prompted for a name.

This logs into the system under the name guest in partition user.

List the names known to the system with the command

USERCONTROL LIST

Add a new user name to the list with the command

ADDUSER username

A command to add a user already listed allows the password to be updated.

Pressing the return key when prompted will enter a null password.

To update a password type

ADDUSER username/PAS

Useful information about USERCONTROL is provided by HELP.

#### Malformed profile files

Malformed profile files prevent logging in to the system.

The following steps will allow you to form malformed or not found profile files.

Load the system. Press the return key when prompted for a name. This logs into the system with the name guest in partition user.

EDIT my profile

To examine and note the contents of my profile file. See section 5.1.3 for use of the EDITOR utility.

Delete the malformed profile file with the command

DELETE my profile

Create a new profile file with your name by copying the default profile file.

COPY SYS:BOOT>DEFAULT.PROFILE SYS:USER>mydir>my profile file

## **Entry to the problem**

## **Isolating the problem**

**3**

## **Functional diagrams**

### **Overview**

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### **Technical notes**

## Functional drawings

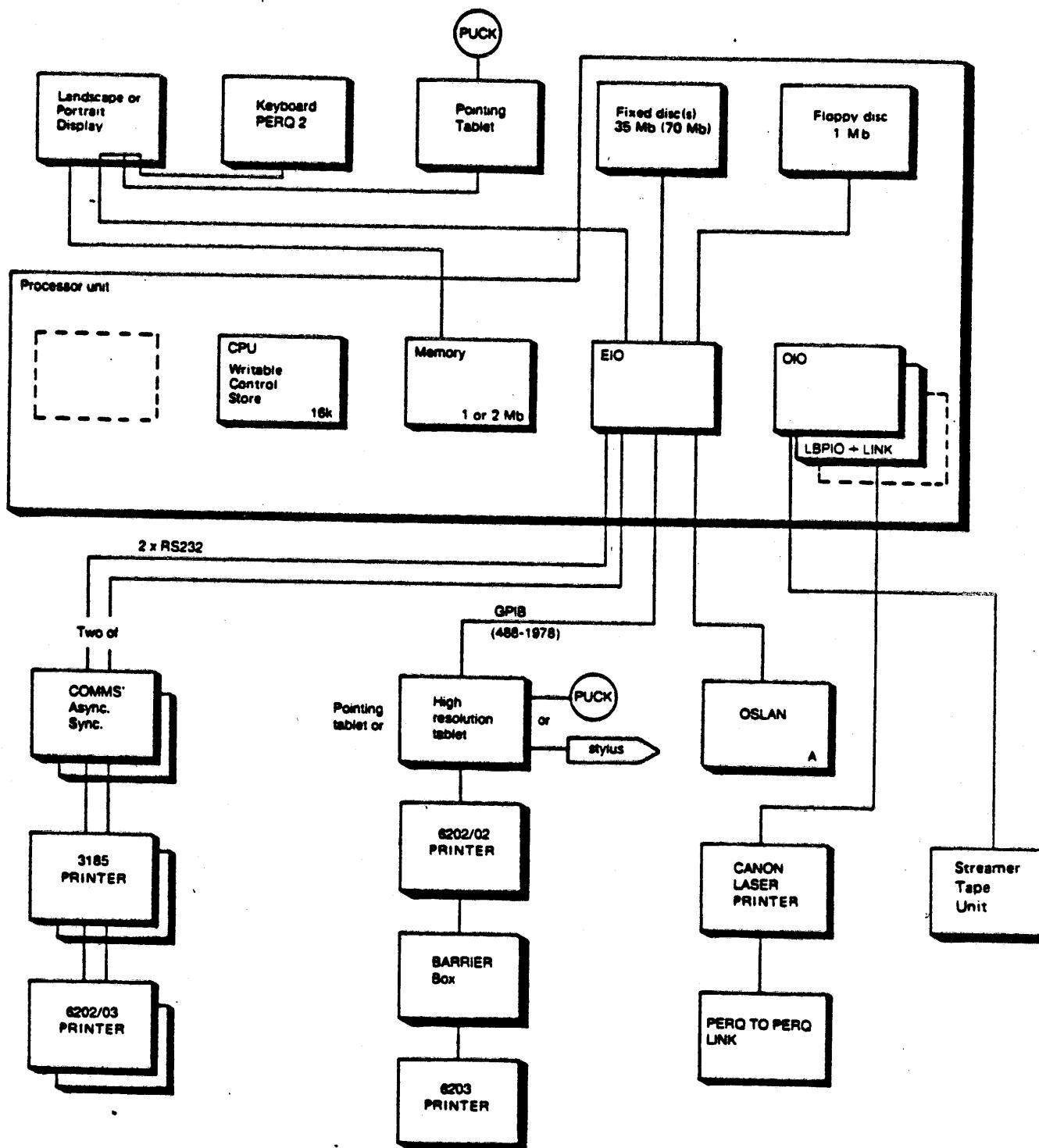
### 3.1 PERQ2 system

#### 3.1.1 Configuration capability

The diagram shows the configuration capability of a typical PERQ2 system. Options are available for displays, fixed disc capacity, printers and other peripherals.

See 4.1 and 4.2 for an overview.

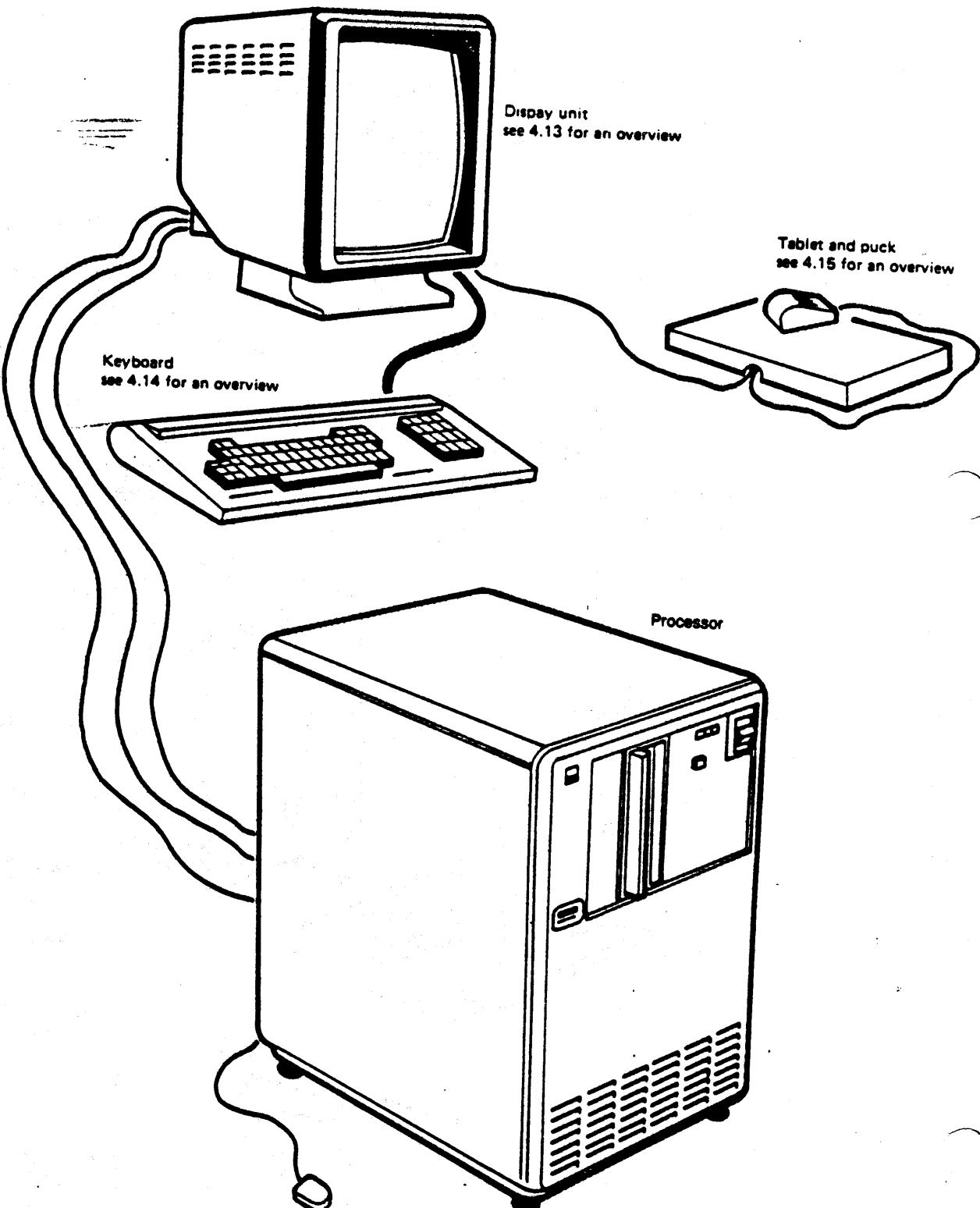
See 6.1 for type and feature numbers for T1 and T2 systems.



### 3.1 PERQ2 System

#### 3.1.2 PERQ2 system basic equipment

The drawing shows the physically separate units of the basic PERQ2 system. The display can be portrait or landscape depending upon system requirement. The tablet and associated puck can be portrait or landscape, whichever is appropriate.



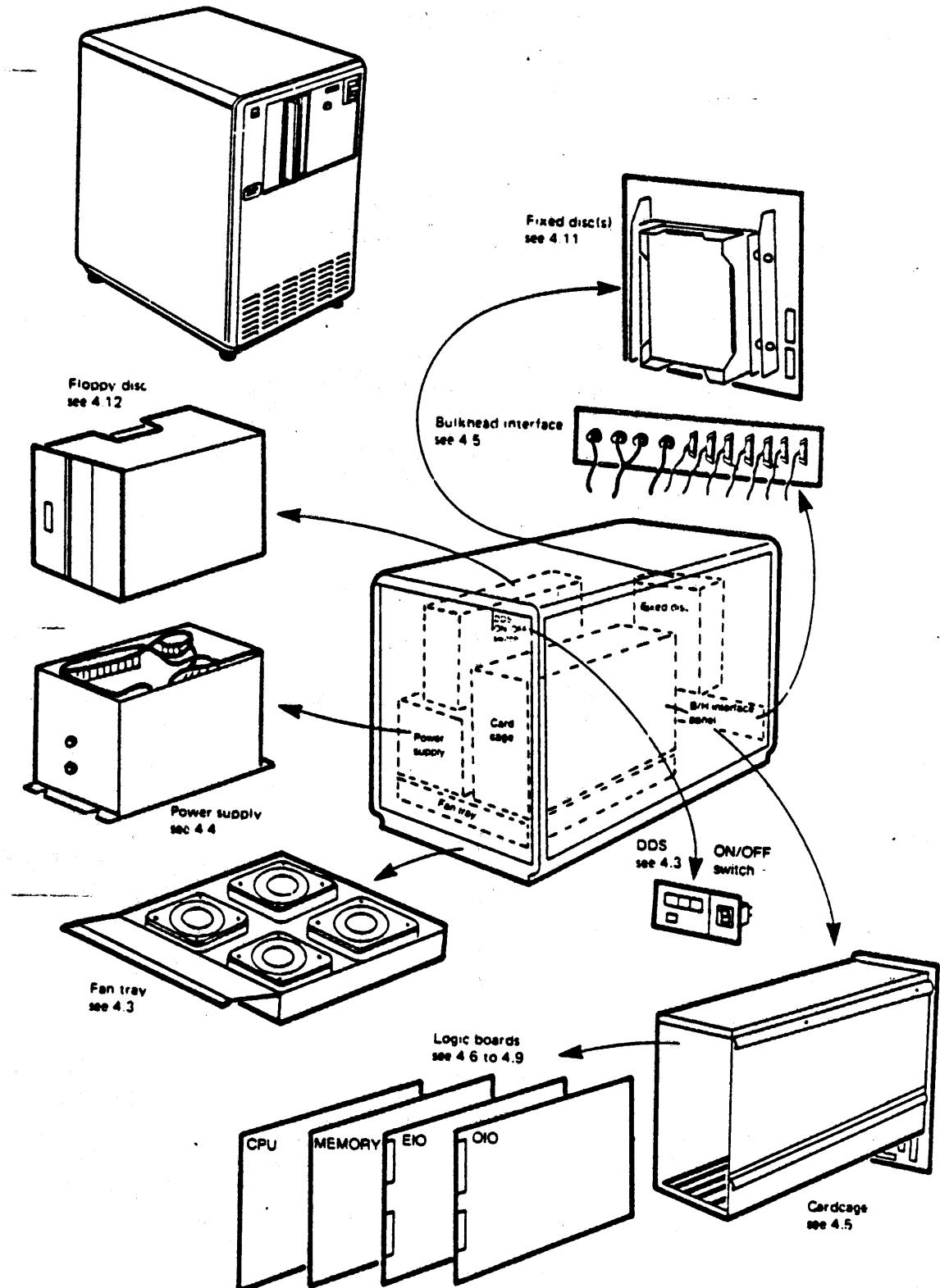
## Functional drawings

### 3.1 PERO2 system

#### 3.1.3 Processor unit assemblies

The drawing shows the layout of the major assemblies housed within the PERO2 processor unit covers. Note that T1 version is fitted with 1 x 8 inch fixed disc and T2 version may have 1 or 2 x 5.25 inch fixed discs, depending upon system requirement.

The references are to an overview of these units:



### 3.1 PERQ2 system

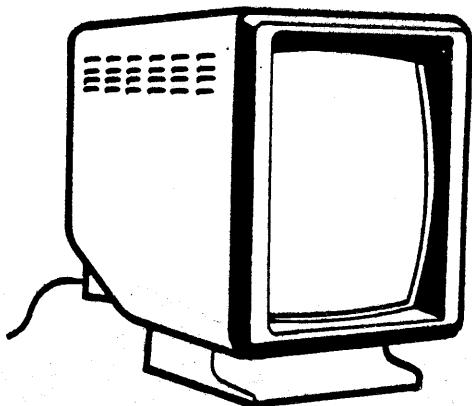
#### 3.1.4 Display types

Two types of display are available for the PERQ2 system. The display can be the standard portrait unit, or the landscape unit. Some display units may be fitted with an integral psu and will therefore need to be connected to the AC mains electricity supply.

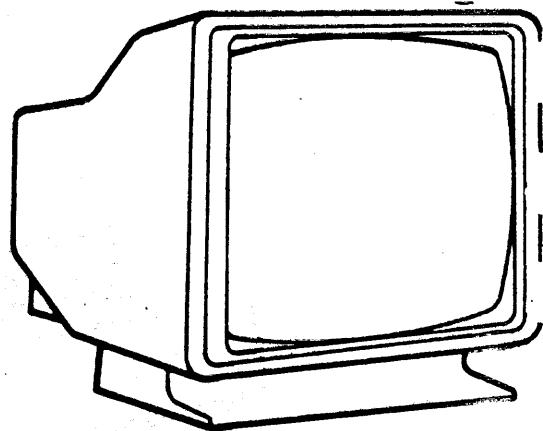
See 7.10 for replacement information.

The physical dimensions of the screens are about:

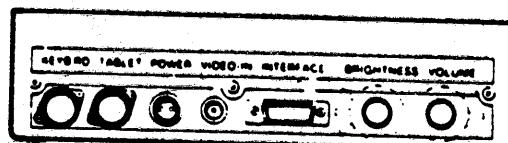
- Portrait; 250mm wide; 330mm high
- Landscape; 430mm wide; 330mm high



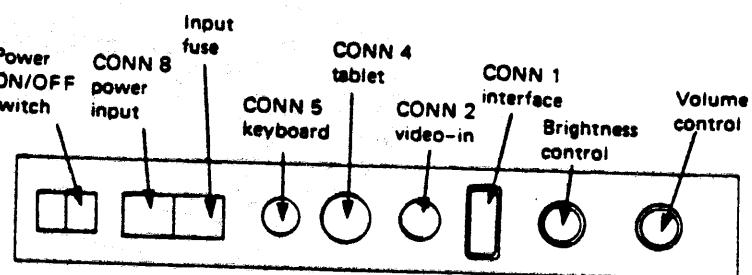
Portrait display 15 inch



Landscape display 20 inch



Interface panel for dc powered units



Interface panel for ac mains powered units

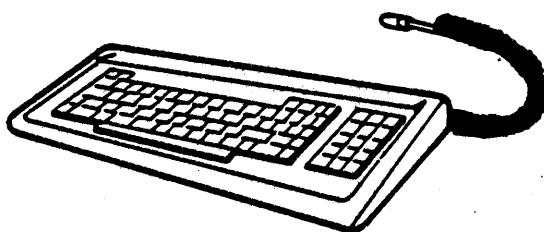
## Functional drawings

### 3.1 PERQ system

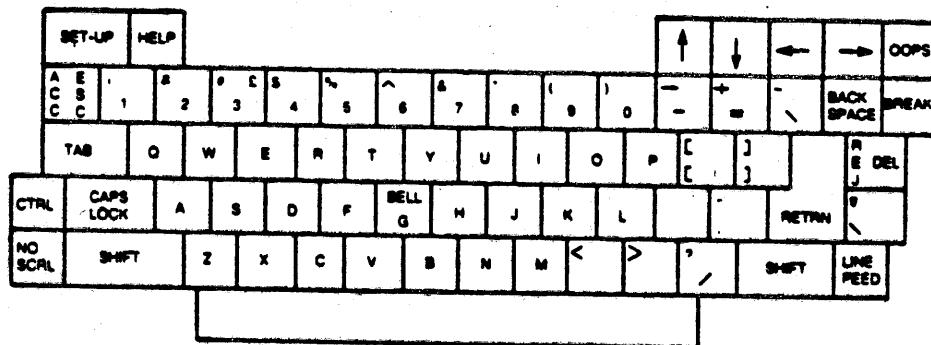
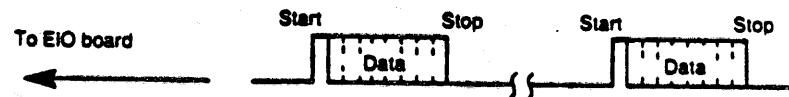
#### 3.1.5 Keyboard unit

The keyboard unit consists of an 85-way alphanumeric keyboard contained in a housing. An interface cable connects the keyboard unit to the display unit.

See 7.11 for replacement information.



8 data bits  
no parity, 300 baud



PF1	PF2	PF3	PF4
7	8	9	—
4	5	6	
1	2	3	ENTER
0			

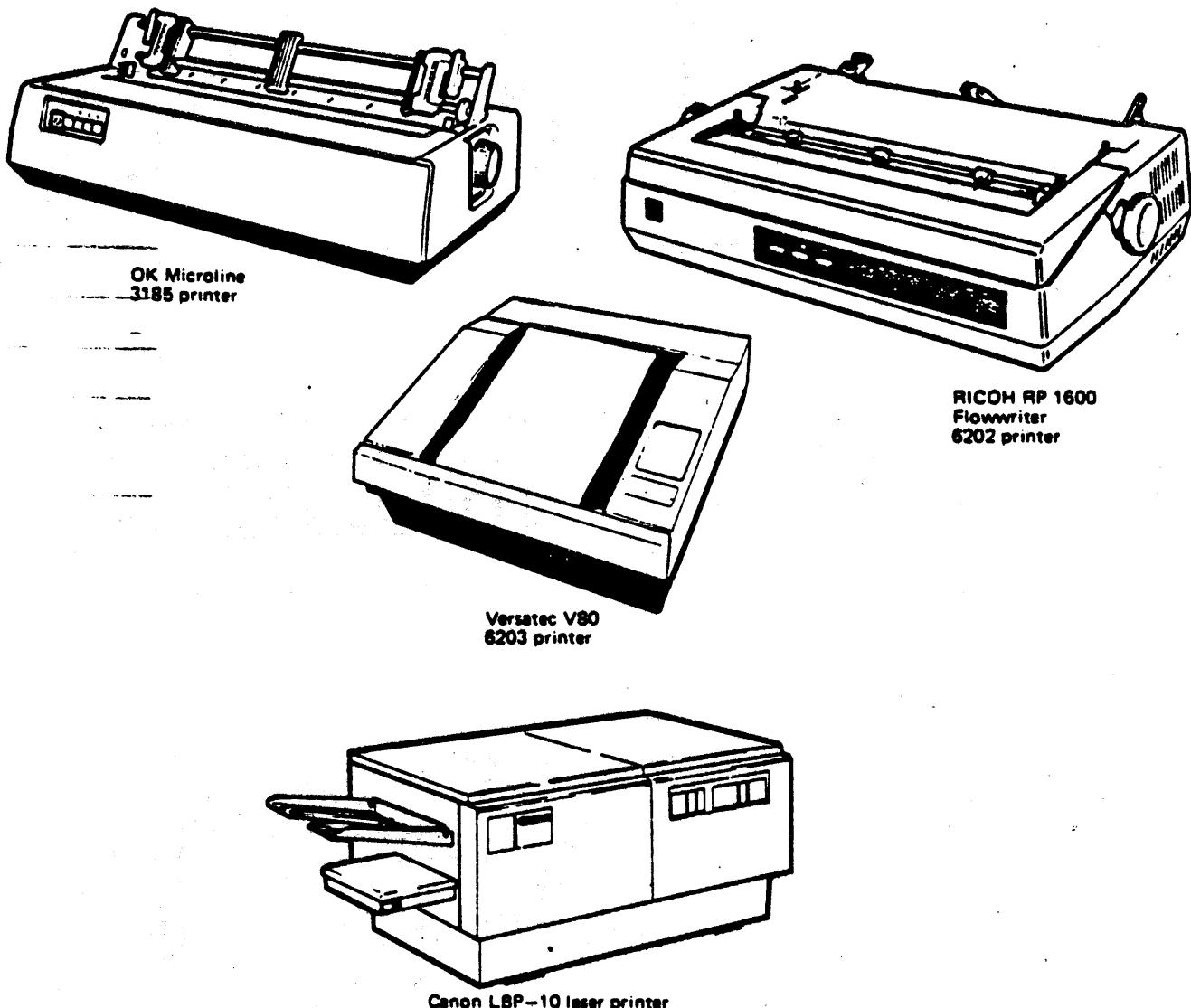
3.1 PERQ2 system

3.1.7 Printer options

The PERQ2 system has provision for the connection of several printer options:

- ICL3185
- ICL6202
- ICL6203
- CANON LBP-10

Printers normally interface via the EIO board in the processor cabinet. The exception to this is the CANON LBP-10 laser printer; this printer interfaces via the OIO board which is also contained in the processor cabinet.



## **Entry to the problem**

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This section contains a brief description of the system units and their major functions: The content is presented in terms of replaceable items, where applicable, and expands the diagrams in section 3.

Section    Heading

- 4.1              **Introduction**
- 4.1.1             **General information on PERQ2**
- 4.2              **System units**
- 4.2.1             **System appreciation**
- 4.2.2             **System hardware mains units**
- 4.3              **Power distribution**
- 4.3.1             **System AC supply**
- 4.3.2             **DC power**
- 4.4              **Power units**
- 4.4.1             **General information on PSUs**
- 4.5              **Motherboard and interfaces**
- 4.5.1             **General information on motherboards**
- 4.6              **CPU board**
- 4.6.1             **General information on CPU board**
- 4.7              **Memory board**
- 4.7.1             **General information on memory board**
- 4.8              **OIO board**
- 4.8.1             **General information on OIO board**
- 4.9              **EIO board**
- 4.9.1             **General information on EIO board**
- 4.10             **Link board**
- 4.10.1           **General information on link board**
- 4.11             **Fixed disc drives**
- 4.11.1           **The Micropolis 8 inch 35 megabyte drive of PERQ2 T1**
- 4.11.2           **The Micropolis 5.25 inch drive of PERQ2 T2**
- 4.12             **Floppy disc drive**
- 4.12.1           **General information on floppy disc drive**
- 4.13             **Display units**
- 4.13.1           **General information on display units**
- 4.14             **PERQ2 keyboard unit**
- 4.14.1           **General information on keyboard unit**
- 4.15             **Tablet units**
- 4.15.1           **High resolution graphics tablet**
- 4.15.2           **Standard or pointing tablet**
- 4.16             **Optional printers**
- 4.16.1           **General information on optional printers**

4.17 RS232 Communications

4.17.1 General information on RS232 communications

4.18 OSLAN

4.18.1 OSLAN concept

4.18.2 OSLAN hardware

4.19 Operating systems

4.19.1 POS operating system: general information

4.19.2 PNX operating system: general information

4.20 POS memory organisation

4.20.1 General information on POS memory organisation

4.21 POS filestore

4.21.1 General information on POS filestore

4.22 POS system load

4.22.1 General information on POS system load

4.23 PNX system load

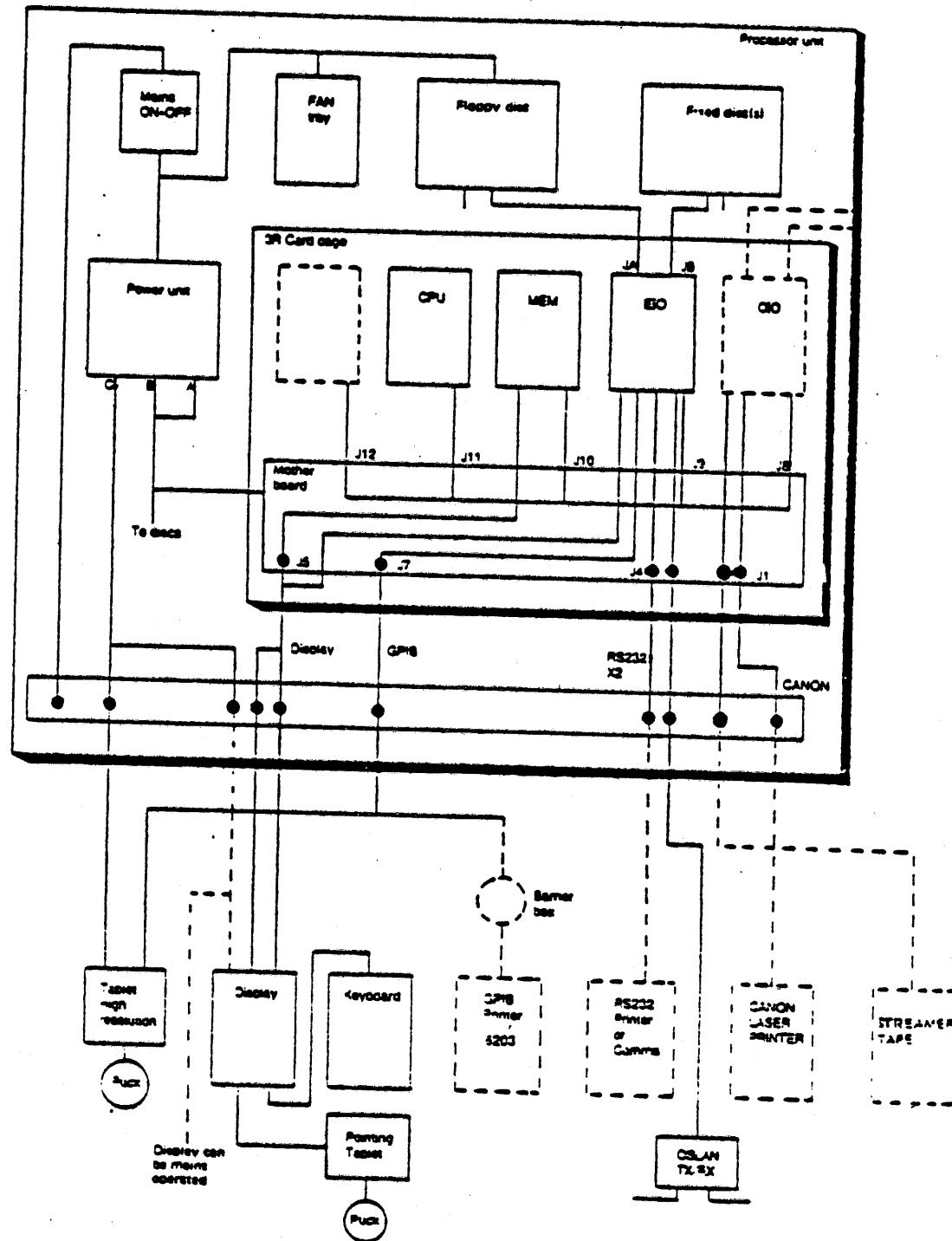
4.23.1 General information on PNX system load

**Overview**

**PAGE RESERVED**

## 4.1 Introduction

## 4.1.1 General information on PERO2



## **Overview**

### **4.1 Introduction**

#### **4.1.1 Continued**

The ICL PERQ2 is a complete single-user computer system with a powerful processor and high resolution graphics. PERQ2 offers increased storage, greater connectivity, higher reliability and improved software. A choice of portrait or landscape display is available.

The system satisfies the needs of scientists and engineers whose work requires a combination of dedicated processing power and interactive graphic facilities.

The product is subject to continuous development and additional facilities will be introduced from time to time. The following summary of features reflects the plans for PERQ2 systems.

The hardware will include:

- high resolution graphics displays
- up to two megabytes of memory
- fast microprogrammed processors
- pointing and graphics tablets
- keyboards
- 35 or 70 megabytes fixed disc drives
- floppy disc drive
- printer options
- communications connection
- open system local area network connection
- system extension for second fixed disc drive, streaming cartridge tape and distributed array processor

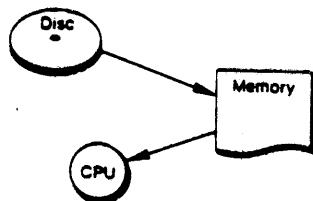
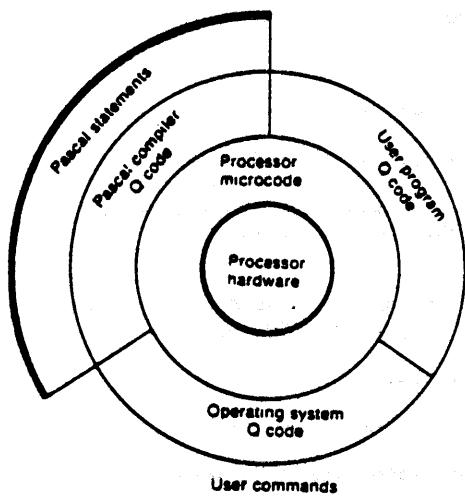
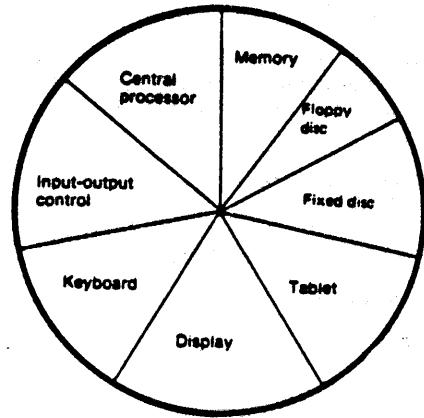
The diagram in section 4.1.1 identifies the main assemblies forming a typical PERQ2 system.

The software will include:

- the PERQ operating system and utility programs
- the PNX operating system based on UNIX
- PASCAL and FORTRAN compilers
- IBM 2780/3780 emulation

## 4.2 System units

### 4.2.1 System appreciation



## Overview

### 4.2 System units

#### 4.2.1 Continued

The ICL PERQ system consists of hardware, firmware and software units which together form a complete system. This service guide is primarily concerned with the replacement of parts of the hardware. However, an appreciation of all the units forming the system is needed.

The user is concerned with the generation, storage and control of programs and data. The system is designed to meet the users needs and is best appreciated from that viewpoint. The diagram in section 4.2.1 will facilitate understanding of the complete system when reference is being made to this section.

#### Program generation and execution

The user writes programs in high level languages, and his statements are compiled to generate an intermediate level code. This intermediate level code is not executed directly, but makes entries to sequences of micro-instructions which the central processor hardware executes.

There are two separate operating systems. These are:

- POS or PERQ operating system
- PNX a version of UNIX

The POS systems intermediate level instructions are in Q code.

The PNX systems intermediate level instructions are in C code.

#### Program and data storage

The user's programs and data are stored in the filestore or in the memory subsystems. The filestore provides permanent storage for all information available to the system. The memory provides temporary storage for copies of filed information during program execution.

#### Input-output

A visual display, keyboard and graphics tablet allow interactive data input and output.

The operating system provides the user with a command level interface. It organises the movement of data and program execution in response to the user's commands. The movement of information between the system units is supported by the processor input-output hardware.

#### 4.2 System units

##### 4.2.2 System hardware main units

The ICL PERQ system hardware consists of the following physically separate main units:

- processor cabinet
- display unit
- keyboard unit
- tablet unit
- Optional printers

##### **Processor assemblies**

The processor unit consists of the following major assemblies:

- frame with cable harness and fans
- power supply unit
- fixed disc drive(s)
- floppy disc drive
- the card cage assembly containing printed circuit boards: mother board, processor, memory, and input-output

#### 4.3 Power distribution

The diagram in section 4.3.1 shows PERQ2 TI power distribution.

##### 4.3.1 System Ac supply

###### **General information**

The PERQ2 system is manufactured for connection to one of the following supplies:

- 240 volts 50-60 hertz
- 120 volts 60 hertz

Connection in Britain will normally be to 240V through standard 13 ampere fused plugs.

###### **Processor AC supply**

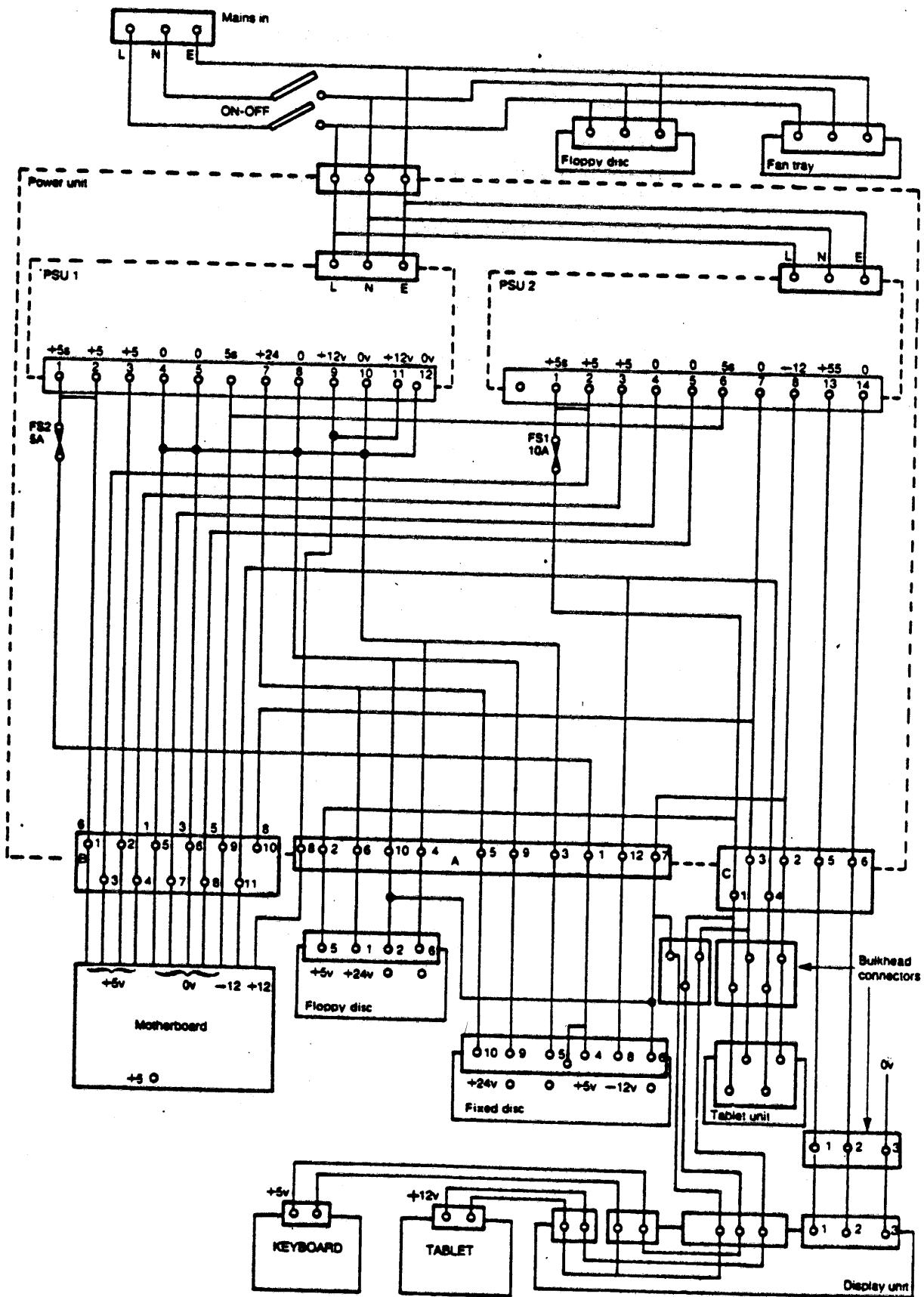
This is routed through a connector on the bulkhead and the ON-OFF isolator switch at the front of the cabinet.

###### **Power ON-OFF**

The ON-OFF isolator switch supplies mains power to the:

- fan tray
- power supply unit
- floppy disc drive

## 4.3 Power distribution

4.3.1 Continued

#### 4.3.2 DC power

##### Distribution

The power supply unit provides DC power to the:

- card cage mother board
- fixed disc drive(s)
- floppy disc drive
- bulkhead interface panel for the keyboard unit, display unit and either or both tablet unit
- DDS unit at the front of the cabinet
- Monitors without integral psu

##### Card cage power

The mother board is supplied with:

- +5 volts
- +12 volts
- 12 volts

## Overview

### 4.3 Power distribution

#### 4.3.2 Continued

##### Fixed disc power

T1 the drive and adaptor board are supplied with DC power through drive connector J3 at +24, +5 and -12 volts.

T2 separate connectors carry power to the adaptor board and the drive.

Drive	Adaptor
+5V @ 1A	+5V @ 2A
+12V @ 3A	-12V @ 0.125A

##### Floppy disc power

The drive is supplied with DC power through drive connector J5.

+24 volts

+5 volts (fused)

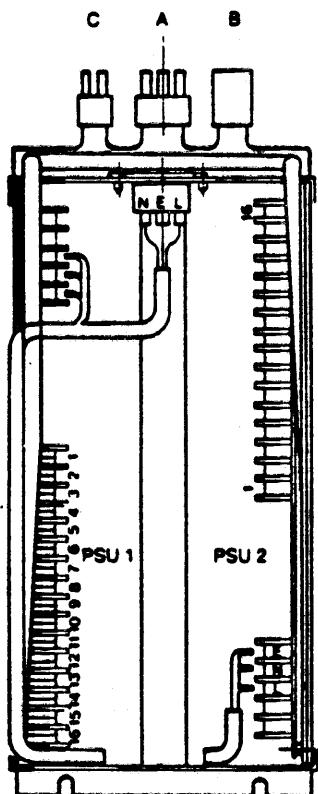
##### Bulkhead interface power

The processor power supply unit provides power for the:

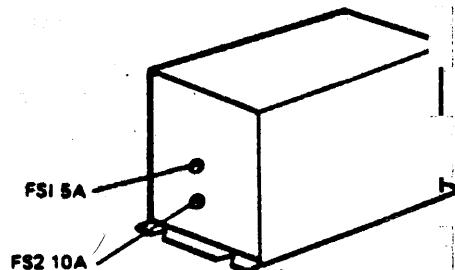
- keyboard unit +5 Volts (fused)
- display unit +55 Volts (except displays with an integral psu). Kriz type monitors will require 24V in lieu of 55V
- high resolution graphics tablet;  
+12 Volts  
+5 Volts (fused)  
-12 Volts
- standard tablet +12 Volts (T2 fused by PS3 on the power supply unit)

#### 4.4 Power unit

##### 4.4.1 General information on PSUs



**80019515**  
T1 Power unit  
DO NOT ADJUST  
8222/xx systems only



**80019835**

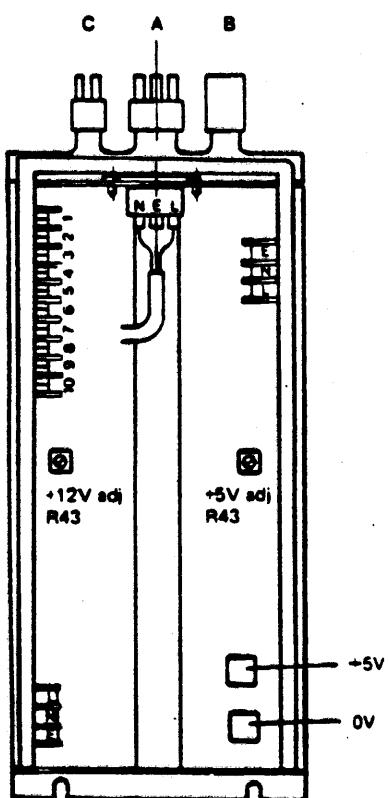
PSU 1

1	+5V sense
2	+5V
3	+5V
4	0V
5	0V
6	0V(+5V sense)
7	+24V
8	0V
9	+12V
10	0V
11	+12V
12	0V
13	+5V
14	0V
15	+5V
16	0V

**80019836**

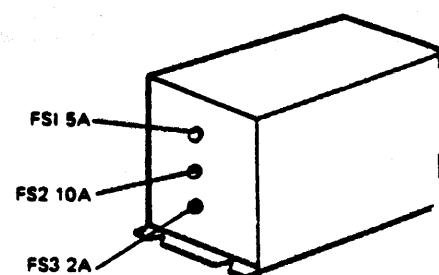
PSU 2

1	+5V sense
2	+5V
3	+5V
4	0V
5	0V
6	0V(+5V sense)
7	0V
8	-12V
9	0V
10	+5V
11	0V
12	-12V
13	+55V
14	0V
15	+5V
16	0V



**7734940**  
T2 Power unit  
8223/xx systems only

1	+55V
2	0V
3	+24V
4	0V
5	0V
6	-12V
7	Sense return
8	0V
9	+12V
10	+Sense



## **Overview**

### **4.4 Power unit**

#### **4.4.1 Continued**

The processor power supply unit supplies DC power to:

- The logic circuits in the card cage
- The keyboard unit
- The display unit, when it is not fitted with an integral power supply
- The DDS
- The fixed disc drive
- The floppy disc drive
- The High Resolution tablet and/or the standard or landscape tablet
- The OSLAN transceiver unit

The unit consists of two power supplies, with connectors, mounted to form a single exchangeable unit. The diagram in section 4.4.1 is of a typical PERQ2 T1 psu containing two sub-assemblies.

#### **CAUTION**

T1 and T2 power supply units are not interchangeable.

#### **CAUTION T1**

The +5 volt outputs on the T1 dual supplies are joined and balanced by a workshop technique. Do not attempt to adjust or replace on site

Dual psu's are identified as PSU1 and PSU2. Inputs and outputs are through terminals to plugs and sockets. Separately fused +5 volts supplies are provided for:

- the fixed disc(s) PS2 10A
- the floppy disc, DDS, tablet, and keyboard PS1 5A

T2 units have a separately fused +12 volt supply for the KRI2 tablet. PS3 2A

The unit identified as PSU1 provides:

T1	T2
----	----

+5V @ 35A	+5V @ 70A
+24V @ 4A	
+12V @ 0.2A	

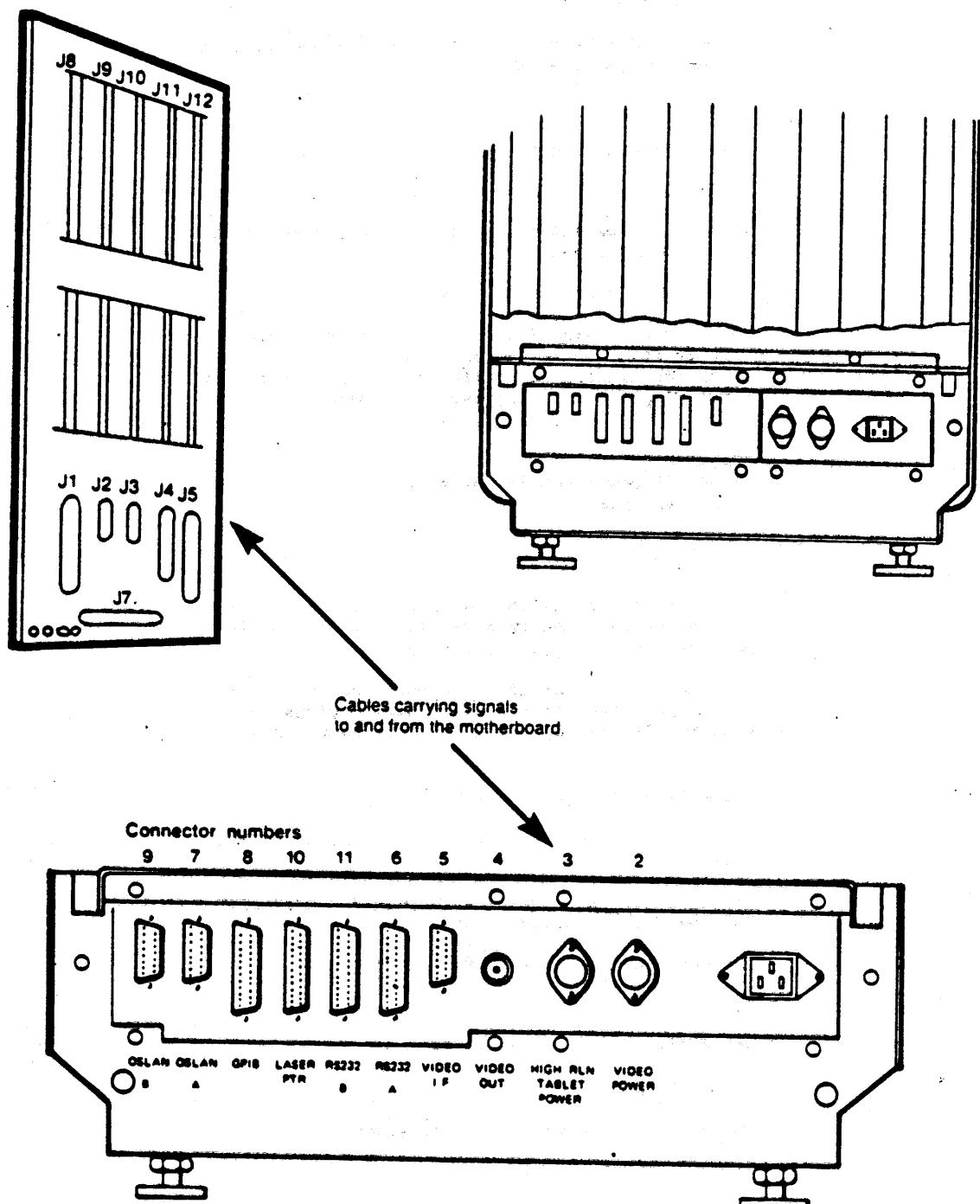
The unit identified as PSU2 provides:

T1	T2
----	----

+5V @ 35A	+12V @ 10A
-12V @ 2A	-12V @ 3A
+55V @ 1.5A	+24V @ 5A
	+55V @ 1.5A

#### 4.5 Motherboard and interfaces

##### 4.5.1 General information on motherboard



## Overview

### 4.5 Motherboard and interfaces

#### 4.5.1 Continued

The mother printed circuit board at the back of the card cage provides for signal interconnection and distribution between:

- The CPU board; connector J11
- The memory board; connector J10
- The EIO board; connector J9
- The OIO or link board; connector J8

The diagram in section 4.5.1 identifies the motherboard connectors and the bulkhead interface panels for TI systems

The mother board also has interface connectors for:

- The display unit
- A general purpose instrumentation bus (GPIB)  
This is used for the high resolution tablet unit and optional printers
- A RS232 interface  
This is used for optional printers and communications. PERQ2 uses the keyboard connector for a second RS232 interface
- A OIO connector  
This is used for OSLAN and the Laser printer connection

The PERQ2 system units plug into the bulkhead interface panel to which the mother board interface connectors and some board connector pins are extended.

Signals to fixed and floppy discs pass through off-card connectors on the I/O or EIO PCB.

PERQ to PERQ link signals are passed through off-card connections on the OIO or Link boards.

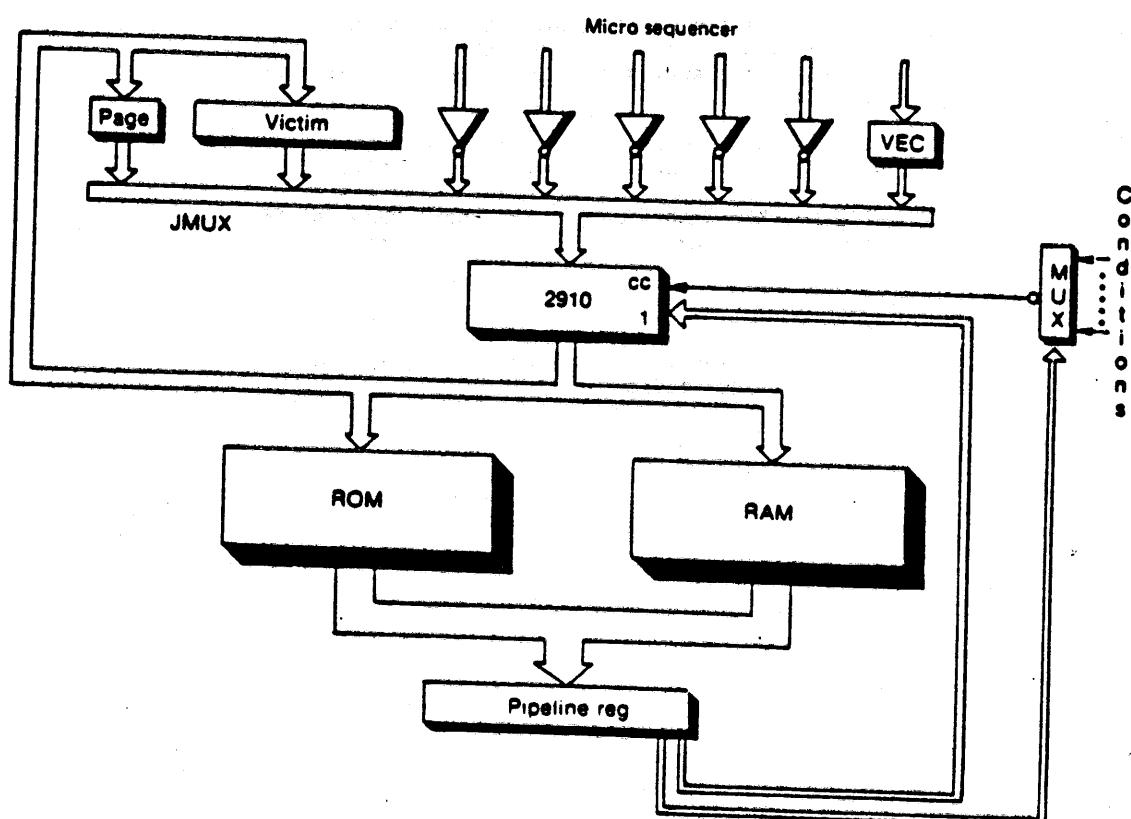
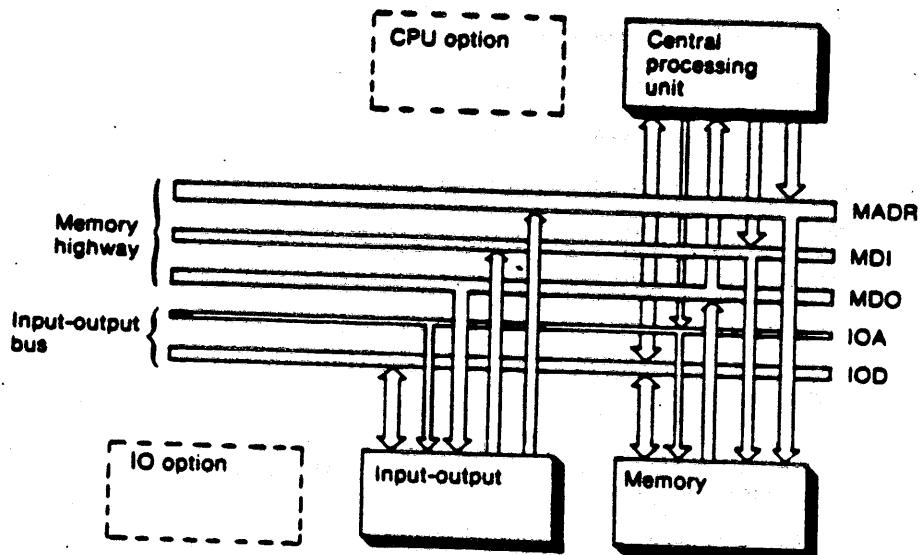
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#### Bulkhead interface

This panel provides the interface for the various PERQ2 configurations.

## 4.6 CPU board

### 4.6.1 General information on CPU board



## **Overview**

### **4.6 CPU boards**

#### **4.6.1 Continued**

The Central processing unit single printed circuit board is a 16-bit wide, 170 nanosecond instruction time microprogrammed device.

The microcode executes C or Q code. The instructions are single byte instructions followed by up to 4 bytes of parameters.

#### **Control store**

The 48-bit micro-instructions are held in the control store. This store consists of:

- Read only memory (ROM) holding instructions used during the first phase of system establishment and then disable
- Random access memory (RAM) loaded during system establishment

This version of the CPU board has a control store of 16K 48-bit words.

The two diagrams in section 4.6.1 show the general layout and operation of a CPU board

#### **Micro-sequencer**

The control store address is generated by a complex single-chip micro-sequencer incorporating a 5-level call stack. Inputs are jump parameters, interrupts, and operands.

The micro-sequencer allows the execution of a micro-instruction while fetching the next micro-instruction from the control store.

#### **Micro-instruction**

Addressed micro-instructions are buffered in a 48-bit micro-instruction register from which the various fields control operand selection, mill function, jump conditions and memory access.

Single instructions combine arithmetic or logical operations with memory access and conditional jumps.

#### **Extension bits**

The CPU basically handles 16-bit words but four extension bits are employed within the engine for simplification of multi-length operations and the generation of 20-bit memory addresses.

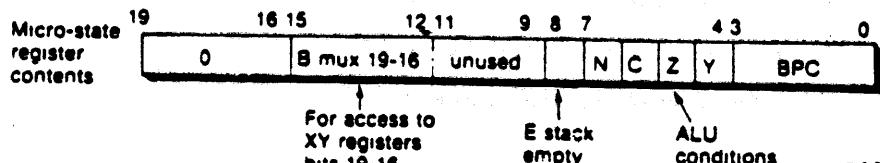
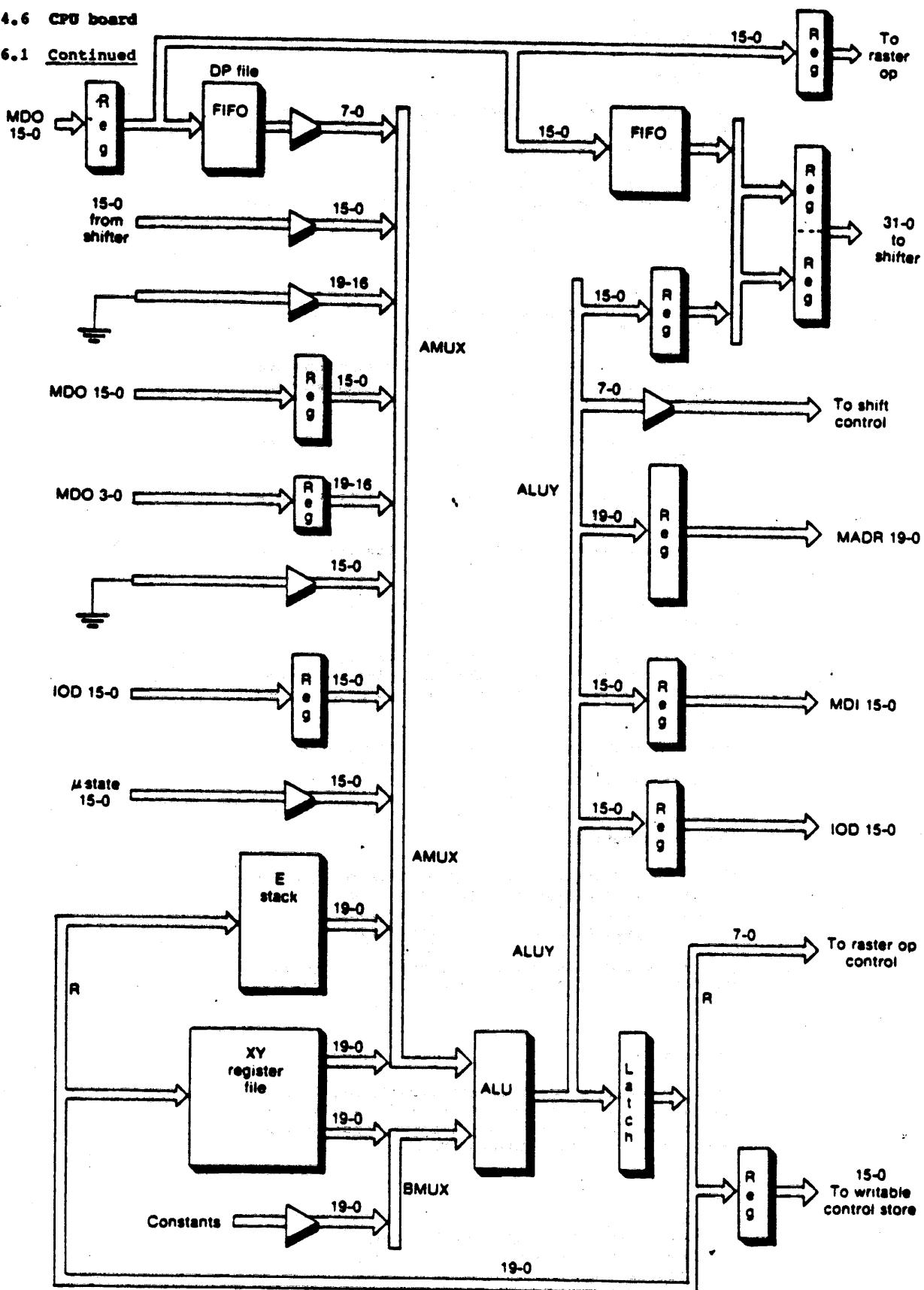
#### **ALU**

The 17-function 20-bit arithmetic logic unit produces micro-instruction results which are buffered for use as:

- Memory address and data in
- Input-output bus address and data
- Source operand register input

## 4.6 CPU board

## 4.6.1 Continued



## Overview

### 4.6 CPU board

#### 4.6.1 Continued

##### A and B multiplexors

Distributed multiplexors select operands for the ALU from:

- The memory
- The I/O Bus
- The CPU internal hardware

##### XY registers

The XY Registers provide general working registers and local storage for certain Q or C code registers. There are 256, 20-bit registers, any two of which may be addressed simultaneously from the X and Y fields of a micro-instruction.

Registers addressed from the X field are available to the A input of the ALU and registers addressed from the Y field are available to the B input of the ALU. The XY registers are loaded with selected ALU results.

##### Expression stack

A push-down pop-up Z (expression) stack holds up to 16 20-bit items providing efficient local storage for partial results. The expression stack is loaded with selected ALU results which are then available to the A side of the ALU.

##### OP registers

The operation registers are loaded from memory with eight Q or C code bytes. The eight bytes are addressed sequentially by a 4-bit byte position counter (BPC), and made available to the A side of the ALU. The most significant bit of BPC indicates that the OP register needs refilling and is employed by the microcode as a jump condition.

The first byte of each Q or C code instruction is used by the micro-sequencer to form the start address of the microcode that executes it.

##### Raster OP

The Raster operation (Raster Op) function is supported by special hardware. The function manipulates, on bit boundaries, areas of the memory holding the display screen areas (Windows).

Part of this hardware also allows the manipulation of ALU results. Items of 16-bits may be shifted left or right 0 to 15 positions and masked within one micro-instruction time of 170 nS.

##### Micro state register

The micro state register allows the transfer of CPU status and extension bits value to the memory.

PAGE RESERVED

**4.6 CPU board**

**4.6.1 Continued**

**Memory access**

Micro-instructions control CPU access to the memory allowing:

- The Storage of 1, 2 or 4 16-bit words
- The Fetching of 1, 2 or 4 16-bit words

These words may be accessed in forward or reverse order (MADR:MDI:MDO).

Timing for the transfer, and CPU use of multiple 16-bit words, requires the provision of only single word buffers within the CPU for memory data in and out.

**I/O data bus**

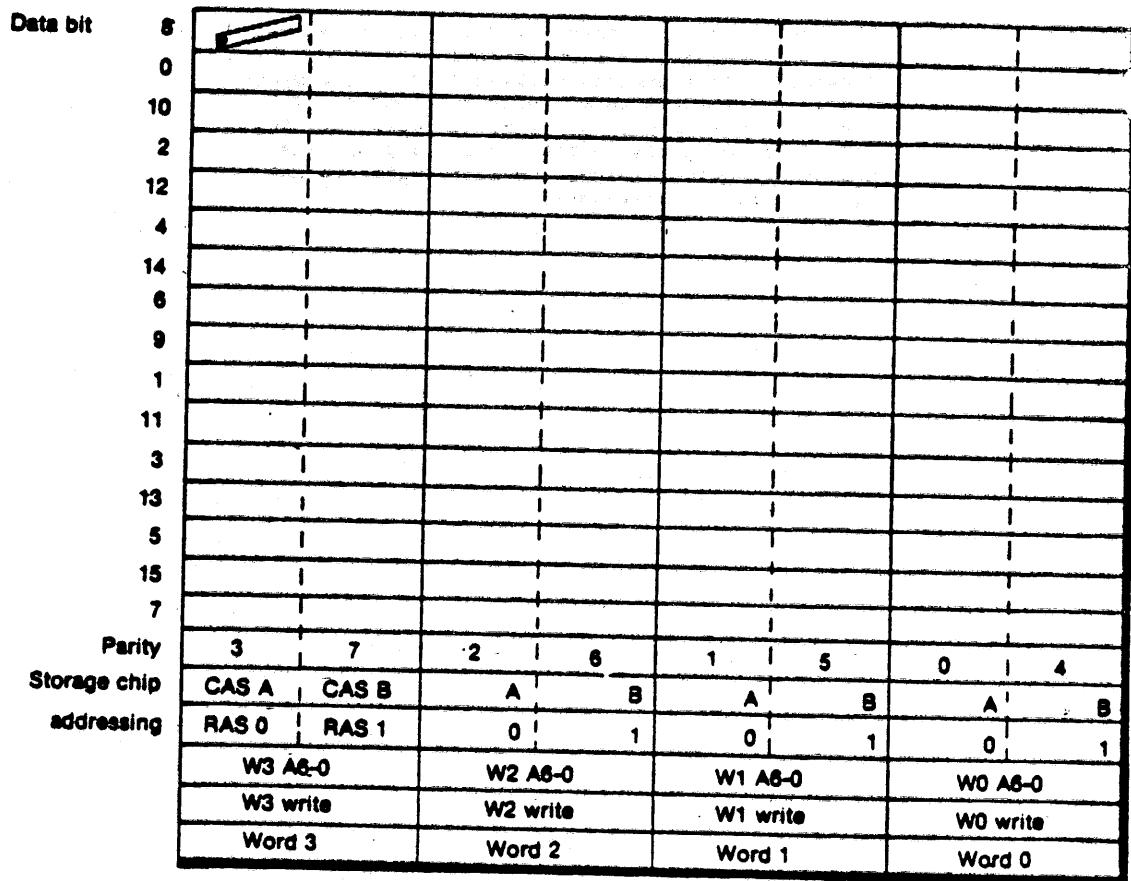
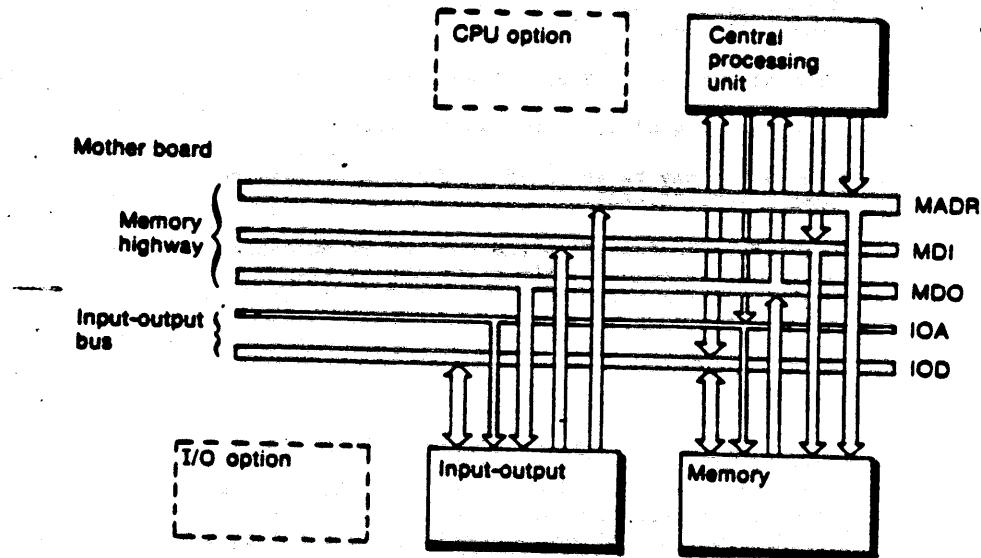
Communication with the input-output subsystem is by means of the 16-bit bi-directional I/O data bus (IOD). Data read from the bus is available to the A side of the ALU. The ALU result is buffered for transfer to I/O and memory boards through the bus.

**Interrupts**

The memory and I/O boards send interrupt requests to the CPU when they require attention. The requests remain pending until polled by the micro-program. Each interrupt causes a unique value (vector) to be input to the micro-sequencer. The CPU microcode jumps to the routine appropriate to the interrupting device. The interrupts are not maskable or unconditional.

## 4.7 Memory board

### 4.7.1 General information on memory board



## Overview

### 4.7 Memory board

#### 4.7.1 Continued

The memory printed circuit boards provide the basic random access store, drivers, buffers and control and also holds the logic circuits generating the visual display signals. Different board types are used for systems with portrait and landscape display units.

The storage capacity of the single board can be up to 2 megabytes

Both CPU and I/O boards can access the memory through the memory data and address highways. The CPU uses the I/O data bus for display generation control.

Requests for memory access are signalled to the CPU board where logic circuits deal with any contention.

The two diagrams in section 4.7.1 show the general layout and operation of the memory board.

#### RAM array

The random access memory (RAM) array is organised for the parallel access of 1, 2 or 4 16-bit words in one 680 ns memory cycle, which is four CPU micro-instruction beats.

Access to sequential row addresses, to refresh the display screen, means that no specific refresh mechanism is required for the dynamic array.

#### Memory address

The CPU or I/O boards present a word address on the 20-bit memory address highway. This is buffered on the memory board and used to generate bank, column and row selection and the two phase 8-bit chip address.

#### Memory data in

The 16-bit words on the memory data in highway (MDI) are loaded into a buffer and a parity bit for that word generated. Dependent on store function 1, 2 or 4 words are collected and written to the array.

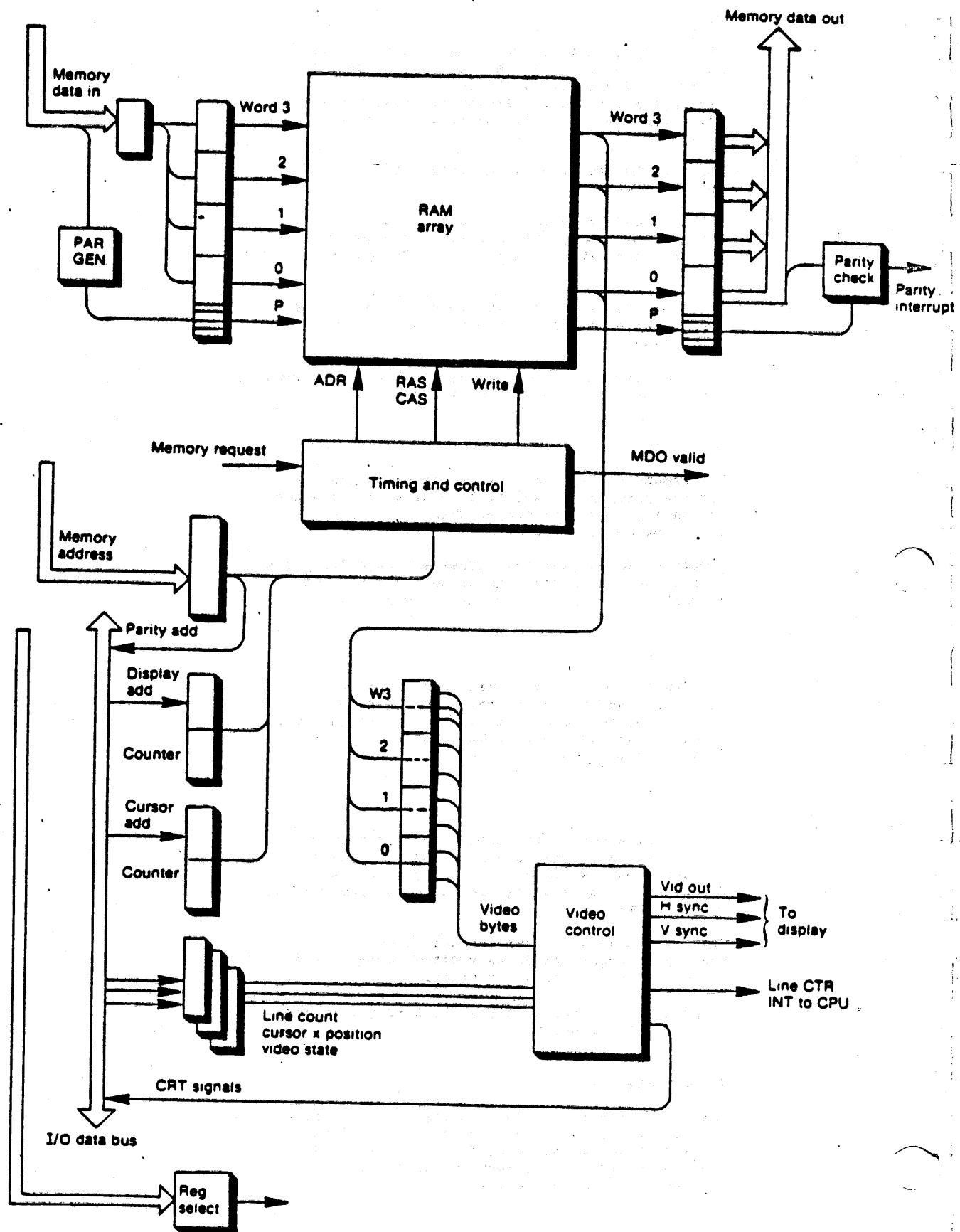
The fixed disc and other channel controllers on the input-output boards have direct memory access and use four word data transfers.

A bad parity facility allows the parity checking logic to be tested.

#### Memory data out

The four words each with a parity bit are loaded from the array to the memory data out buffer. Words defined by the fetch function are enabled on the memory data out highway (MDO). Parity is checked for each word enabled.

## 4.7 Memory boards

4.7.1 Continued

**4.7 Memory board**

**4.7.1 Continued**

**Display data**

Data for the display screen is written by the CPU to an area of memory allocated for that purpose.

**Display control**

The CPU controls the display content by writing the required bit patterns to the display data memory area.

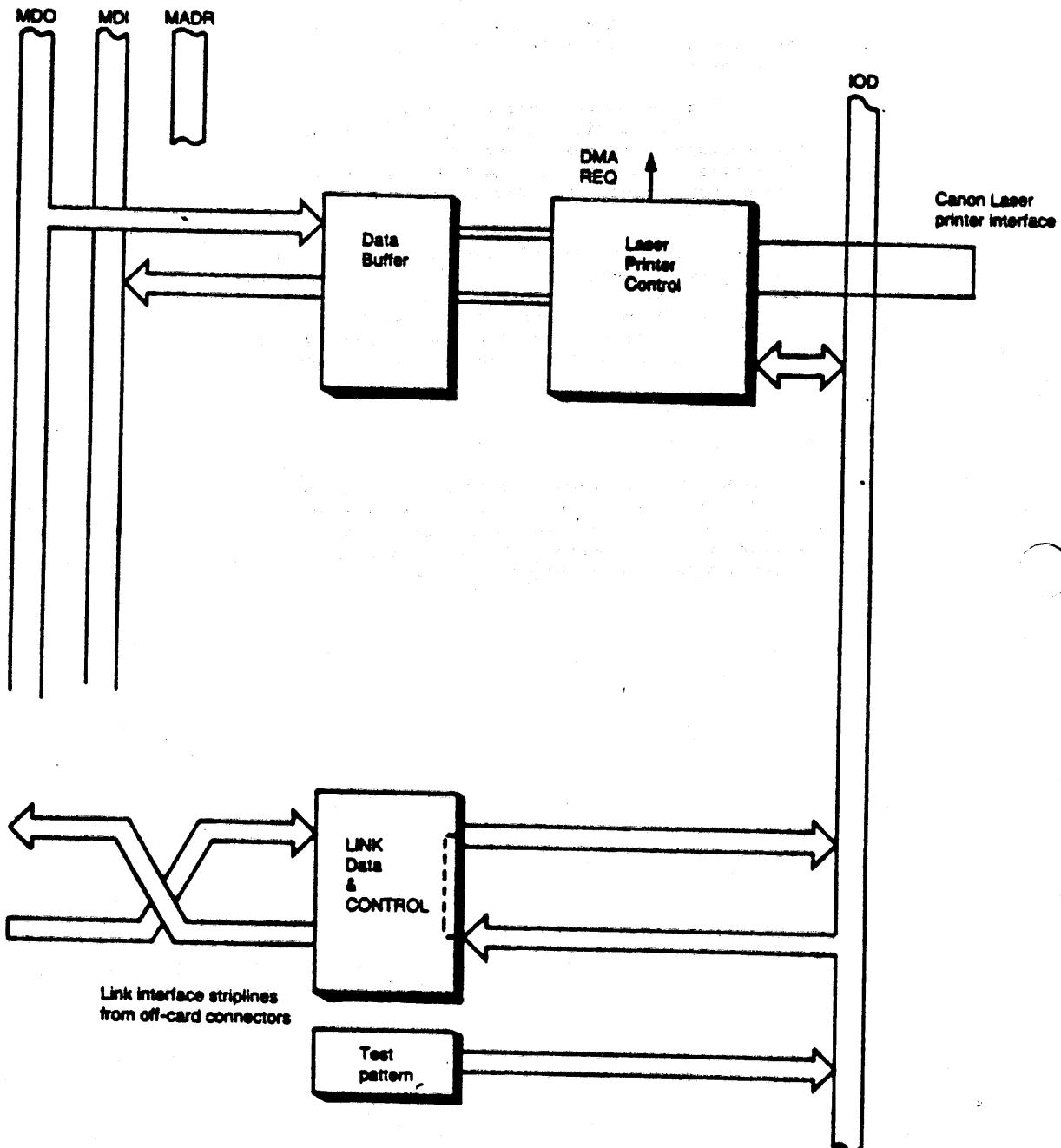
The CPU also loads parameters to the memory display logic circuits which define the memory area employed, and the active screen size. Parameters are updated by the CPU in response to line counter interrupts from the memory display logic circuits.

The screen is refreshed 60 times a second by the memory display logic circuits. The refresh rate is defined by timing circuits on the board interleaving memory accesses with external requests. Display and cursor address counters mean that only infrequent CPU parameter updates are needed.

**Video signals**

Data read from the memory array in response to display and cursor addresses is serialised and transmitted to the display unit. Horizontal and vertical synchronisation signals are also provided by the display logic timing circuits.

## 4.8 OIO board

4.8.1 General information on OIO board

#### **4.8 OIO board**

This description relates to the diagram in section 4.8.1.

The OIO (optional input/output) board when fitted occupies the OIO slot in the card cage. The mother board connector is J8.

The optional input-output board can hold logic circuits for three interfaces. These circuits are for the:

- PERQ to PERQ strip-line link
- OSLAN connection
- Canon laser printer

##### **PERQ to PERQ link**

This interface is provided in the same way as by the link board and functions identically. The physical interface is provided by the two 50-way off-card connectors.

##### **OSLAN connection**

The circuits on the OIO board:

- drive the physical interface to the OSLAN transceiver hardware through PERQ2 OSLAN B connector
- provide data encapsulation and link management functions implementing part of the data link layer in conjunction with the CPU and I/O boards.
- provide a channel controller interface at the memory and I/O data highways

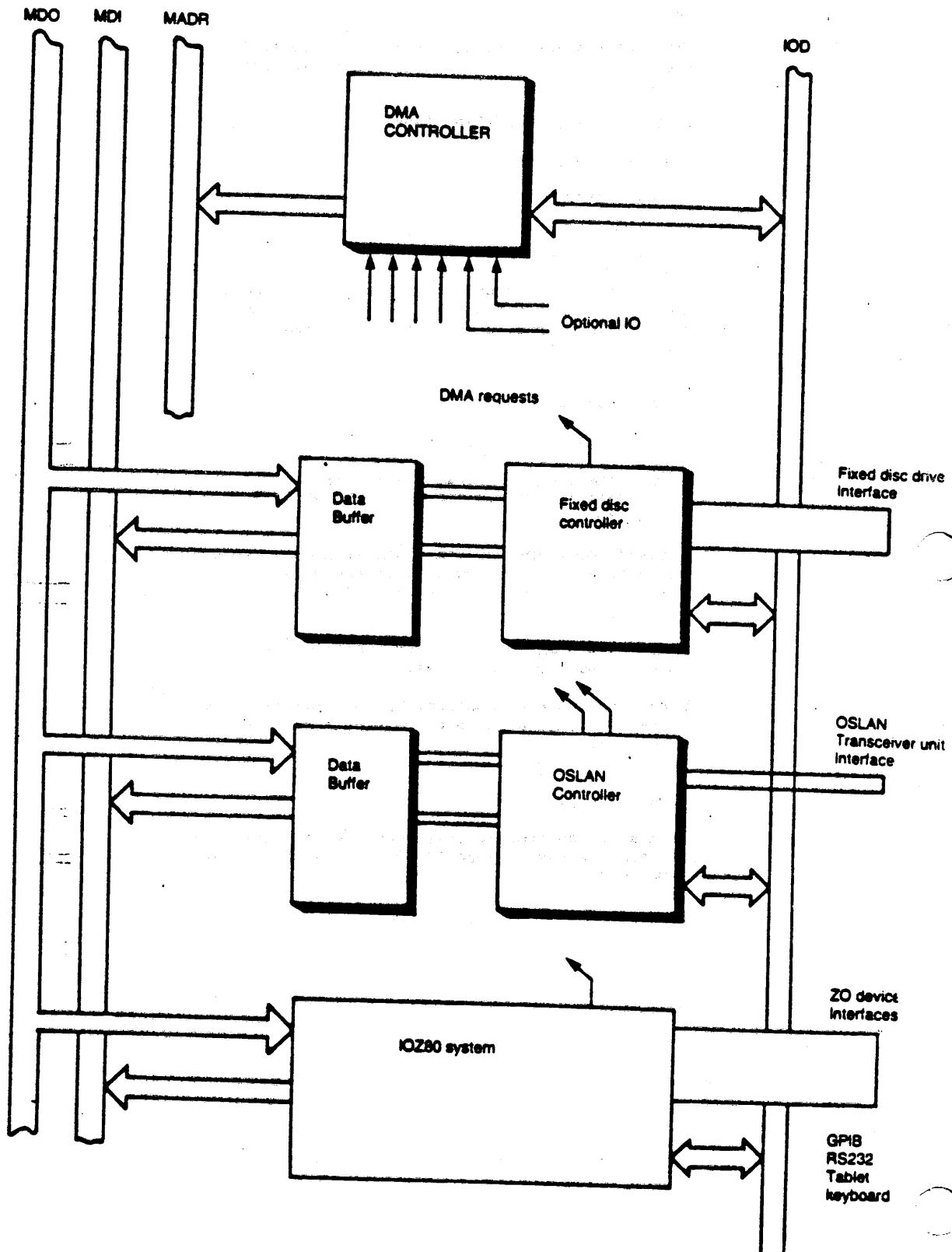
These circuits are functionally the same as those on the EIO board which provide the PERQ2 OSLAN A connection.

##### **Canon laser printer**

The channel controller logic provides an interface for this printer through the OIO connector on the mother board

## 4.9 EIO board

## 4.9.1 General information on EIO board



## Overview

### 4.9 EIO board

#### 4.9.1 Continued

This description relates to the diagrams in section 4.9.1. The ethernet input-output board introduced with the PERQ2 systems provides additional facilities and improved performance.

The same board is used for both T1 and T2 systems. But two links JP2 and JP3 must be fitted to the board when used with T2 5.25 inch discs. Links JP2 and JP3 must not be present when the board is used with T1 8 inch discs.

The EIO board provides control for:

- fixed disc drive
- floppy disc drive
- keyboard
- standard tablet
- OSLAN connection
- two RS232 interfaces
- a GPIB
- speech output

The board also holds a real time clock-calendar.

The EIO board circuits for control and data servicing of peripherals fall into two groups:

- state machines for the fixed disc and OSLAN connection
- the I/O Z80 microprocessor system controlling the other devices

The memory highway and the I/O data bus are used for information transfer with the CPU and memory boards.

#### The PERQ DMA controller

The direct memory access controller has 6 channels for access to the PERQ memory board. The EIO board circuits use four of these channels. One for the fixed disc, two for OSLAN, and one for the Z80 system. The other two channels are for I/O options.

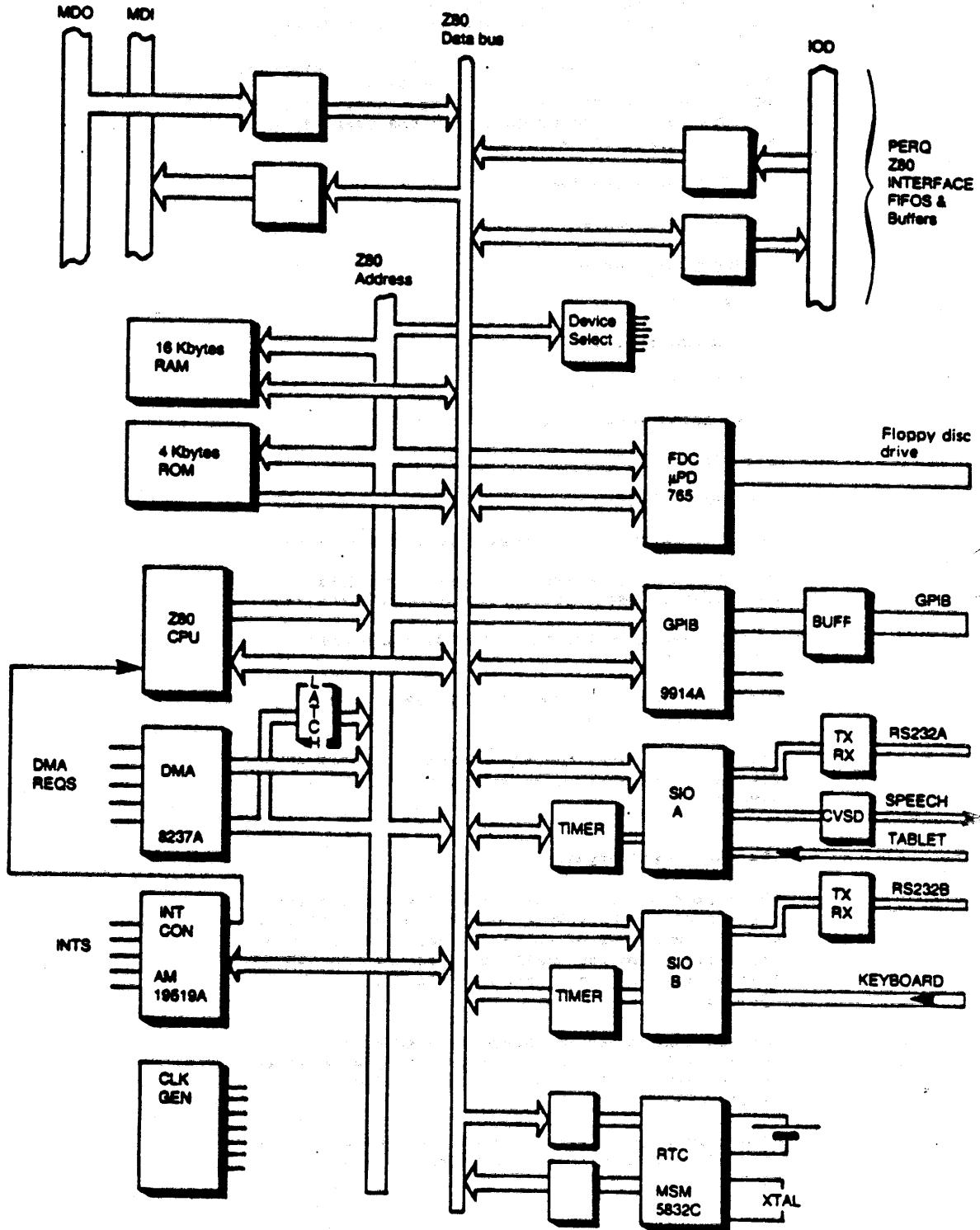
The DMA controller has header and address registers for each channel which it updates after data transfers. The registers are loaded initially by the CPU.

Data transfers initiated by the peripheral result in quad-word transfers of data with the memory board.

#### Fixed disc drive controller

These logic circuits provide the interface to the fixed disc drive. Connection to the drive is by a 50-way stripline from the EIO board off-card connector JB.

## 4.9 EIO board

4.9.1 Continued

## Overview

### 4.9 EIO board

#### 4.9.1 Continued

Controller commands and parameters are loaded into the controller registers from the I/O data bus and the controller returns status to the bus. The dedicated controller logic generates all the signals required for control of head movements, head selection and data transfer. The DMA controller handles the transfer of data between the disc controller data buffer and the PERQ memory.

#### OSLAN Interface controller

These logic circuits provide the PERQ interface to an ICL open system local area network Transceiver Unit. Connections through the mother board are to a 15-way D connector on the bulkhead interface panel.

The EIO board circuits provide data encapsulation and help in the data link management. A microsecond clock-timer is provided to help in sorting out collisions on the network. The timer is set by software and interrupts the PERQ CPU.

The DMA controller handles the transfer of data between the OSLAN controller buffers and the PERQ memory. Separate channels are used for transmitted and received data but transfers are not simultaneous.

#### I/O Z80 Subsystem

The system consists of a 4MHz Z80A single chip microprocessor interconnected with supporting circuits by an address bus and a data bus.

The PERQ CPU controls peripheral operations by transferring commands and/or data to the Z80 subsystem through either the DMA controller channel or the I/O data bus.

The supporting circuits provide the following features:

- The I/O bus interface, two 16 byte registers for Z80 PERQ CPU communications. Interrupt lines and status bits provide hand-shaking for transfers through the I/O data bus
- A 32 byte buffer for transfer to and from the PERQ memory. Transfers are handled by the DMA controller
- The Z80 memory consisting of 4 Kbytes of boot PROM and 16 Kbytes of dynamic RAM
- The Z80 direct memory access chip 8237-2 allowing the Z80 peripheral controllers to access Z80 memory through the Z80 bus. This circuit also refreshes the dynamic RAM
- Interrupt steering for direct entry to Z80 service routines for devices interfaced through the Z80 system
- The Z80 system peripherals interface circuits. The following paragraphs give an outline of these circuits

## 4.9 EIO board

### 4.9.1 Continued

#### The floppy drive interface

Interface connections to the single drive within the processor cabinet are carried by a 50-way stripline and the EIO board off-card connector JA.

A PD765 floppy disc controller chip on the Z80 bus takes commands and parameters from the Z80CPU. This chip has direct access to the Z80 memory for data byte transfers.

#### The GPIB

The general purpose instrumentation bus connection is to the bulkhead interface panel. The devices supported by ICL on this PERO interface are:

- high resolution graphics tablet
- 6202/02 correspondence printer
- 6203 Printer/plotter

A 9914 intelligent GPIB controller chip and transceivers handle all the interface control and data transfers. The controller is programmed by the Z80 CPU and has direct access to the Z80 memory for data byte transfers.

#### Serial input-output

Two serial input-output (SIO) chips provide four channels which are used for:

- RS232 interface A at the bulkhead 25-way D connector
- speech output and standard tablet input
- RS232 interface B at the bulkhead 25-way D connector
- keyboard input

The SIO chips and associated timer circuits are initialised with parameters which define the protocol for each of the four channels. The RS232 interface protocols are defined by PERO software to the Z80 CPU which loads the SIO and timer registers. Operation up to 9600 baud is supported. The protocols for the speech/tablet and keyboard channels are fixed as:

- speech output - synchronous, 8 bit characters, sync character 55, continuous syncbytes are transmitted when there is no data. 32 KHz clock
- standard tablet - synchronous, about 90 messages a second consisting of a syncbyte of 7E and 4 data bytes. 32 KHz clock
- keyboard input - asynchronous, eight data bits framed by a single start and stop bit for each key pressed. 30 KHz clock

## **Overview**

### **4.9 EIO board**

#### **4.9.1 Continued**

##### **The floating point unit**

This unit is not used by the software and the components are only fitted on early boards.

The EIO board can hold a 8087 numeric data processing chip with control and interfacing circuits. This sub-system communicates only with the PERO CPU through the I/O data bus.

The PERO CPU can load instructions to a queue in the FPU and examines its status register for indication that results are ready for retrieval.

**Note:** The floating point, clock speech and timer are not supported at first release.

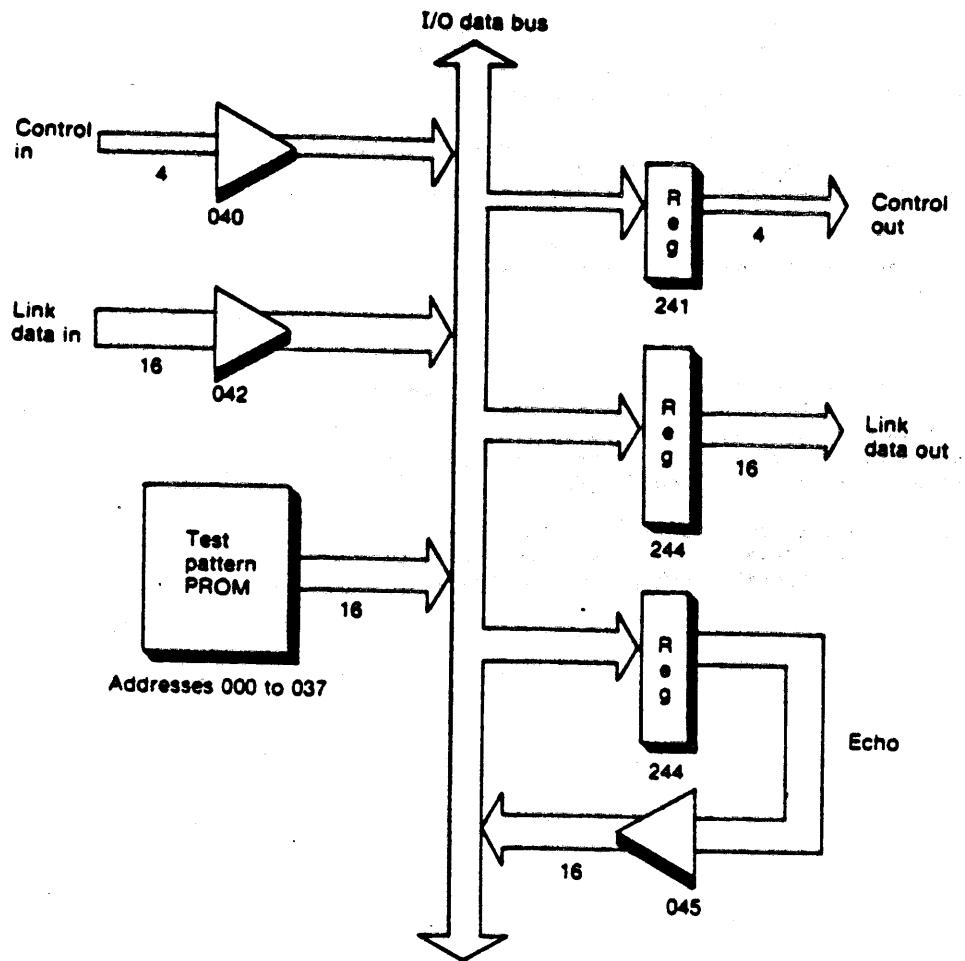
##### **Real time clock**

A crystal controlled clock-calendar chip MSM5832 with battery back-up. The lithium battery's shelf life is approximately four years. The clock is set during board test and can be set again on site using a special tool. See 7.7.4.

This circuit allows the PERO CPU to request the date and time from the Z80 system thus removing the need for operator entry when logging in.

## 4.10 Link board

## 4.10.1 General information on link board



Test patterns

Octal address	Data pattern	Octal address	Data pattern
0 0 0	0 0 * * * * 0 0 0 1	0 2 0	1 1 ----- 1 1 1 0
0 0 1	0 0 ----- 0 0 1 0	0 2 1	1 1 ----- 1 1 0 1
0 0 2	0 0 ----- 0 1 0 0	0 2 2	1 1 ----- 1 0 1 1
0 0 3	0 0 ----- 1 0 0 0	0 2 3	1 1 ----- 0 1 1 1
•		•	
•		•	
0 1 6	0 1 ----- 0 0 0 0	0 3 6	1 0 ----- 1 1 1 1
0 1 7	1 0 ----- 0 0 0 0	0 3 7	0 1 ----- 1 1 1 1

## Overview

### 4.10 Link board

#### 4.10.1 Continued

When fitted, this board slots into the OIO board position in lieu of the OIO board. The link board allows the direct connection of one processor unit to another. Identical link boards are fitted in each processor. Two 50-way 50-foot striplines between the link boards off-card connectors carry the control and data signals.

The feature is not generally available but is used in manufacturing test and other special applications.

The diagram in section 4.10.1 identifies the layout and operation of the link board.

The OIO board has the link logic built in.

#### Logic circuits

The link board provides for an external connection to the I/O data bus. Control and data lines from the link are isolated from the bus by receiver amplifiers on the link board. Control and data lines to the link come from buffer registers on the link board.

#### Test PROM

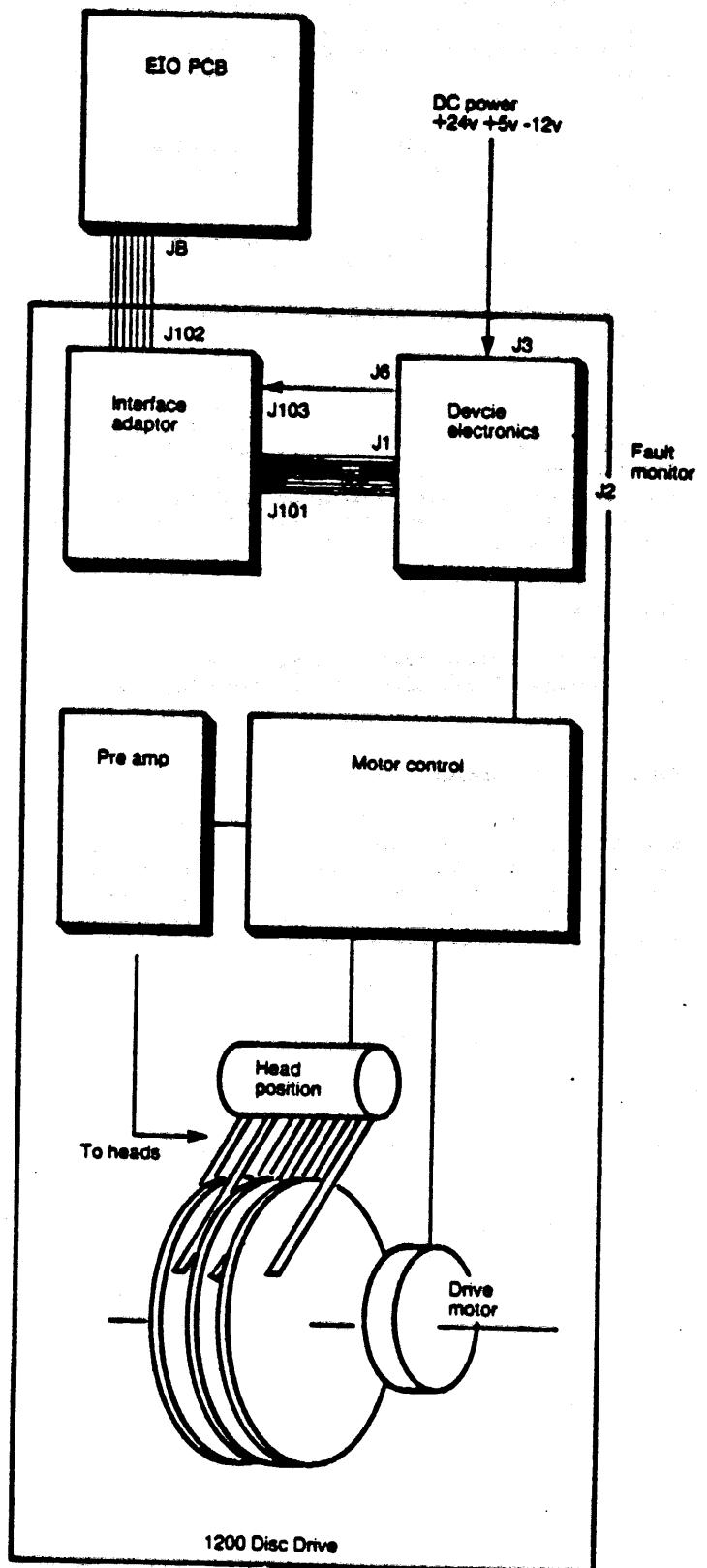
The link board also holds a test pattern PROM and echo facility logic circuits for checking the link.

#### System establishment

The link, if fitted, is the first choice as a system establishment load device. A sequence of 16-bit word transfers is used to load 256 micro-instructions into the control store RAM. There is no sum check on the data which is transferred directly to the control store.

## 4.11 Fixed disc drives

## 4.11.1 The Micropolis 8 inch 35 megabyte drives of PERQ T1



## **Overview**

### **4.11 Fixed disc drives**

#### **4.11.1 Continued**

This description relates to the two diagrams in section 4.11.1.

A Micropolis 1200 series 8 inch non-exchangeable disc drive is mounted in the PERQ 2 T1 processor cabinet to provide 35 megabytes of permanent storage for the operating system and user files.

The drive is interfaced to the fixed disc channel controller on the EIO board. The controller initiates head positioning, head selection and data transfers.

#### **Discs and motor**

The three 8 inch diameter discs are directly coupled to a 3600 rpm brushless drive motor. Power for the motor is provided at +24 volts dc. Information for an electronic commutator is supplied by three LED's on the motor control PCB. There is normally a power on delay of about 30 seconds for the drive to come up to speed.

#### **Head positioning**

The six heads are positioned by a voice coil driving a swinging arm mechanism. Position reference is to 601 tracks recorded on a dedicated surface. The track to track seek time is 12 milliseconds and the average data access time 50 milliseconds.

#### **Data transfer**

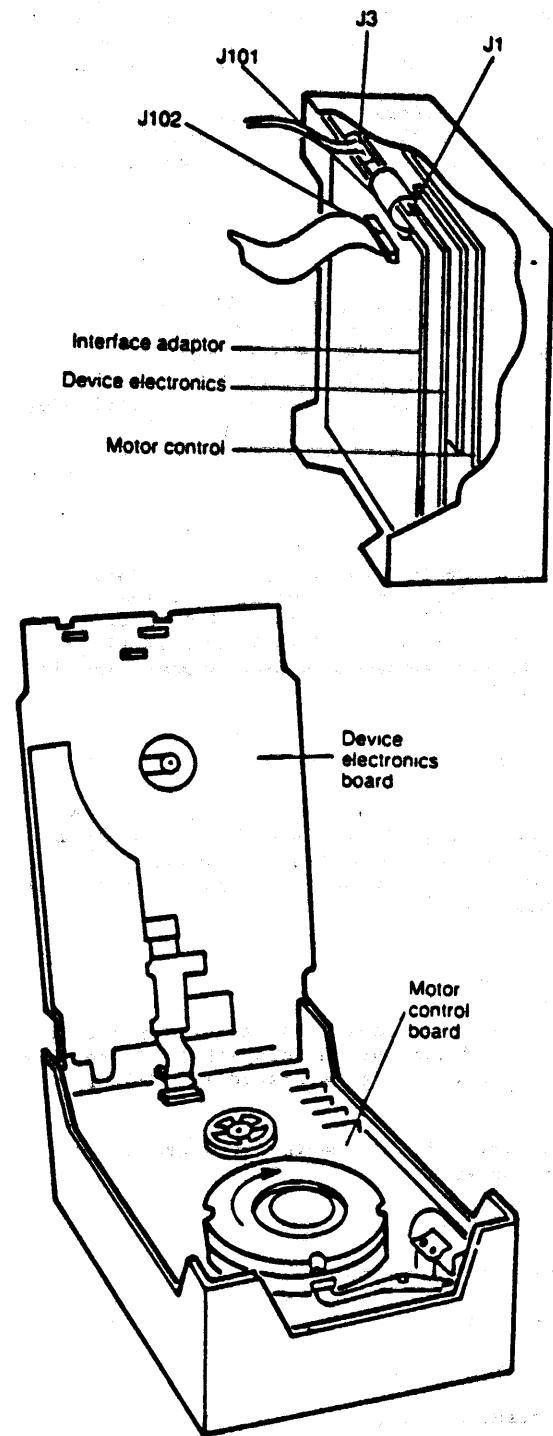
Serial data is transferred to and from the disc drive at 720 kilobytes per second. The format and content of the identifier and data blocks including cyclic redundancy check bytes is defined by the processor.

#### **Drive components**

The basic drive has three PCBs. A further 8 inch basic or slave drive may be daisy-chained from the master drive, but cannot be fitted in PERQ2 T1 cabinet.

The boards fitted in the basic drive and their main functions are:

- Preamplifier board.**
- . Track servo amplification**
- . Head selection**
- . Read data amplification**
- . Write current driving**
- . Fault detection**

**4.11 Fixed disc drives****4.11.1 Continued**

## Overview

### 4.11 Fixed disc drives

#### 4.11.1 Continued

##### Motor control board

- . Drive motor speed control with photo sensor and power amplification
- . Track positioning servo with compensation and power amplification
- . Power sensing

##### Device electronics board.

The device control logic is based on a microprocessor system. The functions include:

- . Manufacturers bad track re-allocation
- . Velocity profile generation
- . Drive sequencing

There are also:

- . Write, read and servo logic circuits
- . Interface transmitters and receivers

##### Physical arrangement

The discs and heads are sealed in a clean air filtered compartment by the motor control board. All electrical connections to the clean air compartment are carried by the motor control board.

The other boards are hinged for access at the opposite end to the interface connectors.

Drive configuration is by means of links on the device electronics and motor control boards.

##### Signal interface

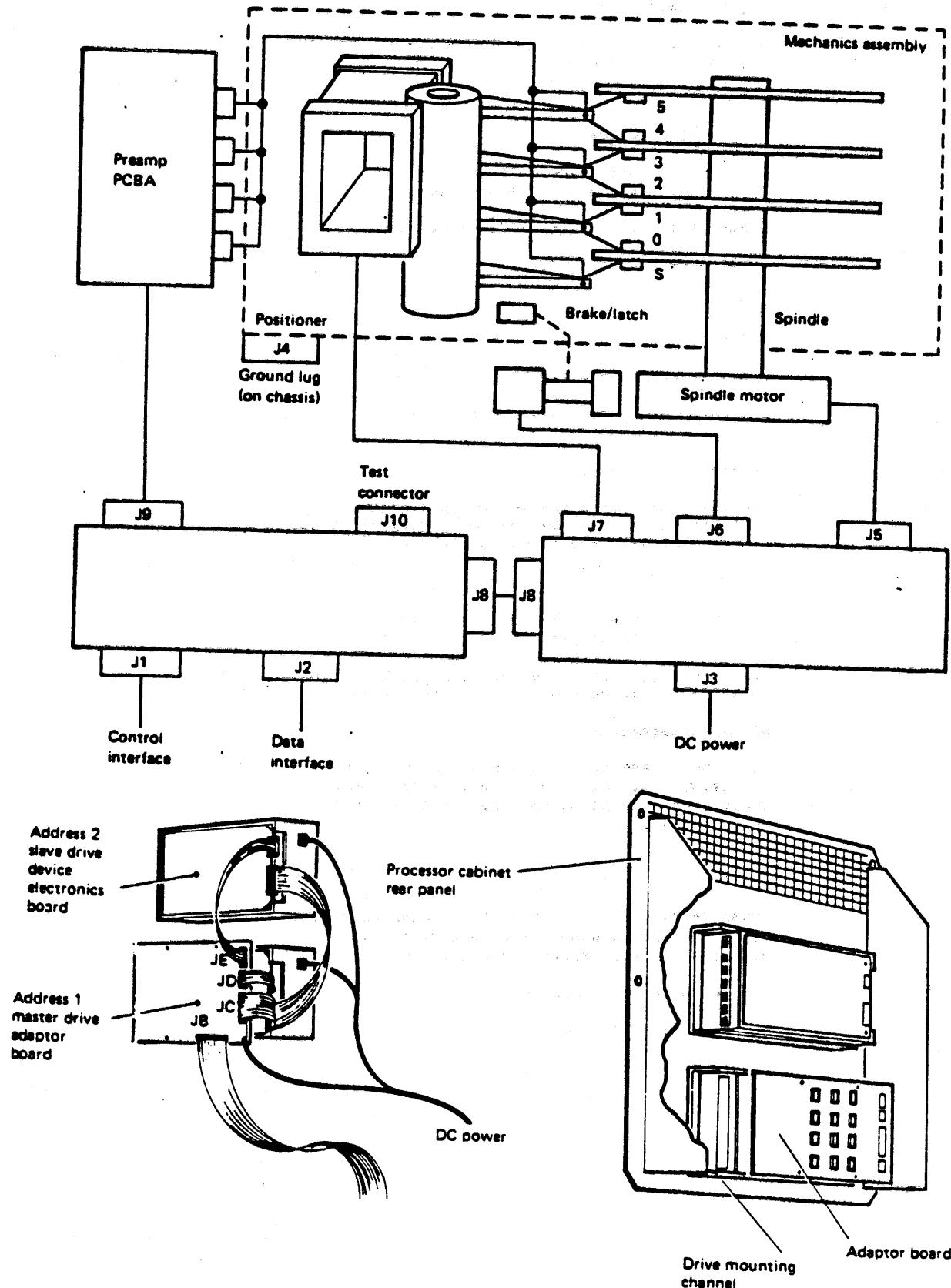
All control and data signals are carried by a 50 way stripline. This links the interface adaptor board connector JB to the EIO board off-card connector JB.

##### Power

Power is supplied to the drive through connector J3 on the device electronics board. The dc voltages and approximate currents are:

- . + 24 volts at 3 amperes
- . + 5 volts at 1.8 amperes
- . - 12 volts at 0.8 amperes

## 4.11 Fixed disc drives

4.11.2 The Micropolis 5.25 inch 35 megabyte drive of PERQ T2

## **Overview**

### **4.11 Fixed disc drives**

#### **4.11.2 Continued**

This description relates to the two diagrams contained in section 4.11.2. Micropolis 5.25 inch fixed disc drive fitted to PERQ2 T2 systems: model 1303.

A Micropolis 1300 series non-exchangeable disc drive is mounted in the PERQ 2 T2 processor cabinet to provide 35 megabytes of permanent storage for the operating system and user files.

A second drive may be housed in the cabinet to provide an extra 35 megabytes.

The drives are interfaced to the fixed disc channel controller on the EIO board. The controller initiates head positioning, head selection and data transfers.

#### **Discs and motor**

The 5.25 inch diameter discs are directly coupled to a 3600 rpm brushless drive motor. Power for the motor is provided at 12 volts dc. Information for an electronic commutator is supplied by three LED's on the motor control PCB. There is normally a power on delay of about 30 seconds for the drive to come up to speed.

#### **Head positioning**

The six heads are positioned by a voice coil driving a swinging arm mechanism. Position reference is to 601 tracks recorded on a dedicated surface. The track to track seek time is 6 milliseconds and the average data access time 30 milliseconds.

#### **Data transfer**

Serial data is transferred to and from the disc drive at 6 Mbits per second. The format and content of the identifier and data blocks including cyclic redundancy check bytes is defined by the processor.

#### **Drive components**

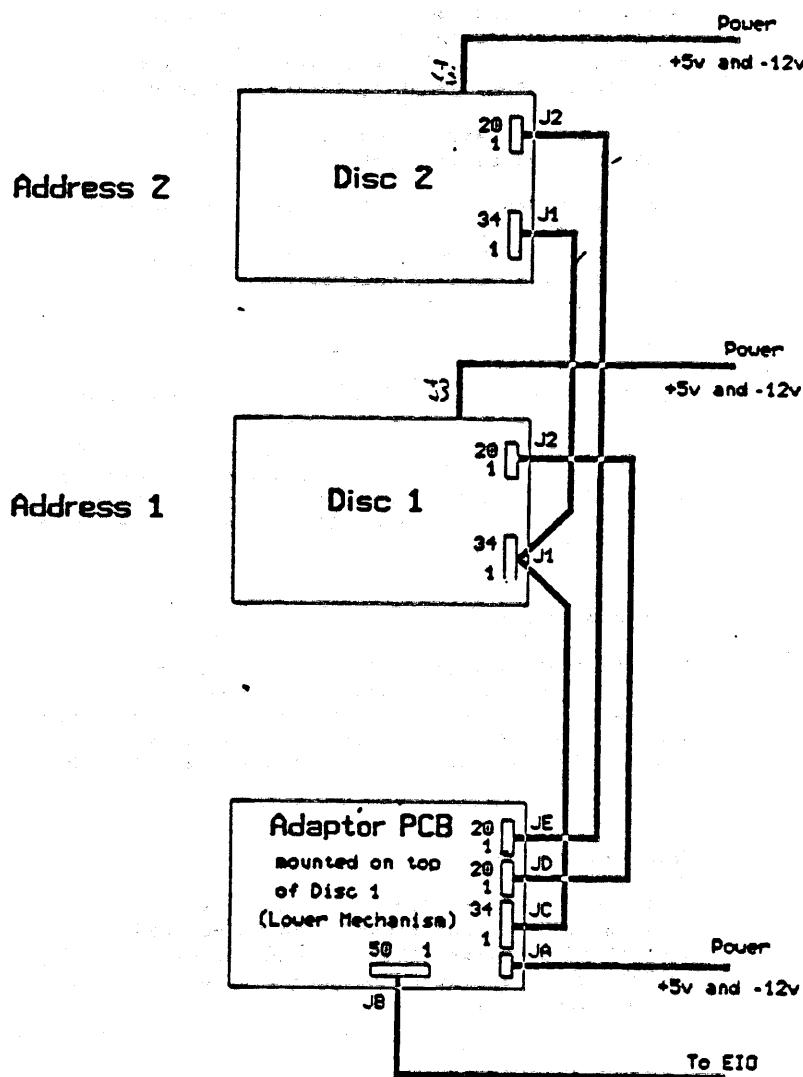
The basic drive has three PCBs. A further basic or slave drive may be daisy-chained from the master drive.

The boards fitted in the basic drive and their main functions are:

Preamplifier board.

- Track servo preamplification
- Head selection
- Read data preamplification
- Write current driving
- Fault detection
- Write fault detection

## 4.11 Fixed disc drives

4.11.2 Continued

## Overview

### 4.11 Fixed disc drives

#### 4.11.2 Continued

##### Motor control board

- Drive motor commutation, current limiting and control
- Positioner signal power amplification
- Brake solenoid control

##### Device electronics board.

The device control logic is based on a microprocessor system. The functions are:

- Spindle speed control
- Write logic
- Read channel amplification, filtering, digitizing
- Servo signal amplification, AGC, demodulation
- Fault detection
- Index, guardband, Track 0 decoding
- Closed loop positioner servo
- Microprocessor based control logic, including drive sequency, and velocity profile generation

##### Physical arrangement

The discs and heads are sealed in a clean air filtered compartment by the motor control board. All electrical connections to the clean air compartment are carried by the motor control board.

The other boards are hinged for access at the opposite end to the interface connectors.

Drive configuration is by means of links on the device electronics and motor control boards.

##### Signal interface

All control and data signals are carried by a 50 way stripline. This links the interface adaptor board connector J1 to the BIO board off-card connector JB.

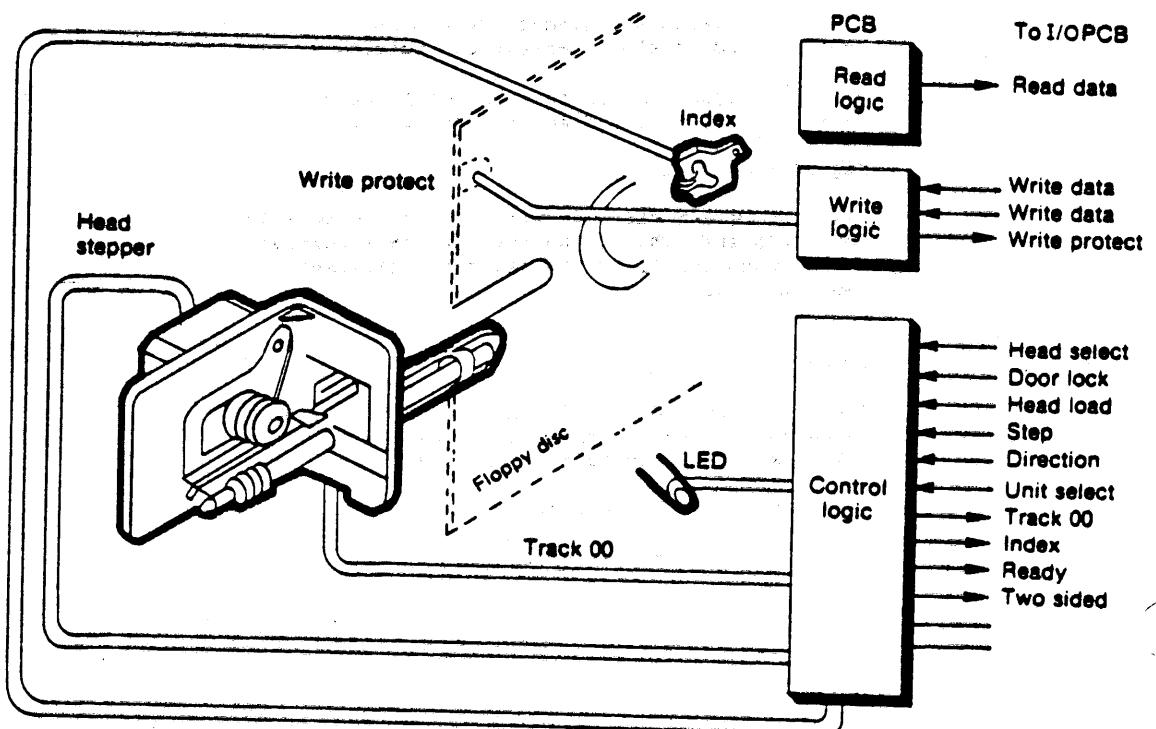
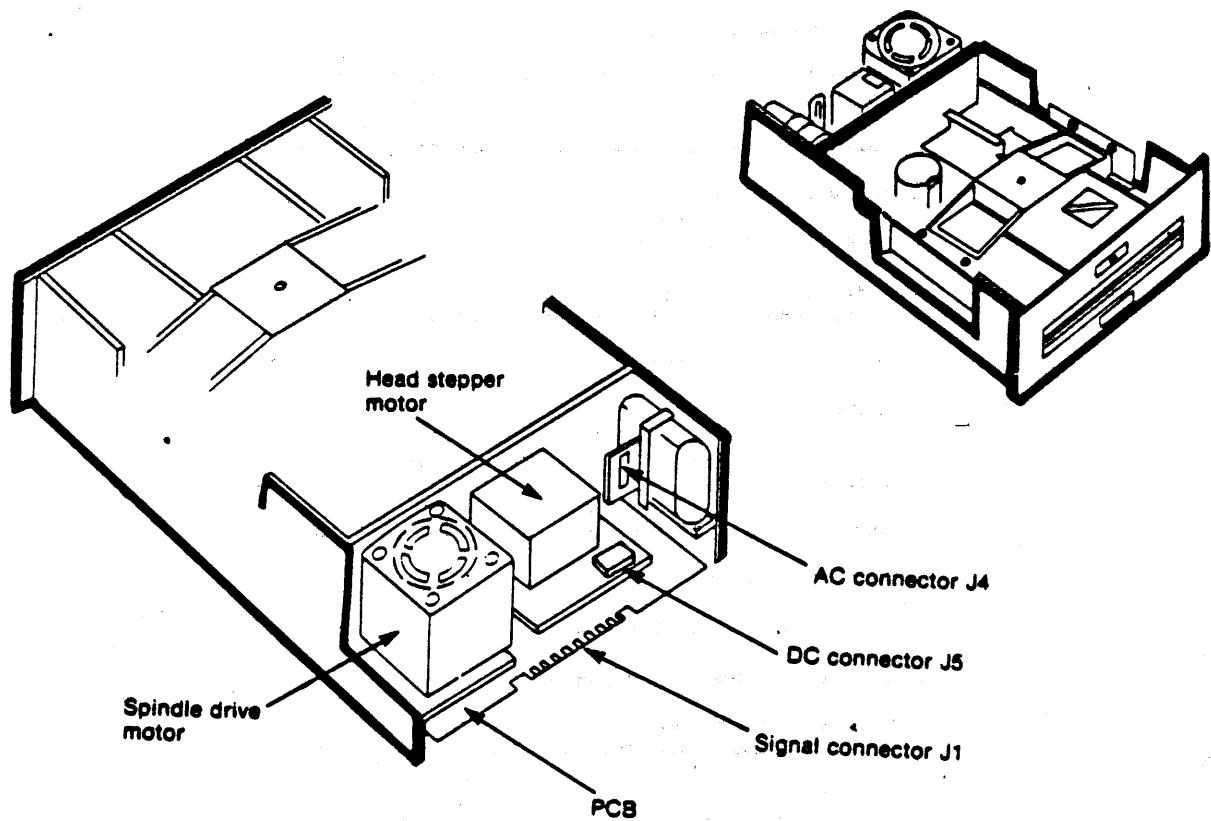
##### Power

Power is supplied to the drive through connector J3 on the device electronics board. The dc voltages and approximate currents are:

- + 5 volts at 0.9 amperes
- - 12 volts at 3.7 amperes

## 4.12 Floppy disc drive

### 4.12.1 General information on floppy disc drive



## **Overview**

### **4.12 Floppy disc drive**

#### **4.12.1 Continued**

A Shugart 851 or SA858 disc drive is used in PERQ2 systems. A layout of the 851 disc drive is shown in the diagram in section 4.12.1.

A Shugart double sided floppy disc drive is mounted in the processor unit. The drive provides up to 1 megabyte of exchangeable storage for user files. The device is also the alternative to the fixed disc for system establishment and allows the operating system to be rebuilt if corrupted.

The unit is interfaced by the I/O Z80 control on the EIO board.

#### **Disc drive**

When a floppy disc is inserted it is positioned by and clamped to the registration hub in the centre of the spindle face. The heads are loaded onto the disc surfaces and the spindle is belt-driven at 360 rpm by the 240 volt 50 hertz drive motor.

#### **Head positioning**

A precision stepping motor positions the two heads on one of the tracks in response to commands from the controller. The track to track seek time is 8 ms.

#### **Head selection**

The controller selects the head on one side of the floppy disc for the transfer of data.

#### **Data transfer**

Serial data is transferred to and from the diskette at 62.5 Kbytes per second, for the 851 disc drive.

The format and content of the sectors on each track are controlled by the processor.

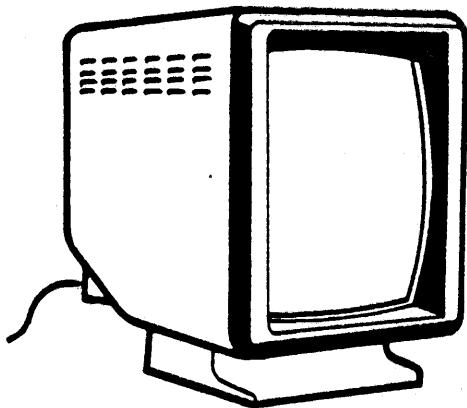
#### **Signal interface**

All control and data lines are carried between the EIO board off-card connector JA and the flexidisc PCB connector J1 by a 50 way stripline.

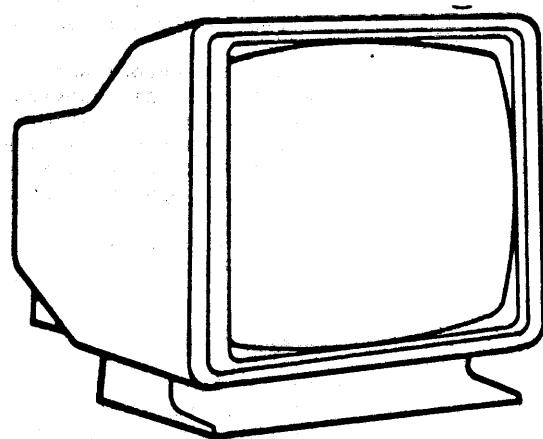
#### **Power**

Mains power is supplied through connector J4. The processor power unit provides DC supplies through connector J5.

## 4.13 Display units

4.13.1 Portrait and landscape displays

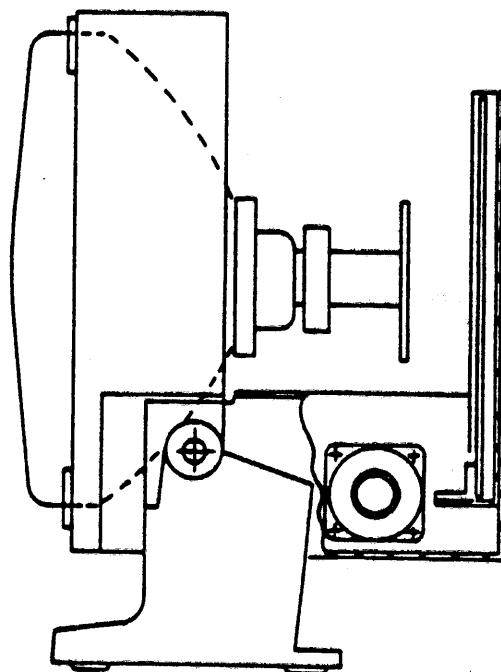
Portrait display 15 inch



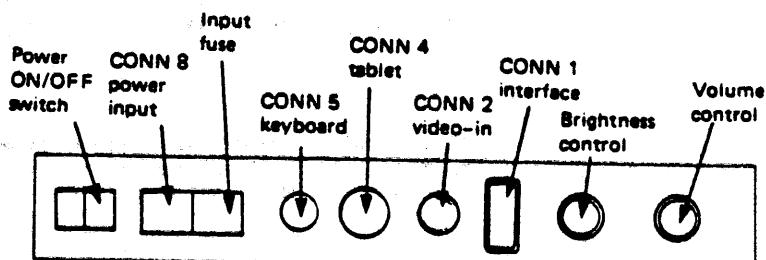
Landscape display 20 inch



Interface panel for dc powered units



Display assembly with tilt base moulding



Interface panel for ac mains powered units

## Overview

### 4.13 Display units

#### 4.13.1 Portrait and landscape displays

The drawing shows features of the PERQ2 display units for T1 and T2 systems.

#### Display components

The display units consist of a display assembly fitted with base, bezel and cover mouldings. The display assembly box chassis holds:

- the CRT, Scan PCB and transformers
- dc power regulator or mains power unit
- display unit interface panel
- loudspeaker, volume and brightness controls

#### Display function

The black and white monitor is driven from the display control on the memory board. The display control provides separate video, horizontal and vertical synchronisation signals.

The sync signals lock free running oscillators on the monitor scan board which generates a screen raster.

The video signal modulates the brightness of the beam during line scans to form the displayed image.

#### Display types

The four display unit types are:

- the T1 portrait display P2362/22; this contains a KME assembly 80019760 powered by +55 volts dc from the T1 processor power supply
- the T2 portrait display P2362/24; this contains a KRIZ assembly 7734942 powered by +24 volts from the T2 processor power supply
- the Monitron landscape display P2362/23(7734546); with ac mains supply power input
- the T2 KRIZ landscape displays (not yet available); this contains a KRIZ assembly powered by +24 volts from the T2 processor power supply

#### CAUTION

The KME and KRIZ portrait displays are not interchangeable.

The KRIZ landscape display will be for T2 system only.

The Monitron landscape display can be used with T1 and T2 systems, but the interface cable is different, and unique to T1 or T2 application. The T1 cable is identified by a yellow band and is P2396/08. Portrait and landscape displays need different memory boards in the processor.

4.13 Display units

4.13.1 Continued

Display unit interface panels

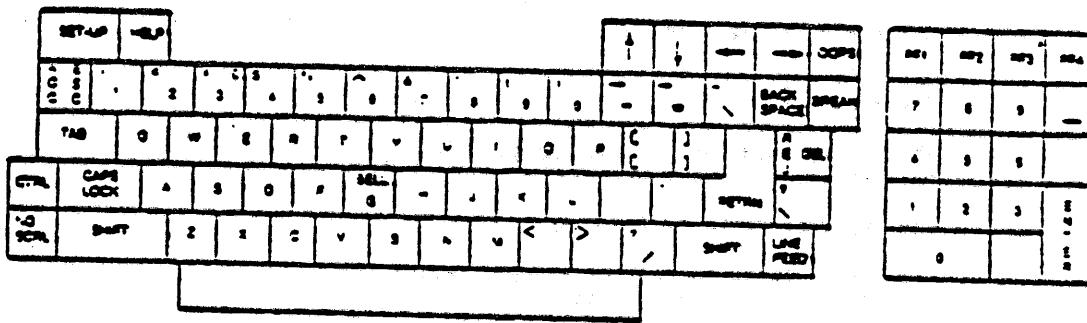
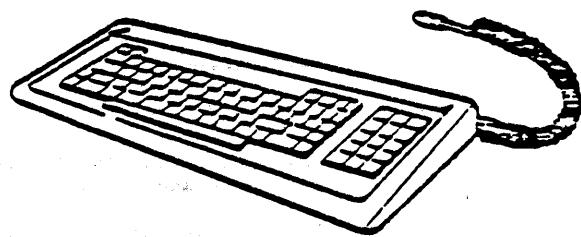
These panels have either a display dc power connector or ac mains input components but are otherwise similar.

The interface connector which carries the display unit synchronisation and audio signals is also used for the keyboard and standard tablet signals and dc power supplies from the processor unit. See 6.5.1 for details.

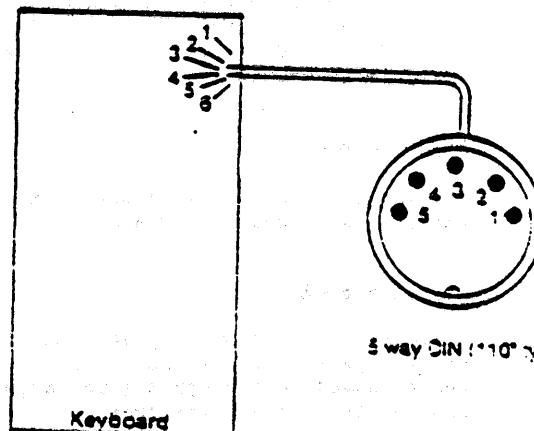
## Overview

### 4.14 PERQ2 keyboard unit

#### 4.14.1 General information on keyboard unit



8 data bits  
no parity, 300 baud



5 way DIN (\*10° type)

- 1 no connection
- 2 Serial Data Out
- 3 no connection
- 4 signal ground
- 5 +5V
- 6 no connection

- 1 no connection
  - 2 serial data out
  - 3 no connection
  - 4 signal ground
  - 5 +5V
- (viewed from pin end (not wiring end))

#### 4.14 PERQ2 keyboard unit

##### 4.14.1 Continued

The information in this section relates to the Figure in section 4.14.

The keyboard unit for PERQ2 systems consists of:

- a 85 key alphanumeric keyboard
- the housing
- a cable to the PERQ2 display unit

##### Keyboard PCB

This board holds the 85 key modules and logic circuits.

The keyboard features include:

- N key rollover to deal with simultaneous pressing of two or more keys
- auto repeat on all keys except set-up, escape, tab, control, and break. Keys repeat their codes about ten times a second when held down for more than half a second. The shift and lock keys do not operate during repeat.
- a pluggable character code PROM to allow for foreign language variants
- a serial TTL level interface

When a key is pressed the keyboard transmits a unique 8 bit character code to the processor unit. The keyboard is interfaced to the EIO board 280 system by an asynchronous, serial input-output (SIO) channel. Each 8 bit character is framed by single start and stop bits for transmission at 300 baud. The 280 CPU services a SIO channel interrupt for each character.

##### Keyboard power

The single plus five volt supply is provided by the processor unit power supply and fused by PS1.

##### Keyboard cable

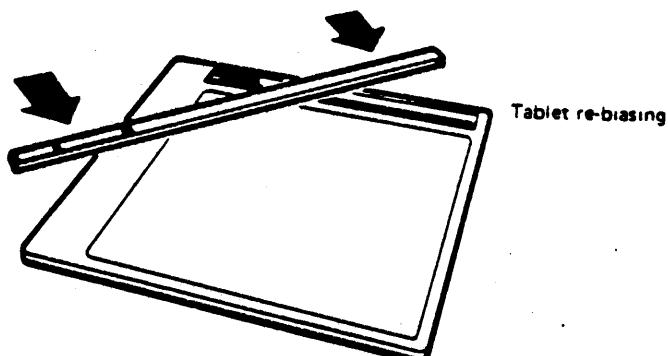
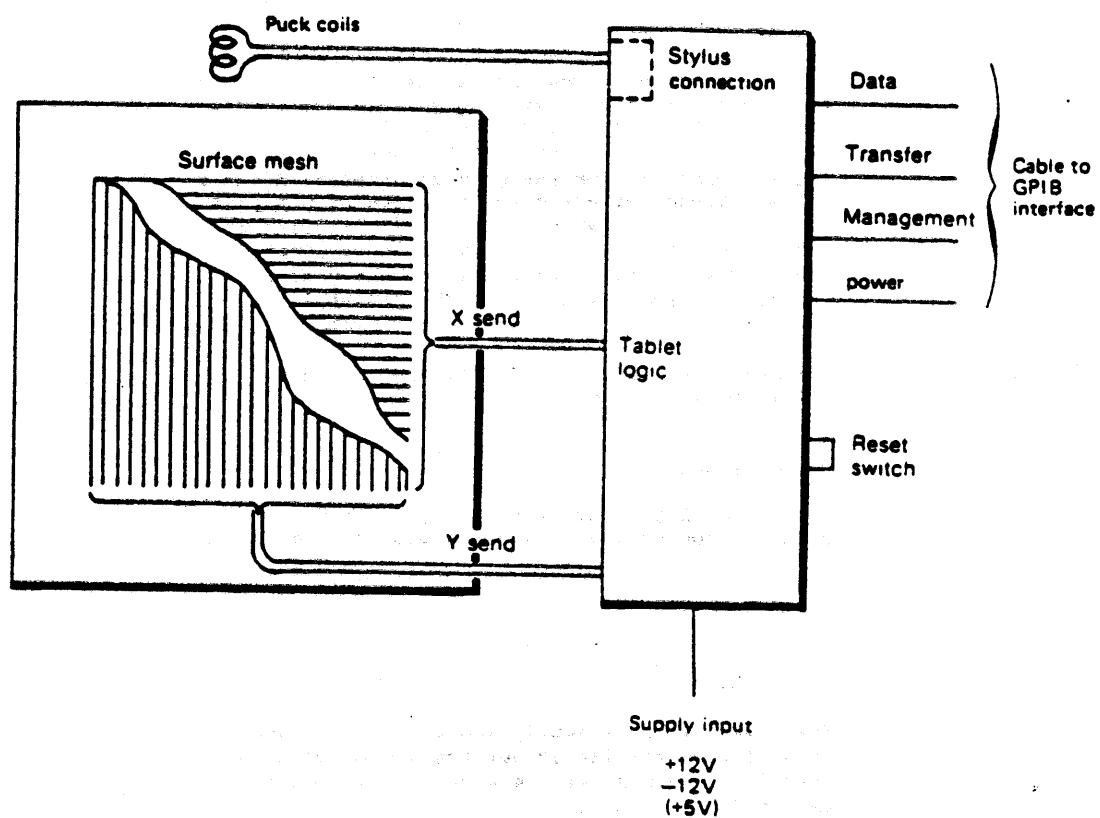
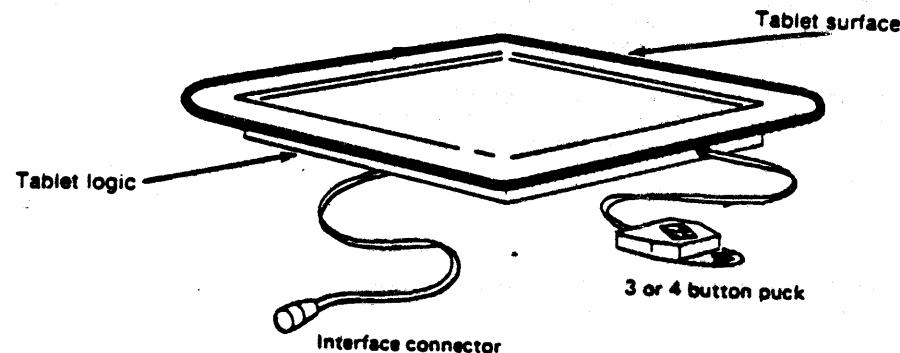
A single cable carrying power and signal lines forms a part of the keyboard unit. Connection to the keyboard is through a 6 way edge connector inside the housing. The free end of the cable terminates in a 5-way DIN connection and plugs into the PERQ2 display unit.

## Overview

### 4.15 Tablet units

These can be portrait or landscape depending upon requirement

#### 4.15.1 High resolution graphics tablet



#### 4.15 Tablet units

##### 4.15.1 Continued

The description relates to the diagram contained in section 4.15.1.

The Summagraphics high resolution graphics tablet may be used for PERQ2 systems, or alternatively a pointing tablet with 3-button puck can be supplied, depending upon system requirement.

The Summagraphics tablet unit consists of, a 4-button puck and interconnecting cable. A marking or non-marking stylus is also available as an optional feature.

##### CAUTION

The tablet has a magnetic field and floppy discs must not be placed on the surface.

The tablet logic circuits are contained on a PCB under the tablet surface. These circuits are based on an 8035 micro-computer system and a 50 mega-hertz counter.

##### Tablet operation

Magnetostriuctive waves transmitted through a wire mesh under the tablet writing surface are sensed by the puck or stylus. The tablet logic uses the time delay between wave transmission and the signal received from the puck to generate X and Y values. These represent the position of the puck cursor on the tablet surface to within 0.127 mm. The XY co-ordinates of the puck cursor position are output as 8-bit characters on the general purpose instrumentation bus. The tablet is interfaced to the input-output 280 system.

Switches internal to the tablet select operational modes and interface options. See 6.7.1

##### Tablet reset

The tablet logic may be reset at any time by the reset button on the right-hand side of the tablet.

##### Tablet bias

The tablet is permanently magnetically biased. A loss of bias results in surface areas becoming inactive. A bar magnet is supplied with each tablet for rebiasing.

**Overview**

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**R10143**

#### 4.15 Tablet units

##### 4.15.1 Continued

###### The puck

On the 4-button puck, a sensing coil surrounds the crosshairs of the cursor sight. This provides the signals used by the tablet logic circuits to compute the cursor position on the tablet surface.

Depression of the push button switches causes the transmission of signals to the processor. Their function is determined by the user's program.

The principles of operation for other types of puck are similar.

###### Stylus

The optional stylus, which may be fitted with a marking or non-marking point, contains a single switch which operates when the point is pressed. The function of the signal generated is determined by the user's program.

###### Tablet power

This is normally drawn from the processor cabinet via the monitor.

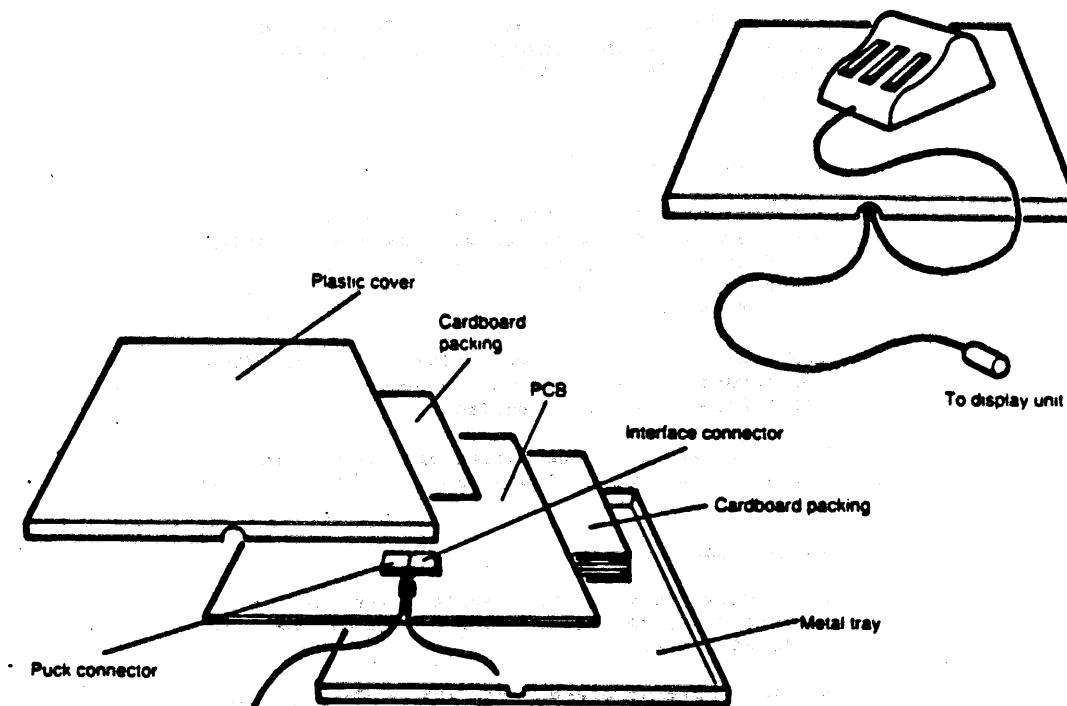
###### Interconnection

The puck and stylus are provided with cables which connect directly to the tablet.

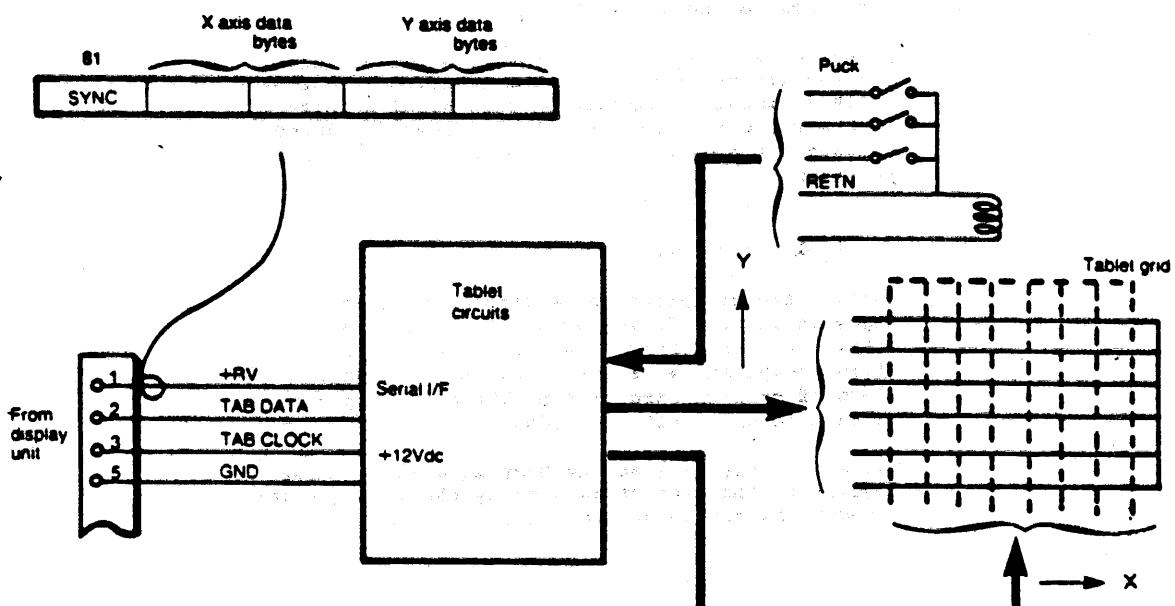
## Overview

### 4.15 Tablets units

#### 4.15.2 Standard or pointing tablet



Byte 1	Unused	off tablet	Unused	Unused	X11	X10	X9	X8
2	X7	X6	X5	X4	X3	X2	X1	X0
3	SW2	SW1	SW0	Unused	Y11	Y10	Y9	Y8
4	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0



off tablet = 1 if mouse is not on active tablet surface  
= 0 otherwise  
SW1,2,3 = 1 if switch pressed  
= 0 otherwise

## 4.15 Tablet units

### 4.15.2 Continued

The description relates to the diagram contained in section 4.15.2.

This tablet is introduced with PERO2 systems as an alternative to the Summagraphics high resolution graphics tablet, and can be either portrait or landscape.

#### Unit components

The unit consists of the tablet, a three button puck, and an interface cable. This cable carries power from the processor unit and a serial interface to the EIO board, and is routed via the monitor unit.

The tablet is a metal tray holding a single PCB and cardboard packing with a snap-on plastic lid which forms the tablet surface.

The interface and puck cables are secured to the PCB and connected by 5 way plugs inside the cover.

#### Tablet operation

The single PCB under the tablet cover has a grid of tracks across its surfaces and holds the tablet logic circuits.

A grid matrix of wires under the surface of the tablet is energised two wires at a time (each wire orthogonal to the other). This creates a magnetic field with a maximum strength where the tracks cross. The field scans the tablet surface as pairs of tracks are selected in turn.

A sensing coil in the puck detects the magnetic field providing an input to the tablet circuits proportional to the puck position with respect to the grid. The tablet circuits generate digital values representing the X and Y coordinates of the puck position on the surface.

Messages defining the puck position and buttons pressed are transmitted to the processor about 90 times a second. A message on the serial interface to the EIO board consists of a syncbyte followed by four bytes of data, 2 for X position, 2 for Y position.

#### Physical arrangement

Correct tablet operation is dependent on the magnetic circuit formed by the PCB tracks and the metal tray which holds the board. The PCB is fitted component side down with only a single piece of packing card on top. The other 5 pieces of card go underneath the PCB.

The metal tray is also the heat sink for a power regulator. The contact is made by the single screw through the bottom of the tray.

**Overview**

**4.15 Tablet units**

**4.15.2 Continued**

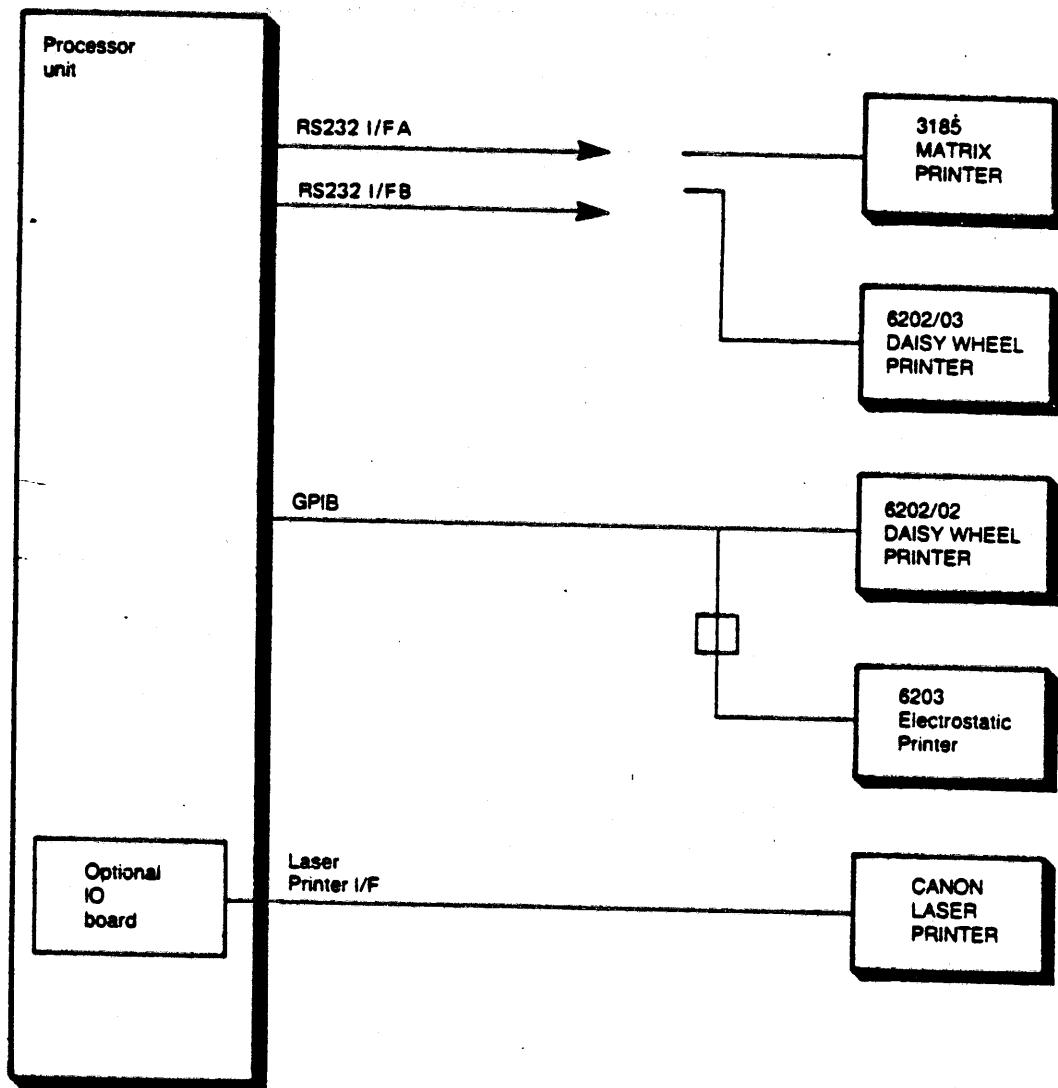
**Tablet power**

The processor power supply provides plus 12 volts to the tablet PCB. (Through PS3 in T2 systems.)

The plus 12 volts is used by a power regulator to provide a plus 5 volt supply for the tablet circuits.

#### 4.16 Optional printers

##### 4.16.1 General information on optional printers



## Overview

### 4.16 Optional printers

#### 4.16.1 Continued

The PERO2 system provides for the connection of several optional printers. The examples indicated in section 4.16 and illustrated in section 3.17 are the most popular:

- ICL 3185
- ICL 6202
- ICL 6203
- CANON LBP-10

#### 3185 Printer

This is the OKI Microline 84, a dot-matrix printer. Ink dots forming the printed character are transferred to the paper by 9 wires impacting through an inked ribbon.

The printer is connected to the processor unit by an RS232 interface cable. See section 6 for details.

Switches on the printer are set to match the PERO input-output circuits used for the interface. See section 6 for details.

#### 6202 Printer

The RICOH RP1600 flowriter is a type serial impact printer. Correspondence quality output is formed by a daisy-wheel and inked ribbon.

Two versions of the printer may be connected to PERO systems:

- the 6202/2 with a APTEC interface board. This is connected to the GPIB (IEE488 interface)
- the 6202/03 with a RICOH interface board. This is connected to a RS232 interface

Section 6 gives details of the printer configuration switch settings and cables used.

#### 6203 Printer

This is the Versatec V80 series electrostatic Printer/plotter. A row of writing elements transfer electrostatic charges to electrographic paper. Black particles from a liquid toner stick to the charged areas of the paper to form the printed output.

The printer is connected to the PERO GPIB (IEE488 interface). The connection is made through an isolating barrier box (F2073/02). The printer must be the last device on the GPIB.

#### 4.16 Optional printers

##### 4.16.1 Continued

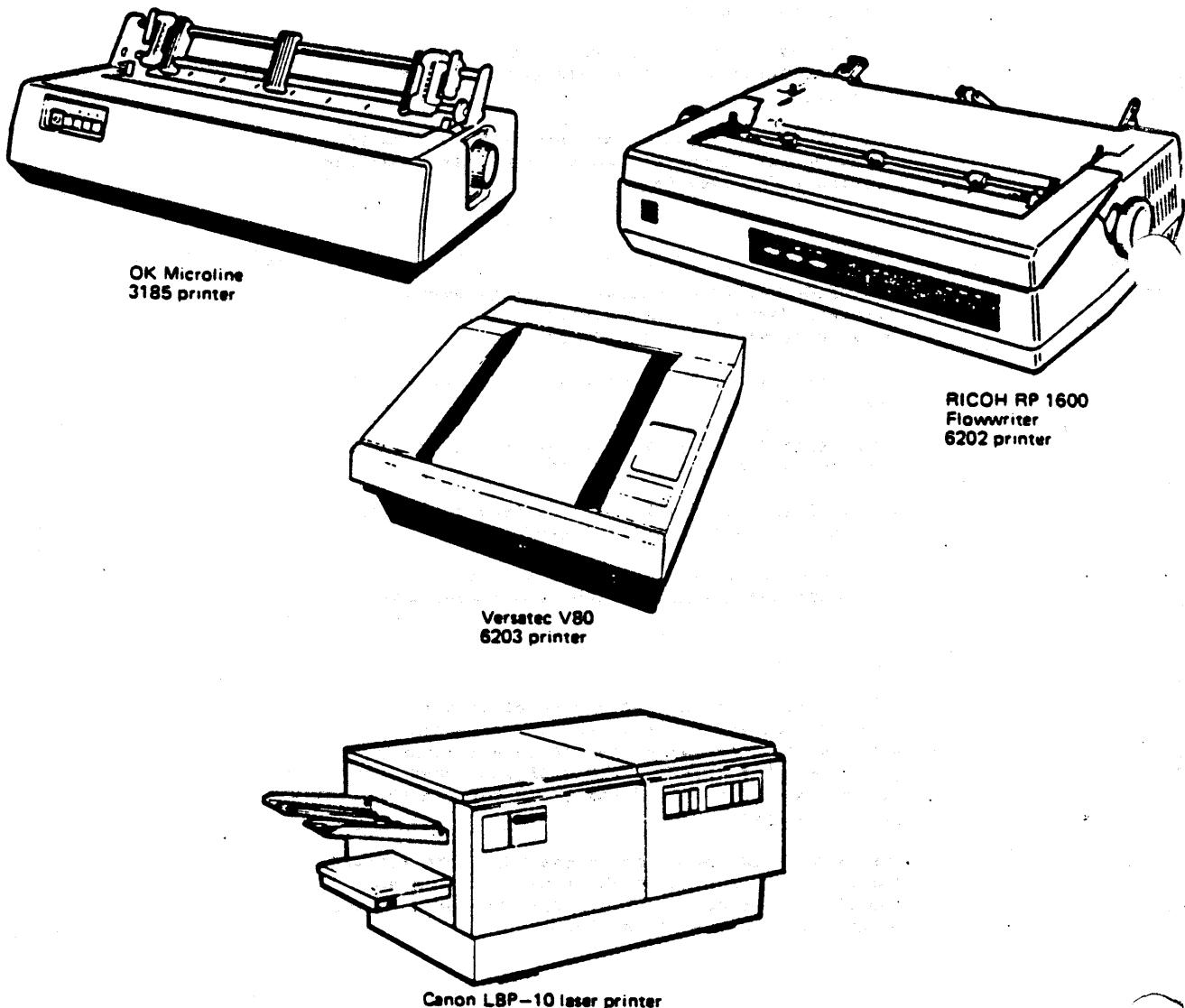
###### **CAUTION**

The desk top printer must not be tilted with toner or concentrate liquid containers installed. See the printer guide for further details.

###### **CANON LBP-10**

The CANON LBP-10 is a desk top laser printer. The laser electrically charges the surface of a drum with the image to be printed. Toner attracted to the charge is transferred to paper and fused by heat.

The interface is provided by the PERQ OIO board.



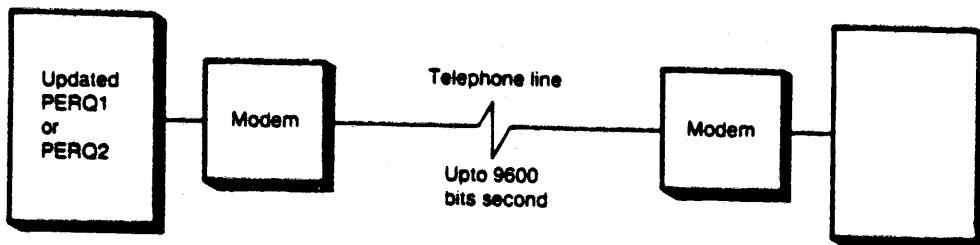
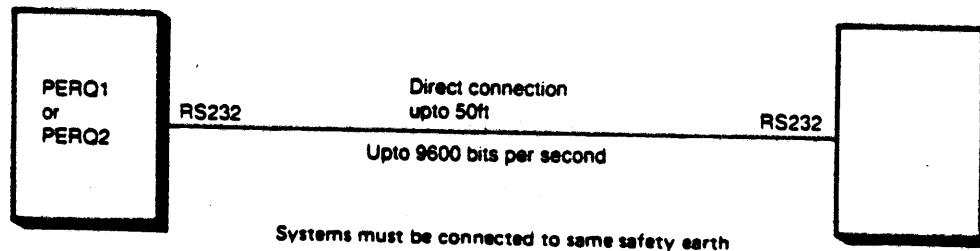
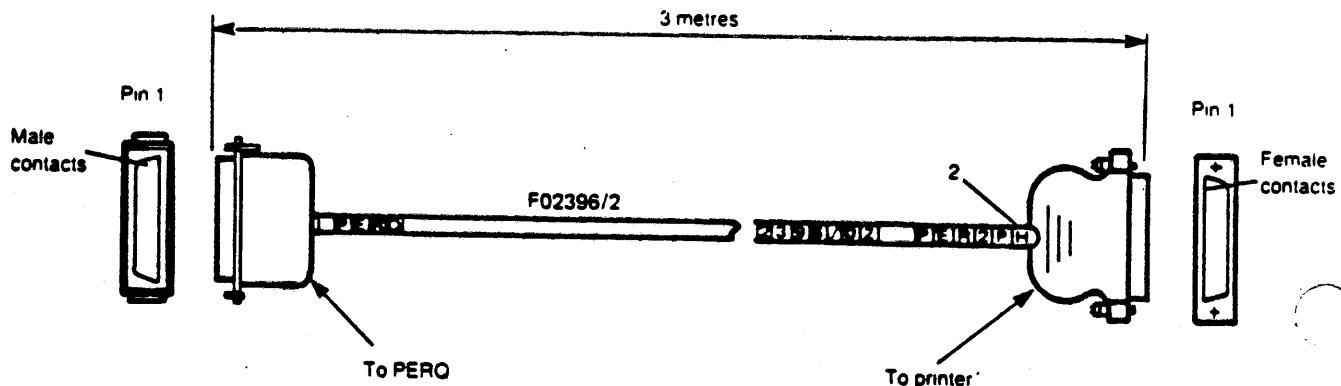
**Overview**

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## 4.17 RS232 communications

4.17.1 General information on RS232 communicationsNOTES

- 1 PERQ2 systems also support asynchronous communications using ICLC-03 and IBM Bisync protocols
- 2 Connections to RS232 interface depend on the type of modem used
- 3 Cable type F02396/ will have different sub-references after / depending on type of printer used, length of cable etc.



## **Overview**

### **4.17 RS232 communications**

#### **4.17.1 Continued**

This description relates to the diagrams in section 4.17.1.

Using the RS232 interface the ICL PERO can communicate with other systems at speeds up to 9600 bits per second.

The connection can be made by a direct cable up to 50 feet in length or to a Modem for communication across telephone lines. Systems joined by direct cables must be connected to the same safety earth.

The ICL PERO can support the use of different line protocols.

PERQ2 and PERQ1 systems with the z80 firmware modifications allow asynchronous mode and synchronous line protocols to be used. The line protocol used is defined by the software.

The available software uses:

- asynchronous teletype
- ICLC-03 synchronous protocol
- IBM 2780/3780 synchronous protocol

#### **Asynchronous mode**

The chatter utility and a File Transfer Program use asynchronous mode with the PERO emulating a Teletype device.

#### **ICLC-03**

The ICL PERO acts as a secondary on an ICLC-03 link responding to commands from a DRS, System 25, ME29 or 2900 primary. This connection makes it possible for the PERO user to access various services offered by the mainframe. Using ICLC-03 protocol PERO becomes a part of the ICL Information Processing Architecture (IPA). Initially only the IPA File Transfer Facility is available. PTF is also available using an OSLAN connection.

#### 4.17 RS232 Communications

##### 4.17.1 Continued

###### 2780/3780

The PERO emulation of IBM 2780/3780 remote job entry terminals and RS232 connection using IBM bisync link protocol. This allows not only connection to IBM systems but also to other systems emulating 2780/3780 terminals. Using this method point to point links can be made to another PERO, ME29, and DRS20 Models 40 or 50.

###### Interface lines

The PERO RS232 interface is signal and pin compatible with the CCITT V24 recommendation for interchange circuits between data terminal equipment and data circuit terminating equipment (MODEM). The signals implemented by PERO are shown in the table below.

CCITT circuit number	Connector Pin	PERO name	Signal description
101	1	GND	Safety earth
103	2	TD	Transmitted data
104	3	RD	Received data
105	4	RTS	Request to send
106	5	CTS	Clear to send
102	7	GND	Signal 0 volts
109	8	DCD	Received line signal detector
114	15	TC	Transmitted signal element timing
115	17	RC	Received signal element timing
108/2	20	DTR	Data terminal ready
125	22	RI	Calling indicator

## Overview

### 4.18 OSLAN

This description relates to the diagram contained in section 4.18.1.

The PERQ system connects to an ICL network called OSLAN. This is an open system local area network.

#### OS

Open system means that different manufacturers' equipment can be connected to the LAN.

#### LAN

Local area networks are a communications facility for connecting a number of processors and peripherals at a single site.

### 4.18.1 OSLAN concept

The network provides a data highway to which a large number of devices can be attached. All the devices can address and send packets of information to each other.

#### Information packets

Every packet of information has a 48 bit header which specifies a unique destination device address. All devices listen to every packet of information transmitted.

#### Transmission medium

The digital signals are coded and transmitted as discrete changes in signal level along a single coaxial cable. This is a baseband system, as opposed to broad band systems like ICL MACROLAN. The OSLAN transmission rate is 10 million bits per second.

#### Network access

The ICL OSLAN is like Ethernet. It is a contention network using broadcast techniques. The method of accessing the network is called CSMA/CD. That is carrier sense, multiple access, collision detection.

#### CS

Carrier sense means that before accessing the network a device listens for another user's carrier signal. If a carrier is sensed the device must wait before transmitting.

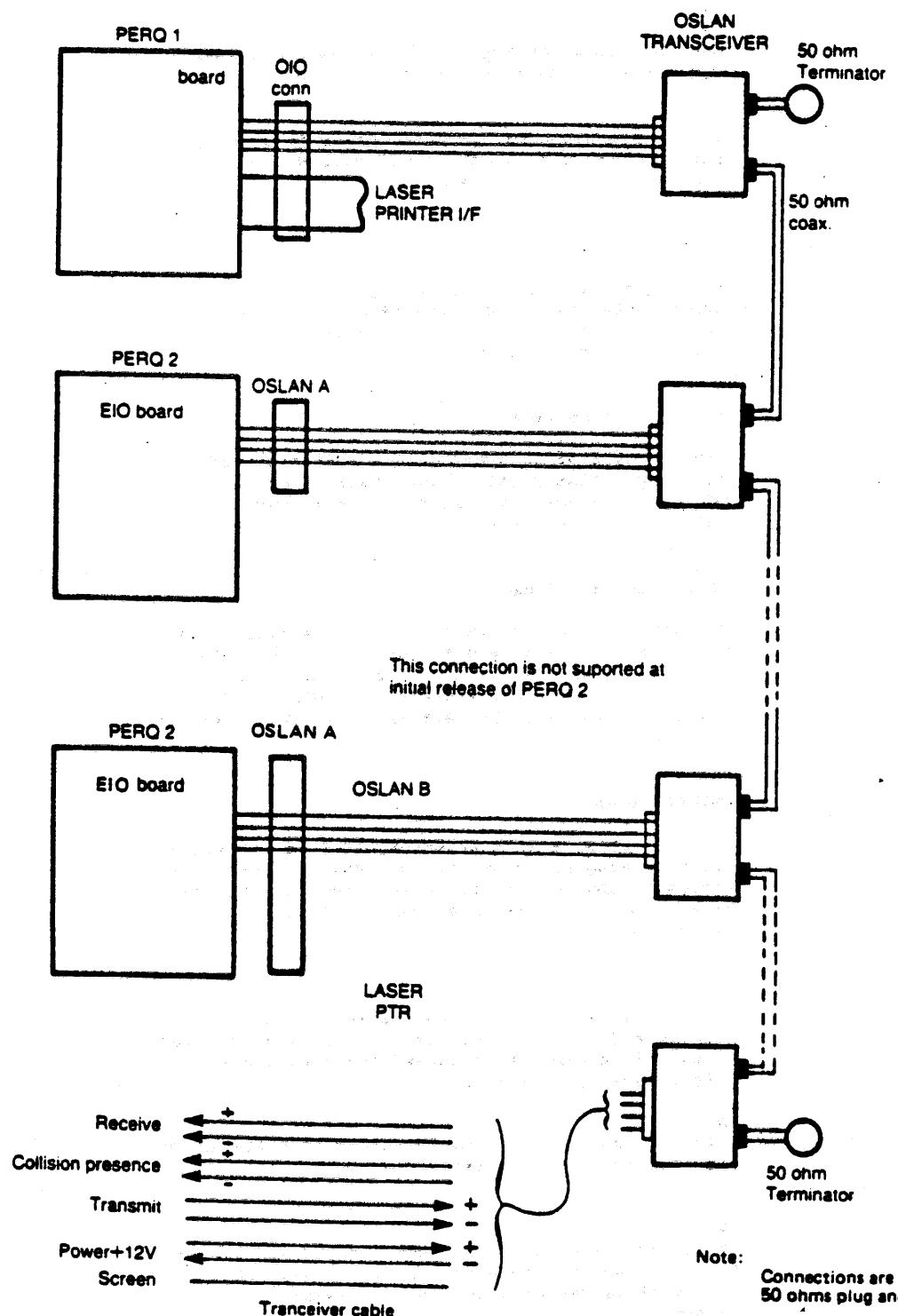
#### MA

Multiple access means that a number of users share the same transmission resource.

#### CD

Collision detection means that a device continues to listen while transmitting. If a collision occurs it is detected and the transmission deferred.

## 4.13 OSLAN

4.18.1 Continued

**4.18 OSLAN**

**4.18.1 Continued**

CSMA is sometimes called 'listen before transmission'. CSMA/CD is sometimes called listen while transmitting as well as listening before.

**Network layers**

The ICL OSLAN conforms to the European computer manufacturers association (ECMA) standards. These standards cover a number of system layers. The lower layers are implemented by hardware, the higher ones by software.

The hardware needed for PERO systems covers:

- the medium. This is the actual network cable
- the physical layer. The transmitters, receivers, data encoding and data decoding circuits
- the data link layer. The two main functions of this layer are data encapsulation and link management. These functions are implemented by the EIO board in conjunction with the CPU microcode.

**4.18.2 OSLAN Hardware**

This network is based on 50 ohm multi-screened coaxial cable. PERO and other devices are connected to the coaxial cable by drop cables and transceiver boxes.

There are two types of OSLAN installation, start-up and full. The start-up system uses transceivers which join lengths of coaxial cable fitted with N type connectors. The full system uses transceivers with tap devices which pierce the coaxial cable along its length.

**Start-up systems**

These are for small installations and allow the connection of up to 10 devices to a single network segment up to 500 metres in length.

The standard lengths of coaxial cable range from 2.5 to 50 metres. A number of cables are chained together by the transceiver units and a 50 ohm terminator fitted at either end of the run. A single PERO or other device is connected to its transceiver by a drop cable up to 50 metres long. The drop cable has four twisted pairs in an overall screen and is fitted with a 15 way D connector at either end.

See the Planning and installation guide for start-up OSLAN systems 39400203 for further information.

## 4.18 OSLAN

### 4.18.2 Continued

#### Full systems

These systems can have several network segments joined together by repeater units. But devices connected must not be separated by more than two repeater units.

Each network segment has up to 500 metres of coaxial cable with a 50 ohm terminator fitted at either end. Up to 100 devices are connected to a network segment by tap transceivers and drop cables. A PERO or other device is connected to its transceiver by a drop cable up to 50 metre long. This cable has four twisted pairs in an overall screen and is fitted with 15 way D connectors at either end.

See the OSLAN planning and installation guide 39400202 for further information.

#### Transceiver boxes

These units containing the coaxial cable transmitters and receivers also have data encoding, data decoding, carrier and collision detection circuits. Power for all the circuits at plus 12 volts dc is supplied by the device through the drop cable.

#### Coaxial cable

The 50 ohm impedance multi-screened cable carries encoded data at a rate of 10 million bits per second. Transceiver box positions and cable lengths are arranged to minimise signal reflections for correct OSLAN operation.

The cable is usually marked at 2.5 metre intervals (the minimum distance between transceivers) and the network segment length related to the wavelength. However special test equipment is used to ensure that reflection levels are acceptable after installation.

The cable screens for each network segment are earthed at one point only and rubber boots are fitted to any connector bodies to avoid accidental contact.

#### Drop cables

These cables have four twisted pairs which carry transmitted data, received data, collision presence and plus 12 volts power for the transceiver box circuits. The screen is connected to 0 volts at the device. The cable may be installed in two ports. The transceiver being connected to a data port with a 15 way connector fixed to the building and a flying lead from the data port to the device.

PERO service contracts only cover the device and the drop cable actually connected to it.

## Overview

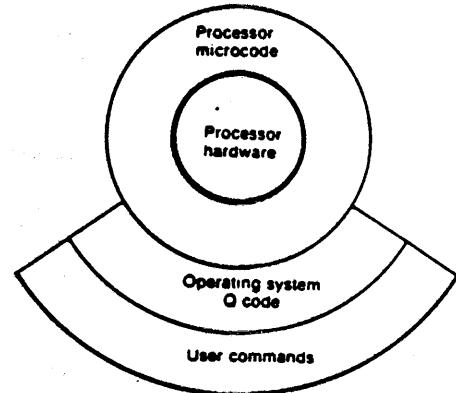
### 4.19 Operating systems

Two operating systems, POS and PNX, exist for use on PERQ systems.

#### 4.19.1 POS operating system: General information

This description relates to the diagram contained in section 4.19.1.

The PERQ Operating System POS is composed of a number of program modules which are the same as user routines and may be employed directly by user programs. The main program is called SYSTEM. This loads and transfers control to valid user programs in response to program names entered on the keyboard.



#### Program files

SYSTEM provides for the execution of two program file types:

- The linked O code output from the Pascal compiler identified by a name extension .RUN. File names without extension are accepted as .RUN files

example: NAMEA.RUN

- Command files having .CMD name extension. These consist of a list of .RUN files which are executed in turn without user intervention. System command procedure alternately loads Shell the command file interpreter and the RUN files named in the command file

example: NAMEB.CMD

#### System prompt

When run or command file execution is completed SYSTEM prompts the user for further instructions. Commands are invited, characters are reflected to the screen as typed and commands taken on receipt of a carriage return character.

example: >  
CR

#### Control and C

Program execution is interrupted by typing control and C. If ignored once a second input should be successful but may leave files in an unusable state. Use of the utility program SCAVANGER should correct this.

Section 5.1 gives an outline of POS system operation. The ICL PEQ system Software Reference Manual (POS) Edition 4, ALI gives full details of the operator facilities provided.

#### 4.19 Operating systems

##### 4.19.2 PNX operating system: general information

The ICL PNX operating system is a development of Bell Laboratories UNIX for use with PERQ hardware. The UNIX system is written in C language and widely used on a variety of computer hardware implementing a C code interface. A PERQ microcode executes C code instructions which are generated by the C language compiler.

#### **PNX features**

The PNX system has a:

- tree structured filestore and provides comprehensive file handling facilities
- powerful and versatile command language

The major features specific to PNX are:

- window manager, for the PERQ high definition display
- virtual store, for the execution of large programs
- device drivers, for PERQ hardware and devices connected to the GPIB and RS232 interfaces

#### **System prompt**

Commands can be input from the keyboard in response to a command line prompt. The two prompts are:

\$ for normal users

# for superusers

#### **CAUTION**

A superuser has access to all the files in the system, a normal user has only restricted access to the filestore.

#### **Command lines**

Command lines have the form:

Command [-flags] [argument]

For example the following command line lists all the files in a directory called user giving full details

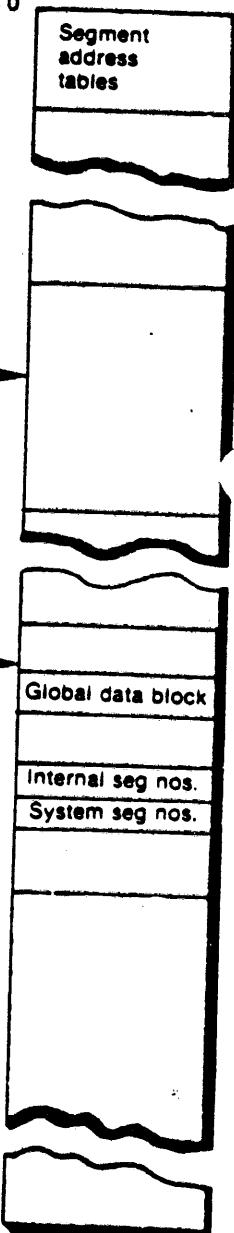
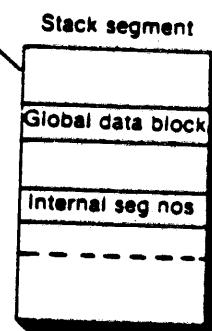
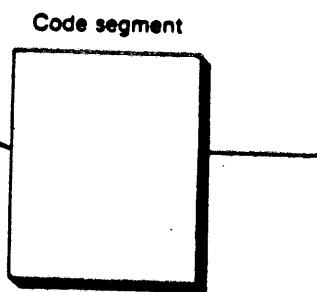
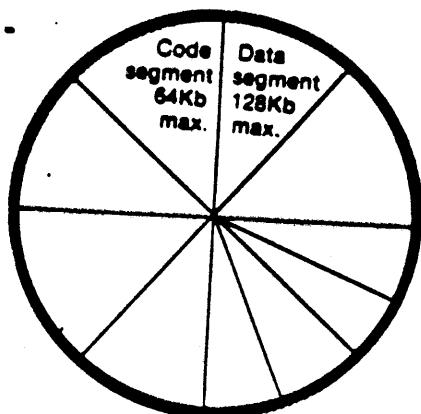
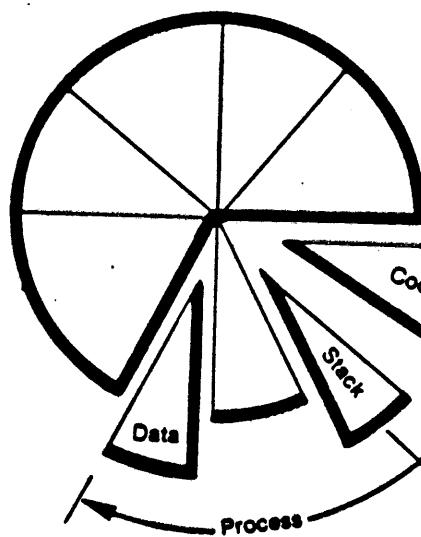
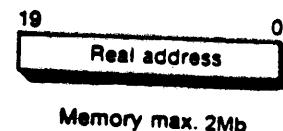
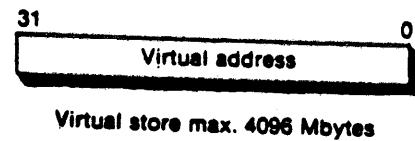
ls -t /user

Section 5.2 gives an outline of PNX system operation. Full information is provided by the ICL PERQ: Guide to PNX (RP10103) in conjunction with the UNIX Programmers Manual (RP10125, RP10126 and RP10127).

**Overview**

**PAGE RESERVED**

## 4.20 POS Memory organisation

4.20.1 General information on POS memory organisation

## Overview

### 4.20 POS Memory organisation

#### 4.20.1 Continued

This description relates to the diagram contained in section 4.20.1. This is the way the POS operating system organises the storage of programs and data in memory.

The system has a virtual store with an address range of 4096 million bytes. Items from the virtual store are held by the discs and memory.

#### Segment

The virtual store is divided into segments which are multiples of 512 bytes and referenced by segment numbers. The segments are either code segments or data segments.

#### Code segment

Segments of code for execution by the processor have a maximum size of 64 Kbytes; they are accessible on a read only basis.

#### Data segment

Segments of data have a maximum size of 128 Kbytes; they can be written to or read from.

#### Process

A number code and data segments are grouped together to form a process (program). A minimum of two segments is required: a code segment and a data segment defined as the process stack segment.

#### Stack segment

The stack segment (M Stack) contains internal segment numbers (generated by the compiler) which link the segments within a process. The stack segment also contains a global data block (GDB) which allows access to data not included in the process.

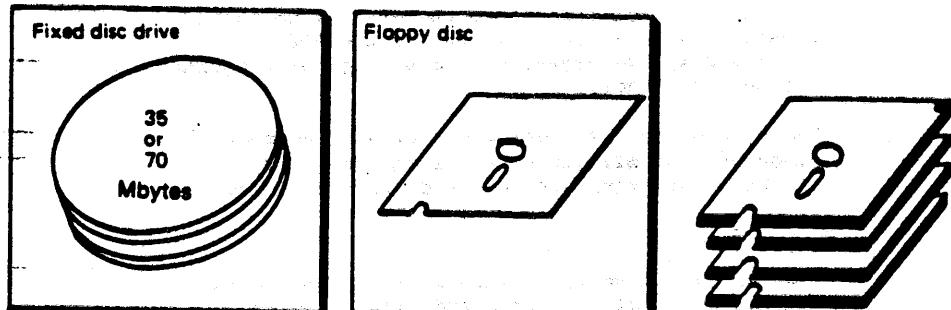
#### Process in memory

To run a process it is loaded into memory. The segments loaded are referenced by segment address tables (SAT) in memory starting at address 0. During loading internal segment numbers (ISN) are related to system segment numbers (SSN) in the segment address tables and by further entries in the stack segment.

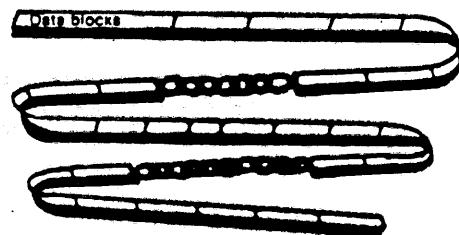
Much of the arithmetic of a Q code process is performed on operands addressed by means of the GDB and transferred to the CPU expression stack (E stack).

## 4.21 POS Filestore

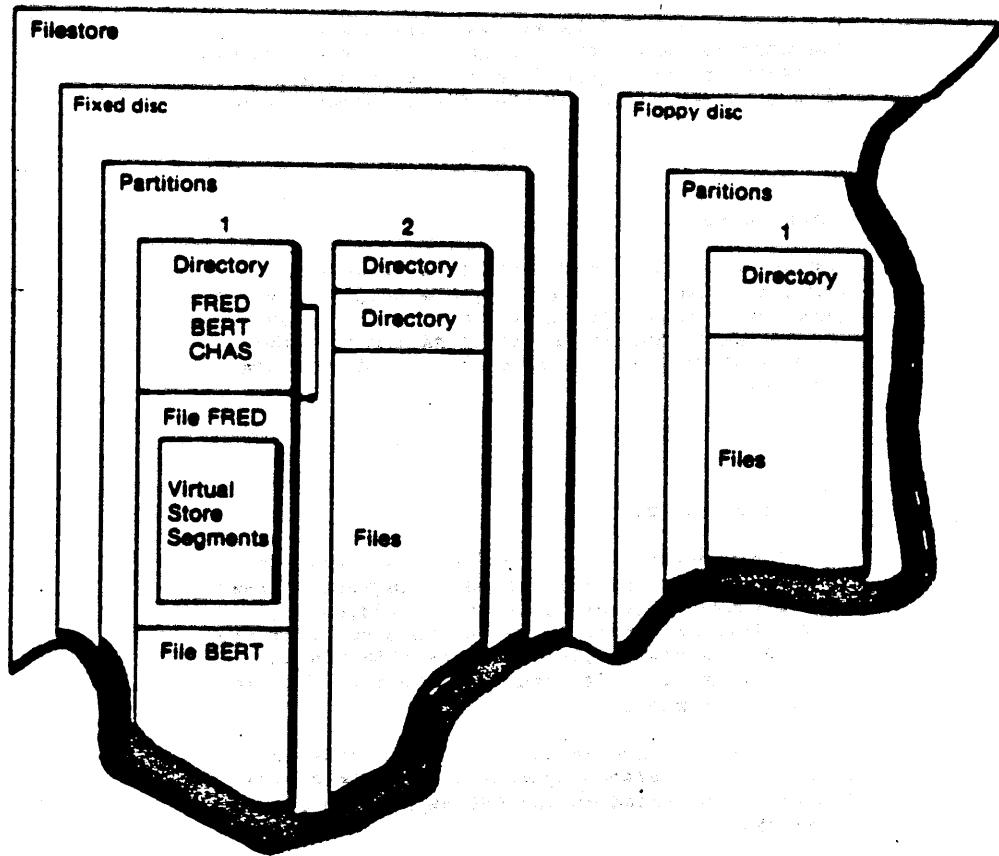
### 4.21.1 General information on POS filestore



Filestore devices



File



## Overview

### 4.21 POS Filestore

#### 4.21.1 Continued

This description relates to the diagram contained in section 4.21.1.

This is the way the POS operating system organises the storage of program and data files.

#### Filestore devices

Virtual store code and data segments are held in files by the filestore devices, the fixed and floppy discs. The device surfaces are formatted to hold the information in 512 byte blocks. A file consists of a number of blocks linked together forming a chain.

#### Partitions

The filestore is split into a number of manageable partitions, a filestore device holding one or more directories.

#### Directories (Dirtree)

Named files within a partition are listed in directories (held as separate files). At least one directory (the root directory) is provided for each partition. Other directories forming a tree structure are created to suit particular system applications.

#### Filestore paths

Files are accessed by means of paths. The path leads the way to a file within the system and consists of:

Root directory (Device) -partition-directories-file name

#### File types

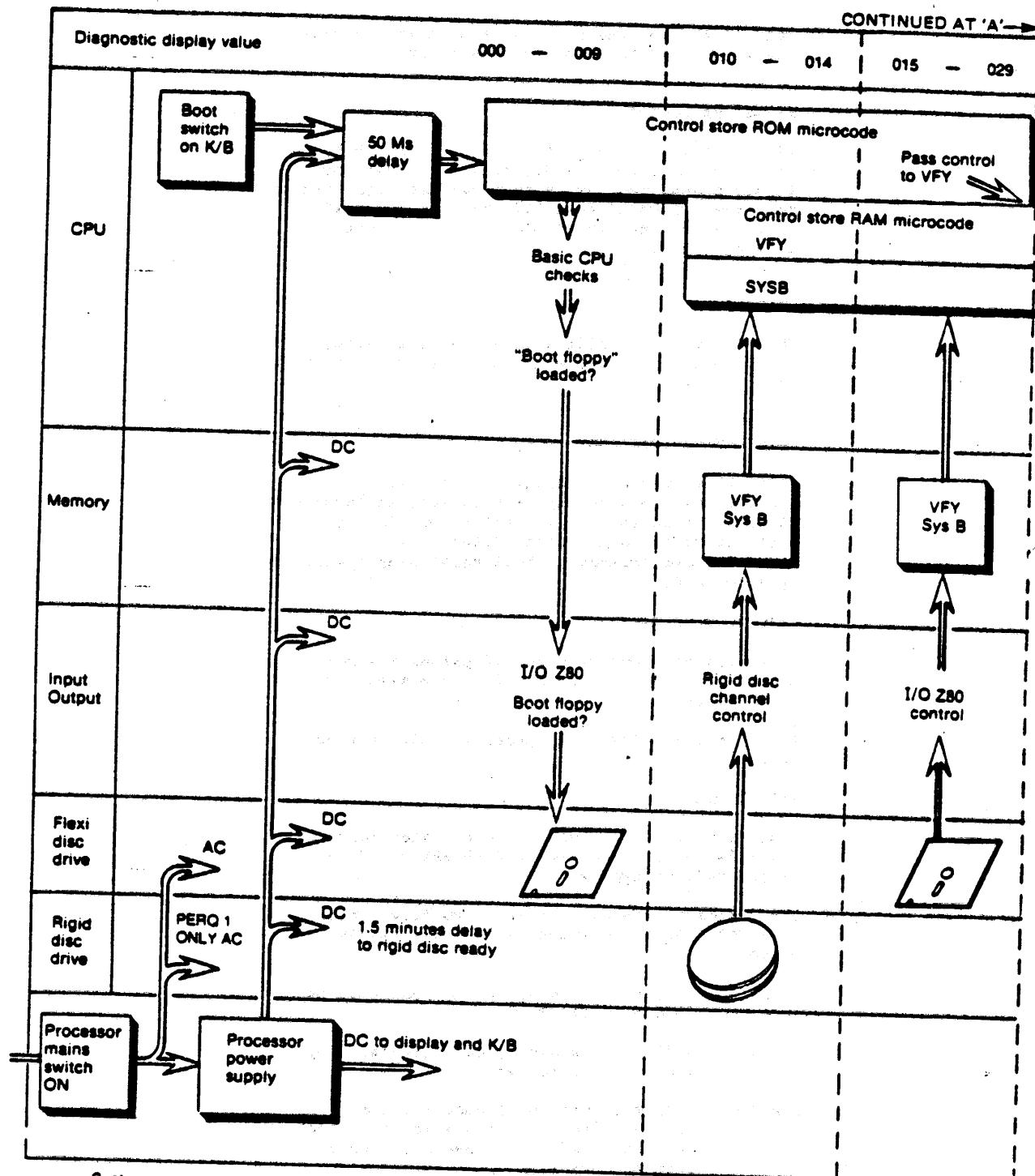
PERO file types are identified by extensions to the file name. For example, FRED.PAS - a file called FRED of type PAS.

The following are some of the PERO file types; full details may be found in the user reference manual.

- PAS A file containing source code for the PASCAL compiler
- SEG A file containing O code generated by the PASCAL compiler
- RUN A file containing O code and the framework to allow its execution, that is, code and data segments linked to form a process
- CMD A file listing run files which the operating system will initiate in turn
- DR A file containing a directory
- MBOOT A file containing the microcode interpreter
- BOOT A file containing the operating system

## 4.22 POS system load

## 4.22.1 General information on POS system load



System establishment is started by power ON or the 'boot' switch.

Verify tests (VFY) and the system boot loader (SysB) are read from the flexidisc drive or from the rigid disc drive if a "boot floppy" is not fitted.

## Overview

### 4.22 POS System load

#### 4.22.1 Continued

This description relates to the three diagrams contained in section 4.22.1.

This is the way the POS operating system user interface is established.

##### • Diagnostic display

During system establishment the diagnostic display on the front of the processor will display a number relevant to the action in progress.

In the event of an unsuccessful action, the system halts with the relevant number displayed. The display reads 999 at the successful completion of the system establishment process.

##### Display increment

The microcode causes the display to be incremented at the end of a routine if the CPU expression stack is reset. In the last phase of system establishment a 0 code instruction called increment diagnostic display is used.

##### Establishment initiation

System establishment is initiated either when power is applied to the system by operation of the ON-OFF switch, or by depression of the button mounted on the keyboard adjacent to its cable entry point.

##### Fixed disc delay

There is a delay in the establishment process to allow the fixed disc to come up to speed. This is 30 seconds on Micropolis 8 inch (T1) and 20 seconds on Micropolis 5.25 inch (T2).

##### CPU ROM microcode

After a 50 ms delay from initiation the control store read only memory is addressed and the microcode it contains entered. This code provides simple tests of the CPU and Memory. At the successful completion of these tests the ROM microcode looks for a device from which to load further microcode to the control store RAM. If a link feature is not fitted the first choice is floppy disc. If the drive is not loaded with a "boot floppy", then the fixed disc is selected. 3K words of microcode are written to the control store for the second phase of the establishment. The microcode loaded consists of two parts:

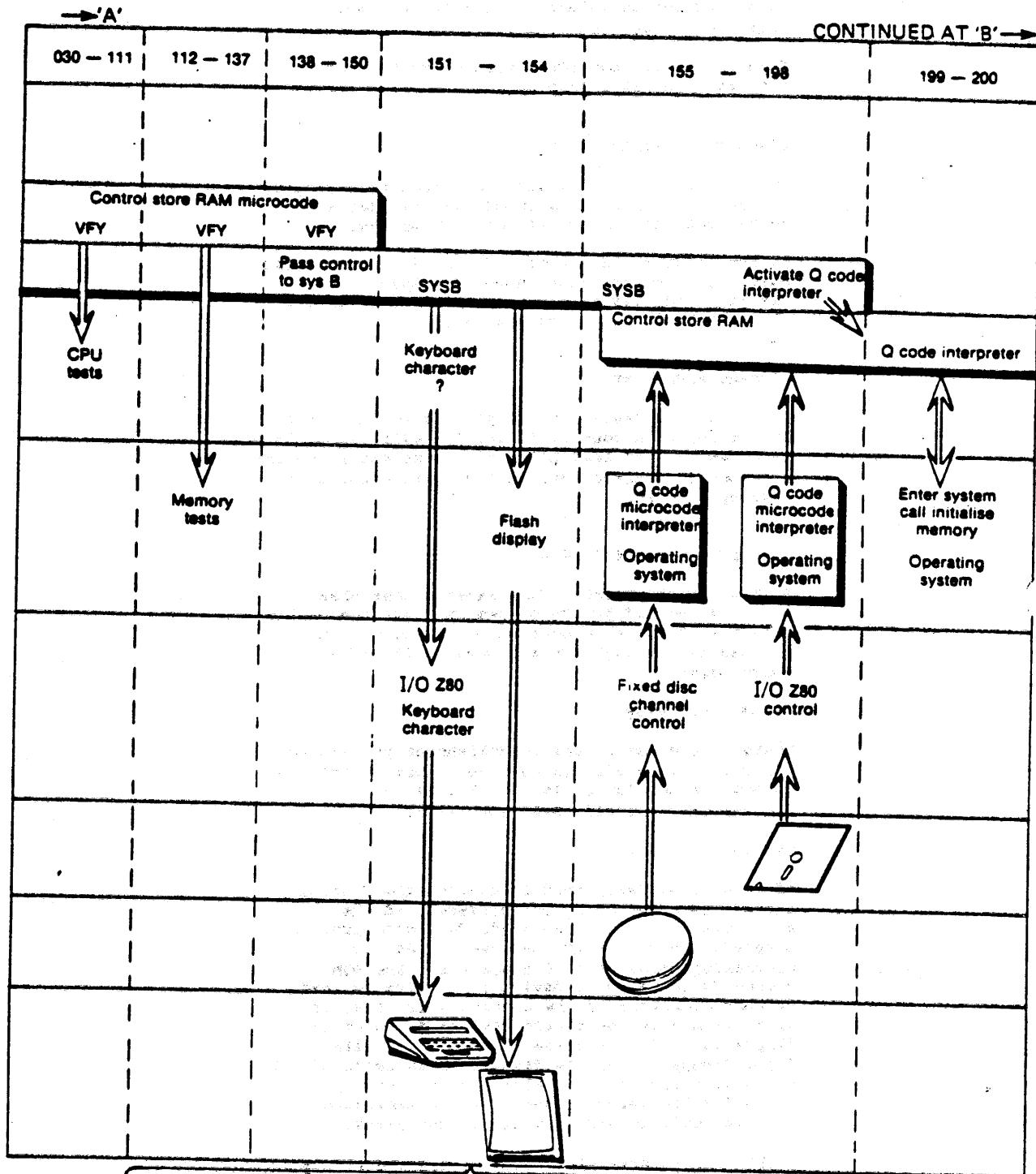
- VFY More extensive tests of CPU and memory
- SYSB The operating system boot loader

Two copies of the VFY and SYSB microcode are written on the fixed disc, one at track 0 head 0, and the other at track 1 head 1. If the first copy cannot be read then an attempt is made to read the second.

The seek complete signals from the drive are not used, the microprogram provides more than adequate delays.

#### 4.22 POS system load

#### **4.22.1 Continued**



If a lower case K/B character is depressed at this time, microcode and operating system are read from fixed disc.

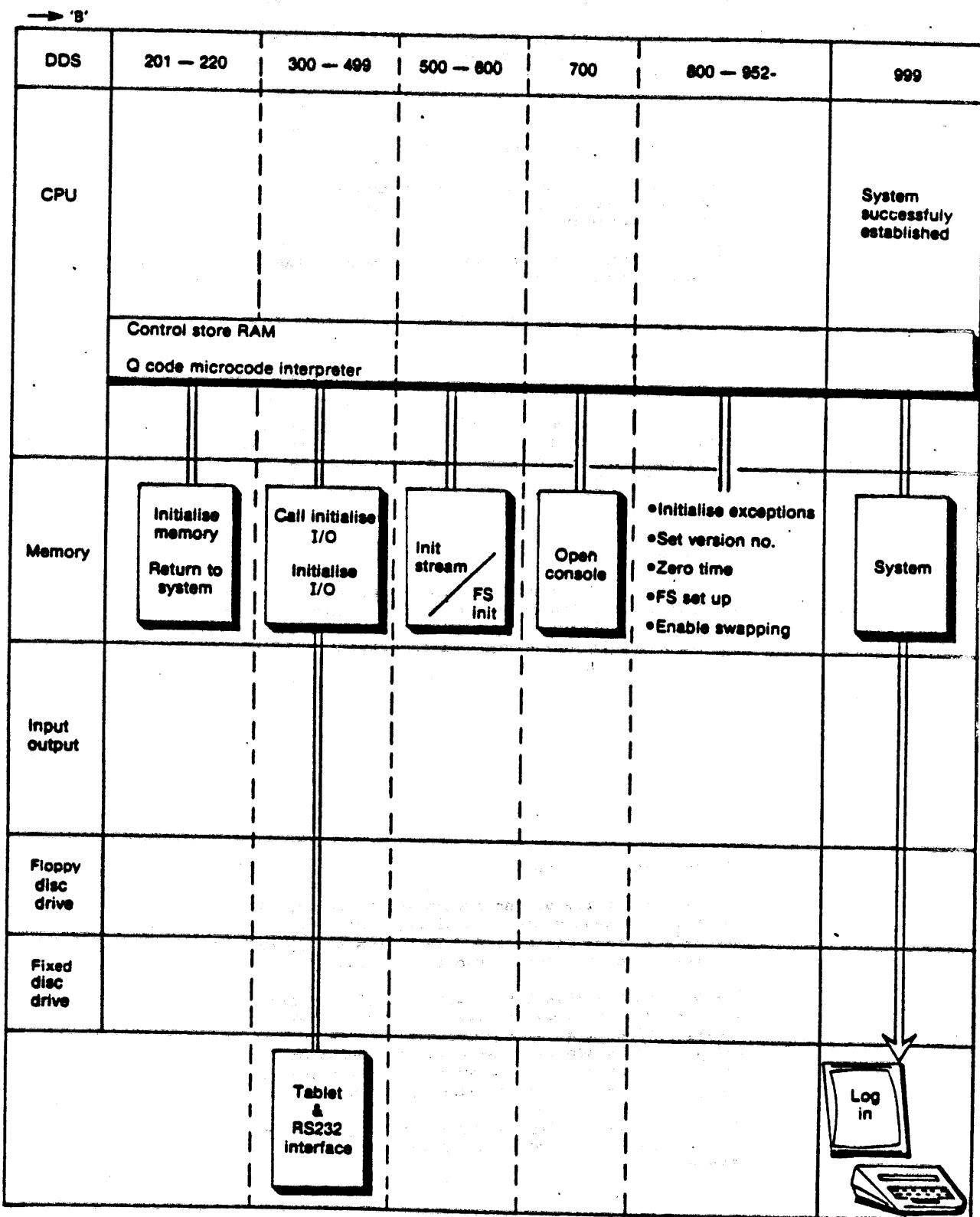
If no character depression is detected default is 'a'.

If an upper case K/B character is depressed at this time, microcode and operating system are read from floppy disc.

## Overview

### 4.22 POS system load

#### 4.22.1 Continued



## 4.22 POS system load

### 4.22.1 Continued

#### VFY, SYSB

When the microcode test VFY is successfully completed the system boot loader SYSB looks for a keyboard character depression. This will determine which G-code interpreter microcode and operating system it is to load. If no key is depressed the loader acts as though 'a' had been detected.

#### Keyboard boot character

Any of the alphabetic keys may be used to identify a system although in practice only two or three are normally used.

The load device is selected by the case of the keyboard character detected:

- Upper case characters select the floppy disc drive
- Lower case characters select the fixed disc

A pattern is flashed momentarily on the screen to indicate that the boot keyboard character has been detected and that depression of the key is no longer required.

#### G code microcode

The system boot loader loads the microcode interpreter and the operating system to the memory. The interpreter is written to the control store. Initialisation required to allow execution of the operating G code is performed.

#### System initialisation

In the third phase of the system establishment all parts of the system are initialised, interrupts enabled, virtual memory and file system set up and all made ready for normal run time operation.

The operating system loaded consists of a number of code and data modules defined in the system configuration file. Some modules must remain permanently in memory, some even in particular locations. The rest may be swapped between memory and disc as required when swapping is enabled.

The diagnostic display is incremented to 999, the user is invited to log in and provide password date and time.

## Overview

### 4.23 PNX System load

#### 4.23.1 General information on PNX system load

This description relates to the two diagrams contained in section 4.23.1.

This is the way the PNX operating system user interface is established.

#### Diagnostic display

During system establishment the diagnostic display registers a number relevant to the action in progress. In the event of an unsuccessful action, the system halts with the relevant number displayed. The display reads 255 at the successful completion of the system establishment process.

#### Display increment

The microcode causes the display to be incremented at the end of a routine if the CPU expression stack is reset. In the last phase of system establishment a C code instruction is used. Section 2.3 relates halted activities to possible causes.

#### Establishment initiation

System establishment is initiated either when power is switched ON or by pressing the boot button.

#### Fixed disc display

There is a delay in the establishment process to allow the fixed disc to come up to speed.

#### CPU ROM microcode

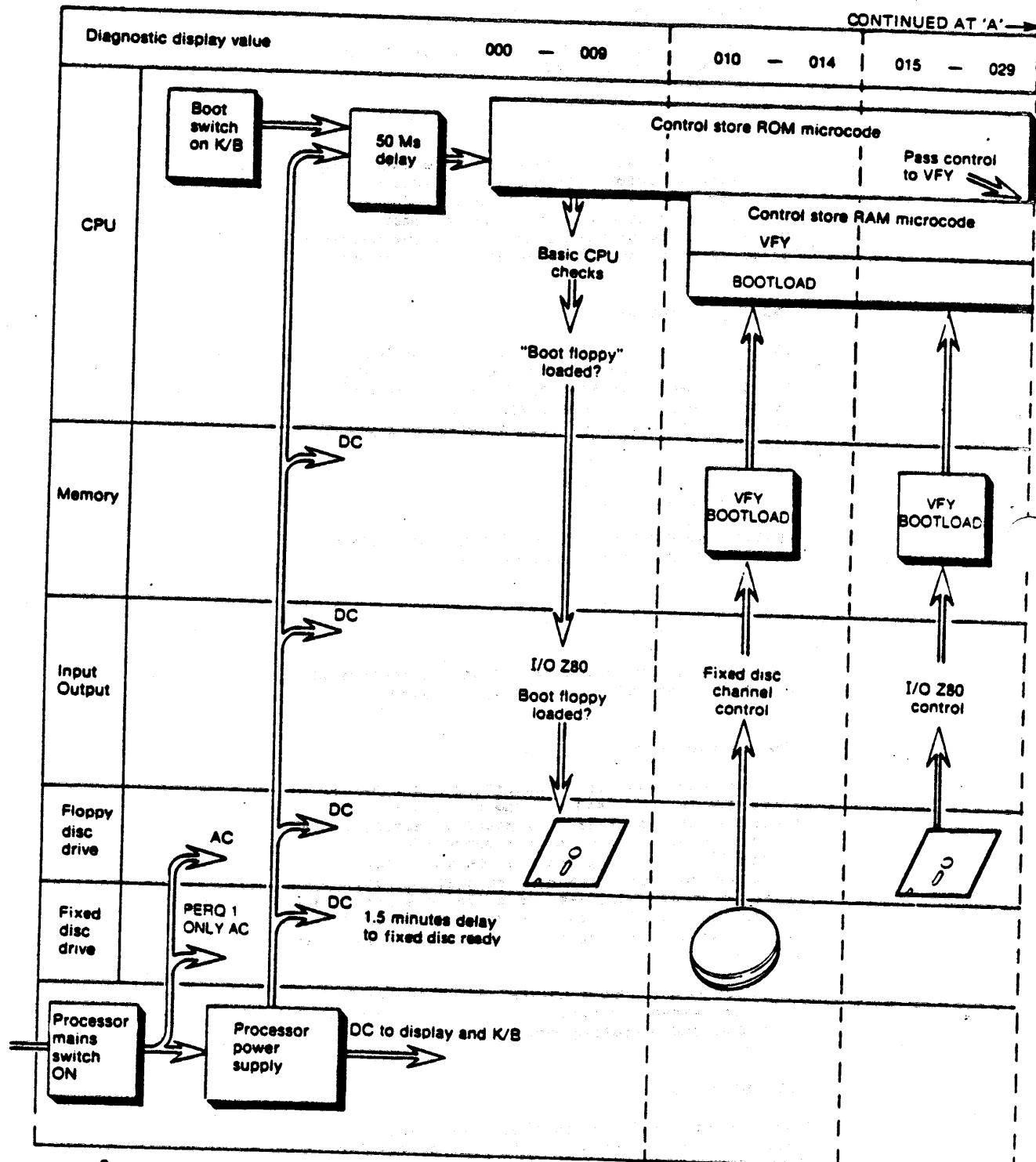
After a 50ms delay from initiation the control store ROM is addressed and the microcode it contains entered. This code provides simple tests of the CPU and memory. At the successful completion of these tests the ROM microcode looks for a device from which to load further microcode to the control store RAM. If a link feature is not fitted the flexidisc is selected. If the drive is not loaded with a boot floppy, then the fixed disc is selected.

The microcode loaded consists of two parts:  
.VFY More extensive tests of the CPU and memory  
.BOOTLOAD The operating system loader.

#### VFY, BOOTLOAD

When the microcode verify tests (VFY) are successfully completed, BOOTLOAD loads the C code interpreter and then the system C code. The interpreter is transferred to the control store. The diagnostic display is incremented to 255, control passes to the system and the user is prompted to log in.

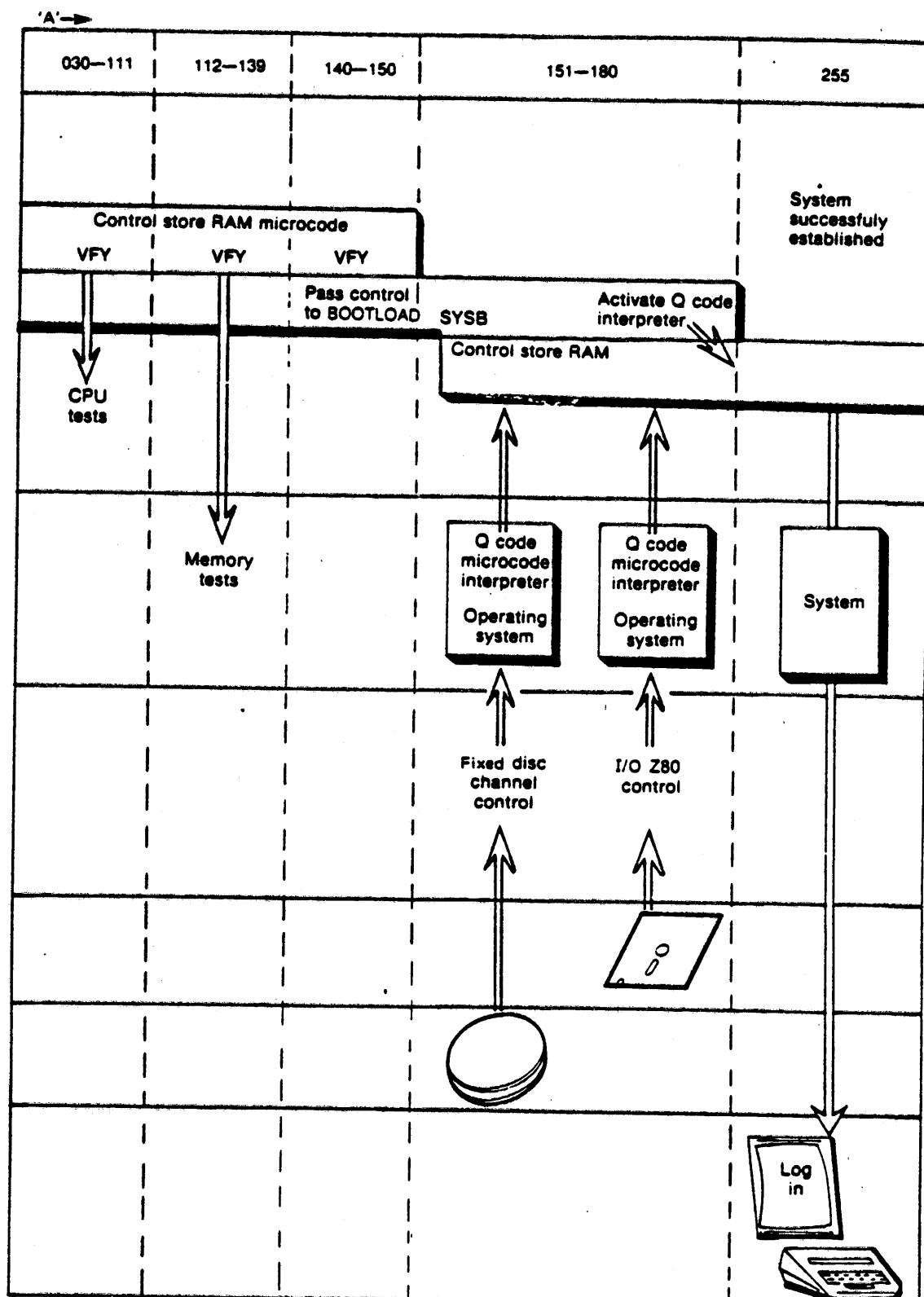
## 4.23 PNX system load

4.23.1 Continued

**Overview**

**4.23 PMX system load**

**4.23.1 Continued**



## **Entry to the problem**

## **Isolating the problem**

## **Functional diagrams**

## **Overview**

**5**

## **Operating information**

## **Reference information**

## **Procedures**

## **Technical notes**

This section contains information to support operation of the system by the engineer. The information covers general operation, test software and system construction.

There are two different incompatible operating systems for PERQ. Either system may be used with PERQ2 hardware. The two systems are:

- the PERQ operating system POS
- the PERQ version of UNIX called PNX

Information about the two operating systems is separated at the subsection level. Differences in test software operation for each Operating system and types of hardware are given in the text.

<u>Section</u>	<u>Heading</u>
5.1	POS system
5.1.1	The operating system
5.1.2	The utility programs
5.1.3	The editor utility
5.1.4	The floppy utility
5.1.5	The makeboot utility
5.1.6	The partition utility
5.1.7	The scavenger utility
5.2	PNX system
5.2.1	The operating system
5.2.2	Commands and utilities
5.3	Test software
5.3.1	Test software issue
5.3.2	Loading the tests
5.3.3	POS transfer to fixed disc
5.3.4	The CPU board confidence tests
5.3.5	The memory board confidence test
5.3.6	Installation test floppy
5.4	I/O Test software
5.4.1	The I/O confidence test suite
5.4.2	Loading the tests
5.4.3	PERQ2 I/O test control
5.4.4	The floppy disc drive test
5.4.5	The fixed disc drive test
5.4.6	The RS232 loop-back test
5.4.7	The tablet test (GPIB)
5.4.8	The keyboard test
5.4.9	The screen linearity test
5.4.10	The ICL 3185 printer test (RS232)
5.4.11	The ICL 6202 printer test
5.4.12	The ICL 6203 printer test
5.4.13	The PERQ OSLAN test

## Operating

### 5.1 POS System

This section gives basic information needed to operate the system using version POS R4 or later versions for PERQ2 hardware.

#### 5.1.1 The operating system

The operating system and utilities are supplied as files on floppy discs. These are used to build the system on the fixed disc.

The system created consists of:

- the Boot files used during the system establishment
- the main operating system program called SYSTEM with supporting modules
- the command interpreter called SHELL
- the utility programs whose names are recognised as commands by SHELL

The system provides the operator with an interface which allows programs to be written, edited, compiled, stored and executed. This interface also supports system modification and on-line test software operation.

#### Logging in

When the system has been established, by power ON, or BOOT button depression, control passes to SHELL and the LOGIN utility is entered automatically.

The operator is requested to enter:

- dd mm yy HH:MM:SS
- the date and time in the form: date ~~dd-mm-yy~~ carriage return, dd-mm-yy (day month year Hours Seconds.)  
For example 17 MAY 83 16:05
  - the user's name and password. When initially built a carriage return character is accepted. If it is necessary a password must be obtained from the user

#### Command line prompt

When the operator has logged in, the SHELL Prompts the input of a command line. Valid commands to the system include the names of the utilities outlined in section 5.1.2. These commands may be qualified by parameters and program switches. Details of the syntax are given in the System Software Reference Manual. A command line is terminated by a carriage return character (CR).

The command line may consist of a run file name which is not a utility. SHELL then loads and runs that program.

The # command must be used to load and run command files.

## 5.1 POS System

### 5.1.1 Continued

#### HELP key

Pressing the HELP Key or, typing the command line HELP carriage return, causes the valid commands to be listed on the screen. The commands are displayed in a pop-up menu controlled by the tablet pointing device. Help specific to particular commands is also available. This is selected by typing the particular command and then pressing the HELP key.

#### Pop-up menus

The pop-up menus provided by the SHELL and some utilities may be used for command selection and control. The tablet cursor is used to point out an item on the menu which is then selected by pressing a switch on the tablet pointing device.

#### Special keys and control characters

The operating system supports the use of other special keys and a number of control characters. These are used for input line editing and program control. The control characters are input by typing the character while holding down the CONTROL key.

#### Input line editing

The special keys, control characters, and their effect are:

- BACKSPACE or CONTROL and H; erases the last character typed
- CONTROL and BACKSPACE or CONTROL and W; erases the last word typed
- OOPS or CONTROL and U; erases the last line typed

#### Program control

- CONTROL and C; aborts the current program the next time input is requested from the operating system
- CONTROL and C typed twice; aborts the current program immediately. This may leave the file system in an untidy state and is not recommended unless in real difficulty
- CONTROL and S; suspends program output to the screen
- CONTROL and Q; program output to the screen is resumed after suspension
- CONTROL, SHIFT and C; dumps the run time stack and aborts the current program or command file
- CONTROL, SHIFT and D; dumps the run time stack and enters a software debugging program called SCROUNGE

## 5.1 POS System

5.1.2 The utility programs

This section lists the utility programs that are available as commands to SHELL (the command interpreter). More information is given for the complex utilities relevant to basic service needs. The system Software Reference Manual gives full details of the utilities.

In general the utility programs are self prompting. Self explanatory menus are displayed and clear indications are given of operator inputs required.

**Commands**

The following is a table of the SHELL command names and their basic functions.

Command	Function
?	Lists all the commands SHELL will interpret
@	Executes a named command file. The command line is @ filename carriage return
APPEND	Attaches one file to another
BYE	Logs the operator off the system
<b>CAUTION</b>	
	If the BYE command is not used to power down the system, temporary files will not be removed until the SCAVEGER program is run
CHATTER	Allows the system to act as an RS232 terminal
COMPILE	Compiles a Pascal or Fortran source program. The input file is type .PAS or .FOR, the output file is type .SEG which may be linked and run
COPY	Creates a new file identical to the source file
DELETE	Erases a file
DETAILS	Displays current system status information
DIRECTORY	Displays a list of files in a directory. Typing DIRECTORY gives the names of files in the current directory only
DIRTREE	Displays a graphic representation of the directories for the whole file system
DISMOUNT	Detaches a disc from the file system. The command DISMOUNT F must be given before removing a file system floppy disc from the drive
EDIT	Creates and amends text files
EXPANDTABS	Allows tabulated files from an alien system to be used on PERO which does not support tabs

## 5.1 POS System

5.1.2 Continued

Command	Function
FINDSTRING	Searches through a number of files for a particular string of volumes
FLOPPY	Floppy disc drive utility
FTP	Transfers files across an RS232 interface
HELP	Provides information about commands and pop-up menus
LINK	Creates .RUN files from .SEG files. See COMPILE and RUN
LOGIN	Initiates a user session. Called automatically when the system is established
MAKEBOOT	Creates system boot files.
MAKEDIR	Creates new empty directories
MOUNT	Attaches a disc to the file system. The MOUNT FLOPPY command must be given when a file system floppy diskette is loaded
PARTITION	Creates and modifies file system partitions.
PATCH	Allows the examination and modification of files
PATH	Changes the directory being used
PAUSE	Suspends the execution of a command file
PRINT	Outputs files to a printer
ODIS	Decodes .SEG files into Q code
RENAME	Used to move a file to another directory
RERUN	Executes the last program run again
RUN	Runs an identified program. If a program identity is not input the last file to have been edited, compiled, linked or run is addressed
SCAVENGER	Checks the file system structure and rectifies errors, reconstructs directories.
SCREENSIZE	Sets the number of lines on the display to be used by a program
SETBAUD	Specifies the data rate for the RS232 interface
SETSEARCH	Modifies search lists
SETTIME	Allows the date and time to be changed
STATISTICS	Reports the time taken for various program operations
SWAP	Disenables and enables the virtual memory system
TYPEFILE	Displays the contents of a file
USERCONTROL	Modifies user names and passwords

## Operating

### 5.1 POS System

#### 5.1.3 The editor utility

This utility allows you to display files on the screen, change their contents and create new files. The editor has a wealth of facilities selected and controlled by use of the tablet and keyboard. Only an outline of the most basic facilities is given here. The HELP command and the system software reference manual provide more information.

##### Entering the editor

Type EDIT filename

If the file does not exist you are prompted to retype the name or press RETURN to create a new file.

##### Display control

The display on the screen is divided into three areas: the header, the left-hand margin and the text area. The part of the file displayed in the text area is selected by tablet cursor point and press actions. The screen cursor symbol and tablet cursor button function depend on the screen area pointed at.

Coarse control is obtained by pointing to the thumb bar in the header area and pressing the yellow, or left hand, button. A O cursor indicates the part of the file to be displayed in the screen text area.

Fine control is obtained by pointing to a line at the left-hand margin and pressing the button.

An upward arrow cursor moves the line to the top of the screen.

A downward arrow cursor moves the top line down to the cursor.

##### Selecting text

The place to insert or delete text on the screen must be selected. For basic text selection use the tablet cursor to point to a:

- character and press the button once
- word and press the button twice
- line and press the button three times

The selected text is underlined.

The whole file can be selected by typing \*

##### Commands

The editor commands include help, delete and insert. Press the HELP key and a list of commands and keywords are displayed. Type a word or letter in the list and further information will be displayed. (It may be necessary to press DEL before HELP.)

Type D to delete the currently selected text and select the next unit.

### 5.1 POS System

#### 5.1.3 Continued

Type I to insert text before that currently selected. When the insertion has been typed press INS to change the file or DEL to abandon.

The editor produces a 'clean copy' of the file but the original is not updated until you leave the editor.

#### Leaving the editor

Type Q to quit and the editor will prompt you to type:

- U to update, \$ is appended to the old filename and a new file created with your changes
- W to write, you are prompted for the name of a file to write the edited text in
- E to exit without updating any files
- R to re-enter the editor utility

## 5.1 POS System

5.1.4 The floppy utility

The utility called FLOPPY is used to format, write, and read floppy diskettes. Either RT-11 or filesystem formats may be used. This program will transfer files to the fixed disc.

Some of the commands are outlined below, for full details the ICL PERQ System Software Reference Manual (POS) Edition 4, AL1 and AL2 should be consulted.

Command	Function
DELETE DIRECTORY	This command will delete the files named from a floppy diskette Lists the files held by a diskette on the display screen
DUPLICATE	Copies the contents of one diskette to another
FAST	CAUTION Inhibits requests for confirmation before writing. This Command is for use in command files only
FORMAT	CAUTION Formats a diskette destroying its current contents
GET	Copies files to the fixed disc
HELP	Provides general help information. Help specific to a command is obtained by typing the command name HELP
PUT	Copies files from the fixed disc
QUIT	Exits the utility
TYPE	Lists a file on the screen
COMPARE	Compares named files on the fixed disc with ones on a cartridge
ZERO	CAUTION Creates a new directory on the diskette. This effectively destroys its current contents
PATH	Changes the directory being used

### 5.1 POS System

#### 5.1.5 The makeboot utility

This program creates a new boot file from the specified stand-alone run file and then associates that boot file with a letter that is specified by the user.

MAKEBOOT uses the directory part of the run file name to determine which device and partition the system will be booted from. In order to create a boot file the run file must be copied to that partition before the MAKEBOOT program is run.

Any program can be made into a stand-alone run file by initialising various modules. It is not usually necessary or desirable to create stand-alone run files except for a new system.

The program is self prompting.

After the run file name has been specified the program requests the configuration file name to be used. This file informs the program of the system modules that can be supplied. The default system configuration file is named SYSTEM.nn.CONFIG and has the following format:

```
*SAT* UM
*SIT* US
*CURSOR* UM
*SCREEN* UM
*FONT* US
*IO* UM
SYSTEM SW
STREAM SW
WRITER SW
IOERRMESSAGES SW
LOADER SW
READER SW
PERQ_STRING SW
SCREEN SW
FILESYSTEM SW
CODE SW
GETTIMESTAMP SW
FILEDEFS SW
MEMORY SW
IO_INIT SW
RUNREAD SW
FILEDIR SW
SCROUNGE SW
```

where SW is swappable, UM is unmovable (that is the module cannot be swapped or moved) and US is unswappable (that is it cannot be swapped but it may be moved in memory).

The default is that modules are unswappable, so only the modules in the system that require to be swappable or unmovable need to be so specified.

The system data segments that the hardware uses are required to be unmovable; the data used by software (\*SIT\* and \*FONT\*) are required to be unswappable; and everything else that is not used by the swapping system itself can be swappable.

When the configuration file has been specified, or the default file has been specified by pressing RETURN, the program requests the letter to be used to boot the system. The default letter used is lower case a.

## Operating

### 5.1 FOC System

#### 5.1.5 Continued

Normally lower case letters are allocated for boot files on the fixed disc and upper case letters for boot files on the floppy disc. Makeboot will only accept lower case letters. The letter can be disassociated from a boot file by deleting the system and/or interpreter boot files. A letter must be used that has not already been assigned to boot another system. The DETAILS program can be run to list letters that have already been assigned.

When the letter has been specified the program requests whether or not to write the boot microcode on to the device. Since there is only one boot microcode for a device this need not be specified unless modifications to the file VFY.MICRO or SYSB.MICRO are required.

There are two files associated with each boot letter. One is the system boot file (a PASCAL file) and the other is the interpreter boot file (a microcode file).

The system boot file is created by MAKEBOOT, if required, and takes the form:

SYSTEM.nn.bootletter.BOOT

An alternative system boot file can be specified, or copied from an existing boot file. If a system boot file is not copied from an existing boot file the program will create a new one. The character set used by the system boot file may be specified but if the default character set is not used (that is PIX13,EST) some programs, for example the EDITOR, may not perform as required.

The interpreter boot file is usually a standard file. If a boot file has already been created for the current letter and the microcode is unchanged then it is not necessary to create a new interpreter boot file, although it is recommended to do so.

The interpreter boot file is created by the MAKEBOOT, if required, and takes the form:

SYSTEM.nn.bootletter.MBOOT

An alternative interpreter boot file can be specified, or copied from an existing boot file. If an interpreter boot file is not copied from an existing boot file the program will create a new one.

The program will assign the boot files to any specified partition, but it is important that the interpreter and system boot files are in the same partition.

The device and partition in which the boot file is located will be the default path after the system has been booted. Therefore there must be a LOGIN.nn.RUN and a SHELL.nn.RUN file in the root directory of that partition (where nn is the version number of the run file). The boot files may be in a subdirectory in the partition but the run files must be in the root directory.

## 5.1 POS System

### 5.1.6 The partition utility

This program creates and modifies partitions on the filestore devices.

The ICL PERQ: System Software Reference Manual Edition 4, AL2 must be consulted for details of the program and its use. The following notes highlight points where particular care is needed.

#### **CAUTION**

A device must have been formatted before the program can be run. The fixed disc should not normally require reformatting. However if the customer situation requires this to be done advice should be sought from support. Floppy diskettes are formatted using the FLOPPY utility program.

The program is self prompting and the option of a dry run is provided if the program is entered by typing PARTITION carriage return. Entering the program with the build switch set is not recommended. Great care is still needed when attempting a dry run as it is very easy to repartition a disc by mistake.

Creating a partition effectively destroys all the data currently existing on that area of the disc.

If the device name is changed then no program, including the operating system, on that device can be run.

If the device on which the program is run holds the operating system, control and C, or control shift and C, must not be typed during the run.

The program asks whether you wish to initialise the partition pages. This makes all the pages in the partition available for use. If the partition pages are initialised then the associated options to test the initialisation and to write each page twice should be selected. Any suspect blocks found in the partition will then not be made available for use.

The scavenger utility must be run after partitions have been created or modified.

## Operating

### 5.1 POS System

#### 5.1.7 The scavenger utility

This program will check the structures within the filesystem, rectify any errors found, and reconstruct the directories.

Use of the SCAVENGER may be requested by a program currently running. But it may be run when files are apparently missing or to remove unreadable boot files. the SCAVENGER must be run after partitions have been created or modified by the PARTITION utility program.

The ICL PERQ: System Software Reference Manual, Edition 4, AL1 and AL2, must be consulted for details of the program. However the following notes highlight some points regarding its use.

#### CAUTION

The program is self prompting but some caution in its use is necessary if a loss of data is to be avoided.

If a partition is full, the program will request the deletion of some files to allow it to run.

CONTROL and C or CONTROL SHIFT and C must not be typed after the program starts writing.

The program can be used to detect and report errors without attempting correction.

It is normally quite safe to scavenge the partition in which you are running.

If errors are to be corrected, temporary files may be deleted but suspect blocks on the fixed disc should not be rewritten.

## 5.2 PNX system

This section gives basic information needed to operate PNX on PERQ2 systems.

The minimum release levels are:

PNX2 for PERQ2 T1  
PNX3 for PERQ2 T2

### 5.2.1 The operating system

The PNX operating system, utilities and documentation are supplied on 12 diskettes. These are used to build the system on the fixed disc.

The system built consists of the:

- boot files used in system establishment
- basic system (kernel)
- C language compiler
- Fortran 77 compiler
- utility programs
- system documentation

The system provides the user with a command language interface which allows programs to be written, edited, compiled, stored and executed.

#### Loading the PNX system

The system is loaded from the fixed disc when power is switched ON or the boot switch is pressed. The DDS reaches 255 at successful system establishment.

The filestore check program is run and a login: prompt displayed.

#### Logging in to PNX

Set the date and time as prompted. For example type in lower case 18 may 1730 RETURN.

Type y or n to confirm the date and time are correct. (The RETURN default is y.)

The screen clears, there is a bleep from the loudspeaker, the operating system displays its identity and invites you to login:

Type in a user name known to the system. For example the superuser name root RETURN.

You will be invited to type the password. The superuser password is usually root RETURN. (This is not reflected on the screen.)

The system will now display a command line prompt:

\$ for normal users

# for superuser

## Operating

### 5.2 PNX System

#### Logging out

Always log out of PNX in the proper way or files on the fixed disc will not be correctly updated.

If in Single User mode type BYE. If in Window Manager mode:

Select Window Manager window.

Type 'd' and enter - this changes the cursor to a box with a superimposed X.

Place cursor in Window Manager window and press the left button (3-button puck) or yellow button (high resolution puck).

Answer question to delete windows with 'y' - the windows disappear.

Type BYE.

The system may now be switched off.

#### Special keys and control characters

A number of special keys and control characters are used for keyboard input, line editing and program control.

For input line editing the special keys and their effect are:

DEL erases the last character typed (not backspace)

OOPS erases the last line typed (before return)

For program control:

CONTROL and c, interrupts and normally aborts the current action

CONTROL and z forces an end of file condition

CONTROL and p stops and starts the display scrolling

When listing and the screen is full RETURN displays the next line and any other key the next screen.

## 5.2 PNX System

5.2.2 Commands and utilities

A full list of commands is given in the ICL PERQ: Guide to PNX or can be listed on the screen by the command line ls /bin

The following examples are a few commands you may find particularly useful.

For enquiry:

<u>pwd</u>	Print working (current) directory
<u>ls</u>	List the files in the current directory
<u>date</u>	Display the date and time
<u>who</u>	Display the current user name
<u>cat 'filename'</u>	List the contents of the file named

For filestore maintenance as a superuser.

/etc/fscck /dev/hard To run the filestore check program on the fixed disc. This is used to tidy up the file system after a system crash or power failure

For formatting and copying floppy diskette as a superuser.

/etc/fl To run a subset of the POS FLOPPY utility

fl help To get details of the program capability

When you want to know more about UNIX. Type

man 'command' To display pages of the UNIX programmers manual

man man To display details of the man command

man cat To display details of the cat command

winit To enter the window manager. Type c or d to create or delete windows with the help of the tablet

Note: In general PNX only responds by obeying a command or rejecting it. No immediate response usually means a command is accepted.

## Operating

### 5.3 Test software

The information in this section is for release 7 of the engineers confidence test software. This release is for PERQ2 T1(8222/xx) and T.2(8223/xx) systems.

#### 5.3.1 Test software issue

Test software release 7 is distributed on 8 inch floppy discs. The set of discs includes a binary floppy disc with files for loading the test software onto a POS system fixed disc and these boot floppy discs:

- a CPU and memory test boot floppy disc
- the IO tests boot floppy discs

Test1 SOAK 8 for T1 systems  
Test1 SOAK 5 for T2 systems

Test2 NISC two copies are supplied as the  
OSLAN test needs the cooperation of  
a second PERQ2 system

Test3 Printers

Two scratch discs are also provided, one double  
sided write enabled and one single sided write  
protected.

The tests can be run from the boot floppy discs  
or from a POS systems fixed disc if the tests  
were transferred when the system was working  
correctly and POS PASCAL available. The versions  
of POS required are:

T1 systems R4 or R5  
T2 systems Version 6 (G.5)

#### 5.3.2 Loading the tests

To load the tests from boot files on the floppy  
discs onto POS system fixed discs these keyboard  
boot characters are used:

- V for the IO tests
- W for the memory tests
- X for the CPU long raster OP test
- S for the short raster OP test
- Y, Z and T for the other CPU tests

Test T for the 16K CPU can only be loaded from a  
boot floppy disc.

Upper case characters select a floppy disc and  
lower case characters select the fixed disc. If  
the system has been in use log out using the BYE  
command.

Press the boot button and hold the keyboard boot  
character down immediately after the DDS registers  
151. Release the key after the floppy disc  
indicator is lit.

To run the IO tests from a POS run file, load the  
POS operating system, log in and type TESTS.

The following parts of this section describe the  
tests, their operation and error reporting.

## 5.3 Test software

5.3.3 POS transfer to fixed disc

The confidence test programs are transferred to the fixed disc from the confidence test binary floppy disc. The transfer requires the POS operating system to be running correctly with POS PASCAL. The PATH and FLOPPY utilities are used.

Load the system and log in to user. The following commands from the keyboard will create a new directory containing the release 7 confidence tests.

<b>DETAILS</b>	To check that partition user has 800 free blocks. If there are less, another partition may be used. For example, try PATH SYS:PART1 and then DETAILS again
<b>MAKEDIR RELEASE 7</b>	This creates a new empty directory called release 7
<b>PATH RELEASE</b>	To enter the new directory
<b>DIR</b>	To check the new directory is empty
<b>FLOPPY</b>	To run the floppy utility program. Insert the build floppy in the drive
<b>GET BUILD8.PQ2</b>	To copy files for T1
<b>or GET BUILD5.PQ2</b>	To copy files for T2
<b>QUIT</b>	To exit from the FLOPPY utility
<b>@BUILD8.PQ2</b>	To run the T1 command file
<b>or @BUILD5.PQ2</b>	To run the T2 command file
<b>GET BUILD.PQ1</b>	To transfer the build command file to the fixed disc

Following the instructions which then appear on the screen will:

- create boot files identified by the characters s,t,x,y and z for the CPU confidence tests
- create a boot file identified by the character w for the memory confidence test
- link the .SEG files from the binary floppy to form a .RUN file on the fixed disc for the IO tests. The name is TESTS

System boot files are created by the MAKEBOOT utility, which prompts for the answers to several questions. The questions and the answers required are shown on the screen before you are prompted for the answers. However, in the first MAKEBOOT sequence, the model questions and answers scroll off the screen before the prompts appear.

5.3 Test software

5.3.3 Continued

An example of the instructions and required responses is given below. Input required as an answer is underlined in the text and must be followed by pressing return. Default answers are in square brackets after prompts, and where the default answer is required you need only press RETURN; this is shown in the text.

The sequence is repeated to create the separate boot files for each test with the microcode file names all taking the form con \* test where \* is the boot character for the test.

After each MAKEBOOT sequence the following messages may be displayed:

\*\* File Shell.100. Run need to be created \*\* File Login.100. Run need to be created \*\* File Link.100. Run need to be created

These warning messages may be ignored because the files have been created in the boot partition under PGS R.4, R.5 or G.5.

The MAKEBOOT prompts and answers for the first part of the CPU test, con2test, are as follows:

Root file name: Testsys.100

Config file name [(pathname)>Testsys.100.Config]:RETURN

Which character to boot from? s

Do you want to write the boot area [No]: RETURN

Write a system boot file [Testsys.100.s.Boot]:RETURN

Existing boot file to copy (type return to build a new one): RETURN

Enter name of character set [Pix13.Kst]: RETURN

Make the screen be Landscape [Yes]: RETURN (Note: If your PERO has a Portrait screen then type no and press RETURN)

Write an interpreter boot file [Yes]: RETURN

Enter name of new micro boot file [Testsys.100.s.MBoot]: RETURN

Existing boot file to copy (type return to build a new one): RETURN

Use standard interpreter microcode file [Yes]: no

Interpreter microcode file: con2test

Interpreter microcode file: RETURN

Write a Z80 load boot file [Yes]: no

### 5.3 Test software

#### 5.3.4 The CPU board confidence tests

These are the confidence test programs for the CPU board circuits. They are identified as x, y, z, s, and t. The conftest is only for the 16K CPU board.

##### **Conftest Conftest Conftest**

These programs provide fast confidence tests for the CPU circuits other than the raster operation (Raster Op) circuits. Besides the verify (VFT) checks relevant to the CPU board, other elements comprehensively test the:

- expression stack
- registers
- shift hardware
- dispatch, next instruction and next operation functions
- data integrity of the control store
- control store dual addressing
- commonly used jump functions

Use of the memory is avoided as far as possible. Some tests, like next operation, do access the memory and there is a slight chance of failure due to a memory error.

##### **Conftest**

The program makes a long and exhaustive test of the Raster Op circuits on the CPU board.

##### **Conftest**

This program carries out a shorter and less thorough test of the Raster Op circuits on the CPU board.

##### **Loading the tests**

If a POS system has been in use type BYE to log off.

If a PNX system has been in use log off as detailed in section 5.2.1.

The tests are loaded from a disc by pressing the Boot button while holding down the keyboard character assigned to the test. The characters used are:

- Y and Z for the general tests
- X and S for the Raster Op test
- T for the 16K CPU board

Upper case characters load from the confidence test boot floppy. For POS systems lower case characters load from a boot file on the fixed disc. But the Conftest can only be loaded from a boot floppy disc.

## Operating

### 5.3 Test software

#### 5.3.4 Continued

##### Test reporting

When the test has been loaded the diagnostic display (DDS) will register 999 for about 5 seconds before the test begins.

Any error detected will result in a halt. The DDS number indicating the type of failure.

At the end of an error free run the DDS will indicate 000.

The following tables gives the meaning of the displays relevant to each program.

##### ConYtest displays

The display screen will go blank during the test, progress is only reported on the DDS. The ConYtest takes about 10 seconds to run.

DDS indication	Meaning
999	ConYtest entered
350	About to enter Jump test
351	Jump test entered
353	Jump destination different from that expected
354	Return to wrong place
355	'If True' went the wrong way
356	'If False' went the wrong way
357	'Loads or Repeat failure'
360	Jump test completed successfully
362	Failure while testing low bank of microcode store
410	Test of low bank of microcode store successfully completed
0	ConYtest completed successfully

## 5.3 Test software

5.3.4 Continued

## ConZtest display

The display screen will go blank during the test, progress is only reported on the DDS. The conZtest takes about 95 seconds to run. The element testing the shift hardware takes about 65 seconds during which 171 is displayed.

DDS	Meaning
999	ConZtest entered
10 to 150	Register Test entered
151	Register Test entered
152	Error found when testing for data integrity via Z Port
153	Error found when testing for data integrity via Y Port
154	Error in Double address test on X Port
155	Error in double address test on Y Port
160	Register test successfully completed
161	Expression Stack test entered
162	Error detected while moving ones to stack
163	Error detected while moving zeros to stack
170	Stack test completed successfully
171	Shift hardware test entered
172	Error detected during a shiftonR rotate function
173	Error detected during a shiftonR rightshift function
174	Error detected during a shiftonR leftshift function
175	Error detected during a 'Z-field' rotate function
176	Error detected during a 'Z-field' rightshift function
177	Error detected during a 'Z-field' leftshift function
180	Shift test completed successfully
181	Dispatch test entered
182	Dispatch jumped to wrong location
190	Dispatch test completed successfully
191	'Next Instruction' test entered
192	Next Instruction jumped to the wrong opcode
200	'Next Instruction' test completed successfully
201	'Next Operation' test entered
202	BPC could not be loaded directly from the ALU
203	Data error in OP file or addressing error on OP file
204	BPC not incrementing correctly or data error in OP file
205	BPC(3) set unexpectedly

## Operating

### 5.3 Test software

#### 5.3.4 Continued

- 206 BPC(3) Not set when expected
- 207 Data error when accessing OP file
- 208 Data error or speed problems
- 209 Probably speed problems in addressing consecutive bytes of OP file
- 210 BPC(3) set unexpectedly. BPC has become confused
- 220 'Next Operation' test completed successfully
- 222 Test of High bank of PERQ microcode store failed
- 270 Test of High bank of PERQ microcode store completed successfully
- 272 Dual addressing test of PERQ microcode store failed
- 320 Dual addressing test of PERQ microcode store completed successfully
- 0 ConXtest completed successfully

#### ConXtest ConXtest display

During test initialisation the DDS will indicate 451 for about 50 seconds. After initialisation the progress of the test run can be seen on the display screen. The ConXtest takes about two hours to run. The ConXtest release 5 takes about 2.5 to 10 minutes to run depending on memory size. At the end of the ConXtest a black screen means the test failed.

DDS	Meaning
999	ConXtest entered
450	About to enter Raster-Op test
451	Raster-Op test entered
453	Raster-Op test detected an error
455	Raster-Op test detected an error and option register altered (should never occur)
460	Raster-Op test completed successfully
470	Unexpected interrupt occurred during Raster-Op test
0	ConXtest completed successfully

### 5.3 Test software

#### 5.3.4 Continued

##### ConTtest

The conTtest program does the following:

- It tests the register indexing mechanism and the single precision multiply and divide hardware
- It tests the operation of the Goto, GotoS, Call and Calls instructions jumping between 4K banks of microcode store
- It tests that the Revive Victim instruction and the readable victim latch work properly in the upper banks of microcode store
- It tests the use of the shifter output as the destination for jump instructions

Although use of memory is avoided where possible, parts of conTtest cause some memory accesses to occur. There is therefore a slight chance of a PERO failing conTtest due to a memory error.

ConTtest takes about ten seconds to run.

Once you have loaded conTtest from the boot floppy disc no further action is needed to run the test program. The screen goes blank shortly after the start of conTtest, and the LED display shows its progress and reports any errors found. On successful completion of conTtest the LED display shows 000.

The following table gives the LED display readings that may be output by conTtest and their meanings:

Display	Meaning of display
999	ConTtest entered
501	Index test entered successfully
502	Contents in memory location (n) and register (n) not equal
503	Contents in memory location (n) and register (n) not equal
504	Contents in X register (n) and Y register (n) not equal
505	Contents in X register (indexed n) and Y register (n) not equal
506	Contents in X register (n) and Y register (indexed n) not equal
510	Index test successful
511	Multiply and Divide test entered successfully
512	Unexpected value in MQ
513	High Product wrong value in Signed Multiply
514	Low Product wrong value in Signed Multiply
515	High Product wrong value in Unsigned Multiply
516	Low Product wrong value in Unsigned Multiply
517	High Quotient wrong value in Divide
518	Low Quotient wrong value in Divide

## Operating

### 5.3 Test software

#### 5.3.4 Continued

530 Multiply and Divide test successful  
531 Goto test entered successfully  
540 Goto test successful  
541 GotoS test entered successfully  
545 GotoS went to S erroneously  
550 GotoS test successful  
551 Second GotoS test entered  
552 Gotos erroneously went to (address) in microcode bank 0  
553 Gotos erroneously went to (address) in microcode bank 1  
554 Gotos erroneously went to (address) in microcode bank 2  
555 Gotos erroneously went to (address) in microcode bank 3  
560 Second GotoS test successful  
561 Call test in upper microcode banks entered  
570 Call test successful  
571 First CallS test in upper microcode banks entered  
575 CallS erroneously went to S  
580 First CallS test successful  
581 Second CallS test in upper microcode banks entered  
582 CallS erroneously went to (address) in microcode bank 0  
583 CallS erroneously went to (address) in microcode bank 1  
584 CallS erroneously went to (address) in microcode bank 2  
585 CallS erroneously went to (address) in microcode bank 2  
590 Second CallS test successful  
591 Test of VictimLatch entered  
595 VictimLatch contained wrong value  
600 Test of VictimLatch successful  
601 Jumpshift test entered  
602 IF NEQ GOTO SHIFT went the wrong way  
603 IF EQL GOTO SHIFT went the wrong way  
610 Jumpshift test successful  
0 ConTest completed successfully

### 5.3 Test software

#### 5.3.5 The memory board confidence test release 6

##### Countest

This program provides a fast confidence test for the memory board.

The test is applicable to 1Mb and 2Mb boards and takes about 2 and 3 minutes to run respectively.

Besides a basic test other elements cover:

- relative addressing - least significant 16 bits of own address
- wandering noughts and ones
- random data
- refresh and fast addressing
- parity
- cursor control
- screen control

##### Loading the test

The test is loaded from a disc by depressing the boot button while holding down the W key on the keyboard:

- an upper case W loads from the confidence test boot floppy
- a lower case W loads from a boot file on the fixed disc, POS systems only

##### Test reporting

When the test has been loaded the diagnostic display (DDS) will indicate 999 for about 5 seconds before the test begins.

The DDS changes to 100 and the test begins. Various numbers will appear on the DDS indicating the test is progressing. At the end of an error free run the DDS will register 000. The test takes about two minutes to run.

Any store test error detected will result in a halt. The DDS will register a number indicating the type of failure.

Errors in the screen control tests are detected by observing the screen.

## Operating

### 5.3 Test software

#### 5.3.5 Continued

DDS

Test progress	Error stop	Meaning
999		Comtest entered
100		Basic store test
110	111	All 0's
120	121	All 1's
130	131	relative address
140	141	store and fetch
	142	store and fetch 2
	143	store and fetch 4
	144	store and fetch 4R
145	146	store 2 and fetch
	147	store 2 and fetch 2
	148	store 2 and fetch 4
	149	store 2 and fetch 4R
150	151	store 4 and fetch
	152	store 4 and fetch 2
	153	store 4 and fetch 4
	154	store 4 and fetch 4R
155	156	store 4R and fetch
	157	store 4R and fetch 2
	158	store 4R and fetch 4
	159	store 4R and fetch 4R
200		Mandering 0's and 1's
210	211	52525
220	221	123252
300/310	311	Random data
400/410	411	Refresh fast addressing
500		Parity
510		expecting good parity
	511	write
	512	data
	513	read
520		expecting bad parity
	521	write
	522	data
	523	read
	524	incorrect address
600		Screen test
610		whole memory
620		single bit
700		cursor test
710		X position
720		Y position
730		address
740		function white
745		function black
750		black stripe on left
755		white stripe on left
800		Comtest completed successfully

Errors are seen as  
black areas on the  
screen

Errors are seen as black  
instead of white, or white  
instead of black

### 5.3 Test software

#### 5.3.6 Installation test floppy

This floppy diskette is issued with all PERO systems. The tests quickly give 90% confidence that the hardware tested is working.

##### Description

The first part of the tests consists of the CPU ROM and VPFY checks of the CPU and memory boards. These are part of the normal system establishment process and the progress is indicated on the DDS. A welcome message is displayed on the screen at the end of these tests.

The second part of the tests check the:

- I/O board
- floppy disc drive
- fixed disc drive
- keyboard
- screen

The result of these tests is reported on the screen.

##### Operation

Load the floppy diskette into the drive and press the boot button. After about 25 seconds a welcome message is displayed on the screen.

During the second part of the tests the operator is prompted to:

- confirm part of cylinder 0 on the fixed disc may be written; this is safe for both POS and PNX systems
- confirm that the hardware has correctly identified the fixed disc as 5 inch or 8 inch
- press all the keys on the keyboard in a specific order
- examine a pattern displayed on the screen for regularity

At the end of the tests the results are displayed on the screen.

##### Results

Use the table in section 2.2 to interpret DDS indications up to 150.

The test results displayed on the screen include the most likely failing hardware units.

## **Operating**

### **5.4 I/O test software**

#### **5.4.1 The I/O confidence test suite**

**The tests cover the devices under the control of the EIO input-output board. The tests enable the parts of the system covered to be tested on a go/no go basis.**

**The parts of the system covered by the tests are the:**

- RS232 interface**
- GPIB**
- tablet**
- keyboard**
- display**
- floppy disc drive**
- fixed disc**
- printers**
- OSLAN**

**The EIO board is adequately tested by running the tests for the devices connected to it.**

**A test control program allows the selection of tests and run options from menus it displays on the screen.**

#### 5.4 I/O test software

##### 5.4.2 Loading the tests

The suite of test programs and their control are loaded from the boot floppy diskette or from a POS run file on the fixed disc.

###### Loading from floppy disc

The tests and test control program are loaded as follows:

- insert the appropriate confidence test software Boot floppy in the drive
- press the BOOT button while holding down the shift and V keys on the keyboard

The test control program is entered when the DDS reaches 999. The user is prompted to input date, time and name, a carriage return character is accepted for the name.

###### Loading from fixed disc

This is not applicable to PNX systems.

The test program file must have been written on the disc.

To load the tests, load and log in to POS then type TESTS to enter the test control program.

## Operating

### 5.4 I/O test software

#### 5.4.3 PERQ2 I/O test control

The program is entered by typing TESTS.

The screen is formatted as:

- a test menu window listing the numbered tests available
- a status window including the numbered options available
- a command window listing the commands available

You are prompted to type in commands and parameter numbers to the command window.

#### Commands

Valid commands to the test control program are:

TESTS 1 2 3	Select numbered tests from the test menu
GO	Start selected tests running
BREAK CYCLE	Interrupt cycle on test or error at the end of the current test
ON 1 2	Set numbered options
RESET 1 2	Reset options, (RESET 0 resets all options)
USER CLASS 1	Select user class to give required level of reporting
HELP	Display information about the commands. (The HELP key may be used instead)
QUIT	Terminate the test control program clearing the screen.

Only the first letter of a command need be typed.  
No carriage return is needed for commands without parameters.

CONTINUE after an error starts the next test.  
Typing CONTROL and C will abandon a test run.

#### Options

The numbered options controlled by the ON and RESET commands are:

- 1 Cycle on selected tests. Stops on error unless option 4 is ON
- 2 Cycle on failing test. Cycles on any test reporting an error unless option 4 is ON.
- 3 Use engineers parameters. Allows you to input parameters to some tests
- 4 Continue past error. Starts next test in a sequence after an error is detected in the current test.
- 5 Use soak mode. Reduces level of test reporting

## 5.4 I/O test software

### 5.4.3 Continued

#### User classes

These classes provide a level of reporting appropriate to the user:

- 1 Customer
- 2 Customer service engineer
- 3 Specialist engineer
- 4 Repair centre engineer

#### TEST menu

The numbered tests on the test menu are:

- 1 Floppy
- 2 Hard disc
- 3 RS232 Loop-back
- 4 Tablet
- 5 Keyboard
- 6 Monitor
- 7 OSLAN
- 8 3185 printer
- 9 6202 printer
- 10 6203 printer

## Operating

### 5.4 I/O test software

#### 5.4.4 The floppy disc drive test

##### Test media

This test requires the use of:

- a double sided single density floppy disc fitted with a self-adhesive write permit tab
- a single sided single density floppy disc cartridge with no write permit tab

##### Description

This program is a confidence test for the floppy disc drive and its I/O Z80 control. A sequence of seek, format, write data and read data tests are performed. The test takes about four minutes to run.

##### Write enabled tests

The following tests are performed using a double sided, write enabled floppy disc:

- format the whole disc without cyclic redundancy checks
- perform 10 random reads and writes
- read track 0 and check head loaded byte is 0
- read track 77 and check head loaded byte is 1
- read track 76 and check head loaded byte is 0
- read track 153 and check head loaded byte is 1
- seek to a non-existent sector and check that the error condition is set
- seek to non-existent tracks -1 and 154, and check that the error condition is set
- read 20 random sectors
- head movements to tracks 0, 76, 1, 75 and so on until track 38 is reached. The first sector on each track is read

User classes 3 and 4 allow the selection of single shot commands to seek, format, read or write any sector.

##### Write protected tests

The following tests are performed using a single sided, single density write protected, floppy disc cartridge:

- twenty random reads
- attempt to write and check that an error is detected
- seek to non-existent track 77 and check that an error is detected

## 5.4 I/O test software

### 5.4.4 Continued

#### **CAUTION**

When tests are loaded from the I/O confidence test boot floppy this must be reinserted at the end of the write protected tests. Failure to respond to the prompt given means the test must be reloaded.

#### **Operation**

On entry, the program prompts the operator to insert the double sided, write enabled floppy disc and press any key except 0.

Pressing the 0 key causes program execution to cease.

At the completion of the write enabled tests, the operator is prompted to exchange the floppy diskette in the drive. The single sided write protected floppy diskette should be inserted.

#### **Result**

The current test will halt if an error is detected. An indication of the error is displayed, together with the expected and actual results. The operator is prompted to continue or to abandon the whole test.

### 5.4.5 Fixed disc drive test

#### **Description**

This program is a confidence test for the fixed disc drive and its channel control on the I/O board. A sequence of format, bad block scan, head stepping, write data and read data test are provided. The program takes about five minutes to run.

#### **CAUTION**

The options available allow the complete or partial overwriting of the system files and the customers data. Only the user classes 1 and 2 are safe if the lengthy process of disc recreation is to be avoided. See I/O test control for details of option selection.

The test consists of five elements, only elements 2, 3 and 5 are selected for user classes 1 and 2. The elements are:

- 1 Disc format - the whole disc or selected tracks
- 2 Bad block scan - all or part of the disc
- 3 Head stepping test
- 4 Random write and read data - all head and tracks
- 5 Random write and read data - known free sectors only

User class 3 also allows the selection of single shot command to seek, format or write any sector.

## Operating

### 5.4 I/O software

#### 5.4.5 Continued

##### Operation

The selection of options is self prompting for the user class picked.

##### Result

The current test will halt if an error is detected. An indication of the error is displayed together with the expected and actual results. The operator is prompted to continue or abandon the whole test. A summary of the results is displayed at the end of the test.

Failures on flagged bad blocks are not regarded as errors.

User classes 1 and 3 do not report 'soft' (CRC etc.) failures, but classes 2 and 4 halt with an error message.

#### 5.4.6 The RS232 loop-back test

This program reflects all the characters with decimal values 0 to 255. The test is repeated for the range of transmission rates. The characters received are checked against the characters transmitted and any errors are reported. The test takes about two minutes to run.

##### Loop-back plug

The characters are reflected through an RS232 loop-back plug. This plug is identified as service aid number 86011474.

On entry, the program prompts the operator to ensure the loop-back plug is fitted, pressing any keyboard character causes the program to continue.

The test allows the user to select PERQ2 interface A or B.

##### Transmission rates

Characters having decimal values 0 to 255 are reflected at the following rates; 110, 300, 600, 1200, 2400, 4800 and 9600 bauds.

##### Results

During the test the transmission rate and character are displayed on the screen title line. The transmission rate and a pattern of dots are also displayed in the main text area.

Possible error messages are:

- I/O error XX. See section 2.4 for details
- Mangled character - the character received was not the one that was sent
- time-out error - check that the loop-back plug is correctly fitted

## 5.4 I/O test software

### 5.4.7 The tablet test (GPIB)

This program tests the summagraphics tablet and puck or stylus. It is also used for testing the GPIB interface and the bell. The test also covers the PERO2 pointing tablet and 3 button puck which do not use the GPIB. The test takes about 25 seconds to run.

#### Description

On entry the program clears the screen and displays an arrow indicating the position of the puck on the tablet surface. Instructions are displayed at the bottom of the screen. The operator is invited to move the puck in straight lines across the tablet to join crosses displayed on the screen. A button on the puck must be pressed at each mark. A small amount of error is allowed. Apparent mistakes are indicated by the bell. Users must decide if mistakes reported are due to their inaccuracy in drawing.

When switch 4 is OFF the number of errors detected is reported at the end of the test. The input of a keyboard character is then required to continue the test sequence.

### 5.4.8 The keyboard test

#### Description

A picture of the keyboard is displayed on the screen together with test instructions and option menus. The default option is for a progressive confidence test. When a key is depressed the octal value is displayed on the screen and that key blocked out on the picture. Apparent errors sound the bell and the total is reported at the end of the run. For PERO2 the release 6 or later confidence test is run unless engineers parameters are selected. The test take about 25 seconds to run.

#### Test options

The test options displayed on the screen are selected with the aid of the tablet. A button on the puck is depressed with the cursor pointing to the option to be selected.

#### Normal use

The operator depresses each key in turn, top left to bottom right. Keys spanning two rows are depressed on both rows. The special shift and control combinations are depressed in accordance with instructions from the program. These instructions are displayed at the completion of the single key depressions.

## Operating

### 5.4 I/O test software

#### 5.4.8 Continued

##### Results

If and only if the default option is selected the bell sound indicates the detection of an error. This may be due to a key not registering, a key returning an incorrect code, or a key being depressed out of turn. The operator must decide if an out of turn depression occurred.

The total of the errors for a run is displayed at the end of the test.

#### 5.4.9 The screen linearity test

This program displays several patterns on the screen and inverts them a few times. The purpose of the display is to enable the operator to make a judgement on the quality of the image, and for the engineers use while making adjustments. The test takes about six seconds to run.

This version of the program has parameters built in. These produce a grid with squares of 50 by 50 pixels on the screen.

A display will persist until a key on the keyboard is pressed. After 10 keyboard inputs the next test in the sequence is entered.

#### 5.4.10 The ICL 3185 printer test (RS232)

This program is a confidence test for the OKI microline 84 printer, cable and related processor I/O board circuits. The printer is connected to an RS232 interface.

##### Media

For this test the printer should be loaded with 280mm form length fanfold paper at least 370mm wide.

See the ICL PERQ Optional Peripheral Guide (RP10128) for printer operating.

## 5.4 I/O test software

5.4.10 Continued**Description**

The test is split into elements which exercise the following printer functions:

- printing a wallpaper pattern, a fixed set of characters shifted cyclically one to the left on each successive line
- form and line feeding
- subscript printing
- superscript printing
- emphasised printing
- underscoring
- incremental printing
- tab setting
- printing all characters
- buffer clear
- character size
- page size
- setting top of form
- near letter quality printing
- line size
- backspace
- enlarged characters
- downline character generation
- graphics, the screen display is output to the printer

**Operation TEST 8**

The test is selected from the I/O test control program menu by the command test 8.

When the test is entered you are prompted to select a valid RS232 transmission rate between 300 and 9600 Baud.

The PERQ2 releases ask whether the printer is connected to RS232 interface A or B.

The time taken to run the test is about 8 minutes at 9600 Baud and up to an hour at 300 Baud.

**Results**

The test printout defines the expected result for each element before its execution.

## Operating

### 5.4 I/O test software

#### 5.4.11 The ICL 6202 printer test

This program is a confidence test for the RICOH RP1600 daisy wheel correspondence printer, cable and related I/O board circuits. The printer is connected to an RS232 or GPIB interface.

##### Media

For this test the printer should be loaded with 280mm form length fanfold paper at least 370mm wide.

See the ICL PERO Optional Peripheral Guide (RP10128) for printer operating.

##### Description

The test is split into elements which exercise the following printer functions:

Test parameters required:

Interface Type [RS232, GPIB] RS232  
RS232 port [A or B] A  
Protocol type [BR, DC1 DC3, ETXACK] BR  
Baud rate [300, 1200, 9600] 9600

- Forward/backward printing
- printing a wallpaper pattern, a fixed set of characters shifted one to the left on each successive line
- line and form feed
- underscoring
- subscript
- superscript
- boldface type
- page size
- tab setting
- All characters
- bell
- backspace
- NUL/DEL
- character size
- print intensity level
- setting margins
- remote restore

## 5.4 I/O test software

### 5.4.11 Continued

#### Operation TEST 9

The test is selected from the I/O test control program menu by the command test 9.

When the test is entered you are prompted to define the interface used and the transmission rate if RS232. GPIB address is requested: address 4 is the default address.

The time taken to run the test is about 7 minutes at 9600 Baud and at 300 Baud.

#### CR

After the abort element the test must be restarted by typing carriage return.

After the repeat data element a delay of about 20 seconds is expected.

#### Results

The test printout defines the expected result for each element before its execution.

### 5.4.12 The ICL 6203 printer test

This program is a confidence test for the Versatec V80 electrostatic printer-plotter connected to the GPIB interface. This test is introduced in test software release 5.

#### Media

For this test the printer should be loaded with Electrographic paper.

See the ICL PERO Optional Peripheral guide (RP10128) for printer operating.

#### Description

NOTE: GPIB Address = 1 must be set up in POS profile for this printer

The test is split into elements which exercise the following printer functions:

- all characters
- printing a wallpaper pattern, a fixed set of characters shifted cyclically one to the left on each successive line
- end of page margins
- all end of print conditions
- all end of plot conditions
- plotting of screen contents
- simultaneous plotting of screen contents and printing of a page

## Operating

### 5.4 I/O test software

#### 5.4.13 Continued

##### Operation TEST 10

The test is selected from the release 5 I/O test control menu by the command test 10.

Printer address is requested: this is 1.

The time taken to run the test is about 7 minutes.

##### Results

The test printout defines the expected result for each element before its execution.

### 5.4.14 The PERO OSLAN test

This is a confidence test for two PERO systems connected by a local area network. The system to be tested is defined as the master and the other as the slave.

##### Test description

The program tests the following functions:

- OSLAN address; checks the master produces its address correctly and consistently
- Microsecond clock; checks the accuracy of the OSLAN system clock. Checks the alarm clock and stop watch against the system clock
- Reception checks; the slave sends a number of known frames to the master with physical, multi-cast and broadcast addresses. The program checks all the frames are handled properly and the content of frames received is correct
- transmission checks; the master transmits a number of frames checking that the slave echoes only those expected
- carrier detection; the carrier sense status bit is tested while transmitting a frame

##### Test operation

The test is selected from the menu by the command test 7.

Select the test on both PERO systems. Define the system to be tested as the master and the other system as the slave.

The program displays the system OSLAN address on the screen. Enter this as the destination address on the other system when prompted.

The master checks the OSLAN clock and waits five minutes for the RETURN key to be pressed on the slave system. When this is done the test programs are synchronised and run without further operator action.

## 5.4 I/O test software

5.4.14 Continued

## Test reporting

The progress of the test is reported on the screen. If an error is detected an error message is displayed and the test terminated.

The error reports for each test element are:

## OSLAN address

## No OSLAN hardware

There is no OIO board in the machine or the address is not produced

## Inconsistent OSLAN address

The address produced is not consistent

## Microsecond clock

## Bad alarm clock

The microsecond and system clocks are not consistent or the alarm clock is not working correctly

## Bad stop watch

The microsecond and system clocks are not consistent or the stop watch is not working correctly

## Reception

## Receive physical address

Wrong number of physical address frames received

## Receive multicast address

Wrong number of multicast address frames received

## Receive broadcast address

Wrong number of broadcast address frames received

## Receive frame time out

A frame expected has not been received within a given time. This could be because:

- the systems are not synchronised
- a network connection is broken
- the machines are too far apart
- the destination address has been corrupted

## •CRC has been corrupted

Incorrect CRC value or frame content

## Source address corrupted

A frame received has an incorrect source address

## Pack type corrupted

A frame received has the wrong packet type

## Bytes received

The number of bytes received is not a multiple of eight

## Receive bytes out of range

Less than 46 or more than 1500 bytes received

## Data received corrupted

Data received is not as expected

## Transmission

## Received an unexpected frame

The slave echoed a frame to the master unexpectedly

## Echo bytes corrupted

An echoed frame data bytes were not those sent

## Operating

### 5.4 I/O test software

#### 5.4.14 Continued

Reception error reports can also appear during transmission tests. Frames sent from the master to the slave are the more likely cause.

##### Carrier detection

###### Carrier B/W fault

The carrier sense bit is sent when there is no data on the network

###### Carrier not sensed

The carrier sense bit is not set when there is data on the network

##### Miscellaneous

###### Nothing received

The master has been ready for 5 minutes but has not received any frames

###### Test discontinued

The operator typed CONTROL and C

Entry to the problem

Isolating the problem

Functional diagrams

Overview

Operating information

6

## **Reference information**

Procedures

Technical notes

- 6.11      **6203 Printer/plotter-General information**
  - 6.11.1    Interface cable
- 6.12      **CANON Laser Printer-General information**
  - 6.12.1    Interface cables
- 6.13      **RS232 Communications-General information**
  - 6.13.1    Loop-back plug
  - 6.13.2    PERO to PERO cable
  - 6.13.3    MODEM cables

## 6.1.2 PER02 T1 Types and Features

Type no.	Description	Note
+8222/11	System Nucleus 240v 50/60 Hz (4K CPU)	The nucleus contains a cabinet, PSU, EIO PCB and keyboard.
+8222/12	System Nucleus 240v 50/60 Hz (16K CPU)	All T1 system are identified by one of these numbers on the processor cabinet.
+8222/71	System Nucleus 115v 60 Hz (4K CPU)	
+8222/72	System Nucleus 115v 60 Hz (16K CPU)	
P2360/04	16K control store CPU option (16K CPU)	Enhancement feature.
P2361/02	512Kb Memory PCB	All systems must have a memory board.
P2361/03	1 Mb Memory PCB ) For portrait	This must match the display unit fitted.
P2361/04	2 Mb Memory PCB ) displays	
P2361/05	1 Mb Memory PCB ) For landscape	
P2361/06	2 Mb Memory PCB ) displays	
P2362/22	Portrait display (Kent) (80019760)	
*P2362/23	Landscape monitor 240v 50/60 Hz (Moniterm)	All systems must have a display unit.
P2362/83	Landscape monitor 115v 50/60 Hz (Moniterm)	Landscape displays require a multi-purpose memory
*P2362/11	Floppy disc drive 240 v 50 Hz	
P2362/72	Floppy disc drive 240 v 60 Hz	All systems must have a floppy disc drive. This is chosen to match the nucleus.
P2362/71	Floppy disc drive 115 v 60 Hz	
P2362/16	40 Mb Fixed disc drives plus adaptor (8")	
*P2362/17	40 Mb Fixed disc drives without adaptor (8")	All systems must have a fixed disc drive with an adaptor PCB.
P2362/01	Stylus	Optional with 11" tablet P2362/03.
*P2362/03	11" tablet + puck 4	All systems must have a tablet unit.
*P2362/04	8.5" tablet + puck 3	
*P2359/03	Link cables	One or both required with P2359/04 option.
*P2396/06	Canon interface cable	Optional feature.
*P2359/04	Canon and link interface PCB OIO BA93)	Can be used in place of P2359/04
P2359/06	Canon, link, OSLAN interface PCB OIO BA92)	Optional feature
*P2359/11	OSLAN cables and transceiver	
P2363/00	Blank keytops	Optional feature.
P2073/02	Versatec printer barrier box and cable	Required with optional 6203 printer
*P2396/02	OKI data RS232 interface cable	Required with optional 3185 printer
P2396/04	RICOH/APTEK IEEE interface cable	Required with optional 6202/02 printer
P2396/05	Ricoh/Ricoh RS232 interface cable	Required with optional 6202/02 printer
P2396/08	MONITERM interface cable	Required with optional T1 landscape display
P2362/14	Streaming cartridge tape	Not available
P3125/11	Mains Cable - MP1	All systems must have a mains cable for the processor cabinet appropriate to the mains distribution of the country where it is installed. See 6.1.1 note.
P3125/12	Mains Cable - MP2	
P3125/14	Mains Cable - MP4	
P3125/15	Mains Cable - MP5	
P3125/16	Mains Cable - MP6	
P3125/21	Mains Cable - Unterminated	
P3123/11	Mains Cable MP1	Required with * P2424/11 MP1
P3123/12	Mains Cable MP2	landscape * P2424/12 MP2
P3123/14	Mains Cable MP4	Monitor * P2424/14 MP4
P3123/15	Mains Cable MP5	Now changed * P2424/15 MP5
P3123/16	Mains Cable MP6	to * P2424/21 unterminated
P3123/21	Mains Cable Unterminated	

\* These features are common to T2 systems  
The keyboard which does not have a feature number is also common to T2 systems.

+ Only the equivalent 8223/xx systems are now available.

## CAUTION

The T1 landscape monitor interface cable is P2396/08. This is identified by a yellow band and not compatible with the cable for T2.

## 6.1 General

## 6.1.4 Documentation

A number of documents have been published by ICL for PERQ systems, only some of these or particular editions are applicable to PERQ2 T1 and T2 systems. This section lists PERQ2 documents giving the edition (ED), amendment list (AL) and publication notice (PN) levels for the 8222/xx (T1) and 8223/xx (T2) products.

## Installation

## Installation your:

- PERQ2	5156224	T1
- 8223 PERQ2	80099053 ED1	T2
- P2361/03 and 04 Store enhancements	80099008 ED1	T1, T2
- P2361/05 (1Mb) and 06 (2Mb) Landscape memory board	80099061 ED1	T1, T2
- P2360/04 CPU enhancement	80099009 ED1	T1, T2
- P2359/04 Optional I/O board	80099010 ED1	T1, T2
- Portrait display	80099054 ED1	T1, T2
- P2362/23 Landscape display	80099044 ED1	T1, T2
- 3185 Printer	5156396	T1, T2
- 6202/02 Printer	5156394	T1, T2
- 6202/03 Printer	5156395	T1, T2
Proper use of this equipment	5156707	T1, T2
Avoiding damage from static electricity	8009905 ED1	T1, T2

## Service

PERQ Service guide (Superceded by this manual)	TP10114 ED2	T1
PERQ2 Service reference manual	5156579 Issue 2	T1, T2
Micropolis 1300 series fixed disc service reference manual	80099172	T2

## Hardware user manuals

User guide (PERQ2)	R10132 ED1+PN1 R10132 ED1+PN2 and AL1	T1 T2
ICL 3185 Matrix Printer on PERQ	R10135 ED1	T1, T2
ICL 6202/02 Printer on PERQ	R10136 ED1	T1, T2
ICL 6202/03 Printer on PERQ	R10137 ED1	T1, T2
ICL 6203 Printer/Plotter on PERQ	R10138 ED1	T1, T2

## Communications

2780/3780 Communications under POS	R10109 ED1	T1, T2
Establishing IPA under POS	R10120 ED1	T1, T2
Establishing IPA under PNX (PNX3)	R10131 ED1	T1, T2

## 6.1 General

6.1.5 CPU Board PROMS

The CPU board Boot PROM types depend on the systems fixed disc type and control store size. This section lists the PROM types for PERQ2 T1 and T2 systems.

PROMS for 8222/xx T1 systems with 8-inch fixed disc.

## CPU BOARD (4K) 80043035

U10	MDAO0 PGAP
U23	MDB00 PGAR
U17	MDC00 PGAQ
U14	MDD00 PGAS
U08	MDE00 PGAO
U07	MDP00 PGAN

## CPU BOARD (16K) 80019910 F2360/04

U10	MCA00 (S/C 3BE1)
U23	MCB00 (S/C C94A)
U17	MCC00 (S/C E2CF)
U14	MCD00 (S/C 9D04)
U08	MDE00 (S/C 52A8)
U07	MCFO0 (S/C 5D99)

PROMS for 8223/xx systems with 5.25-inch fixed disc.

## CPU BOARD (16K) 7734951

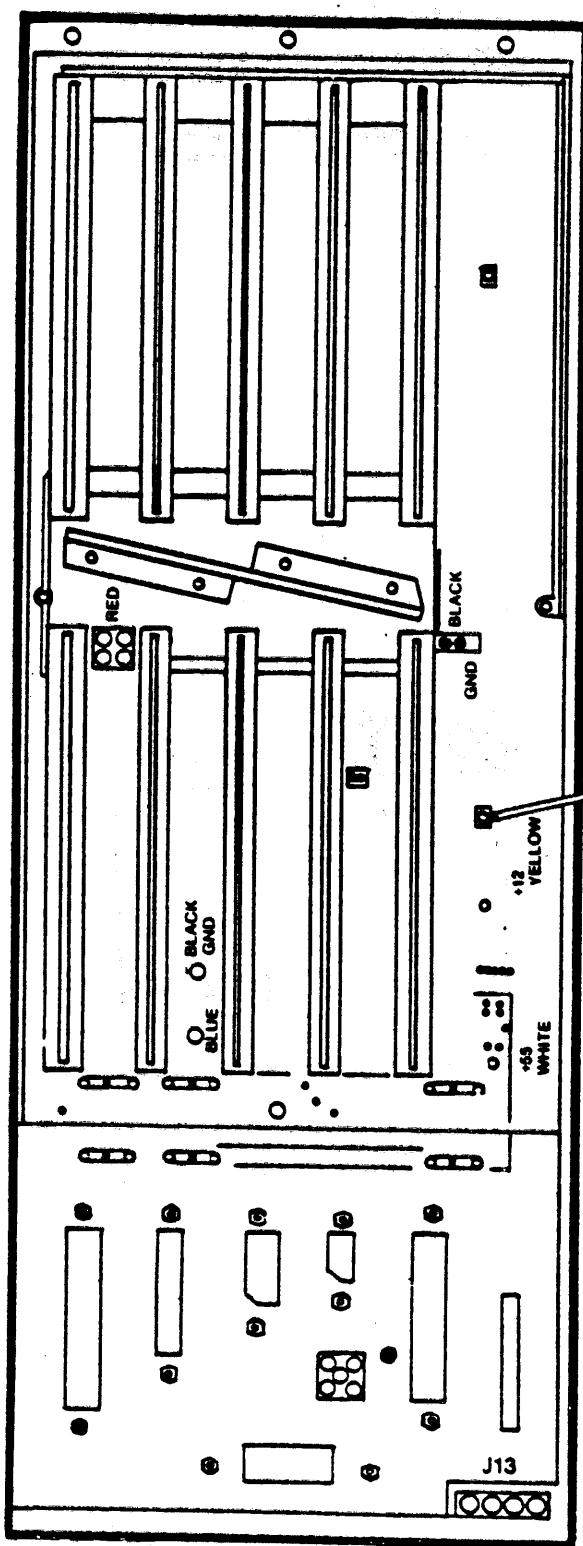
U10	TCA01 (S/C 3334)
U23	TCB00 (S/C C1B4)
U17	TCC00 (S/C D78B)
U14	TCDO0 (S/C 8F88)
U08	TCE00 (S/C 4E0C)
U07	TCFO0 (S/C 5AF5)

Note PROM types SCxx and SDxx are for PERQ1 systems

6.2 PERQ2 connectors - General information

6.2.1 Motherboard layout T1 model - continued

Note: Board layout may have been modified during production.



EDGE CONNECTOR SIDE

6.2 PEG connectors - General information

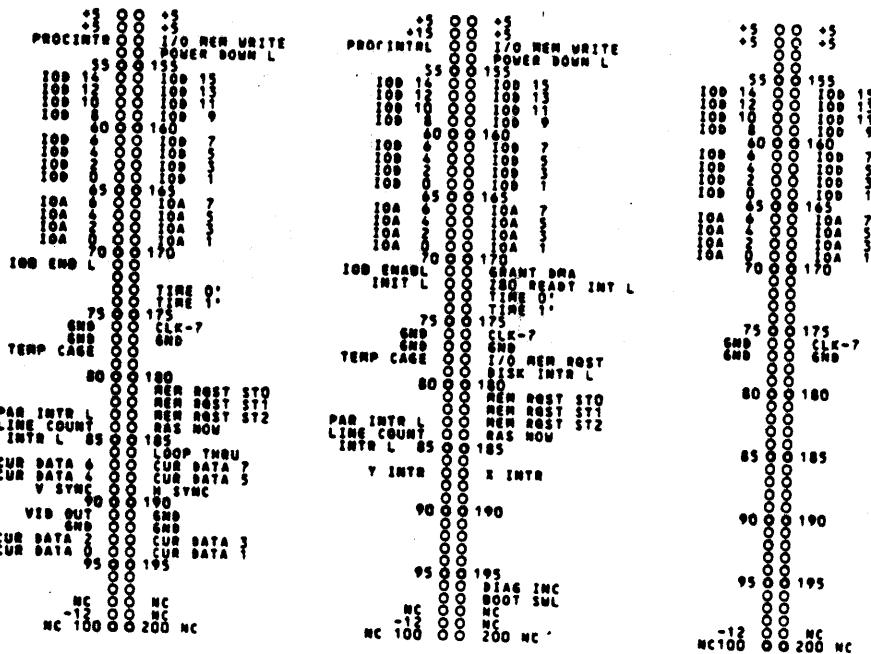
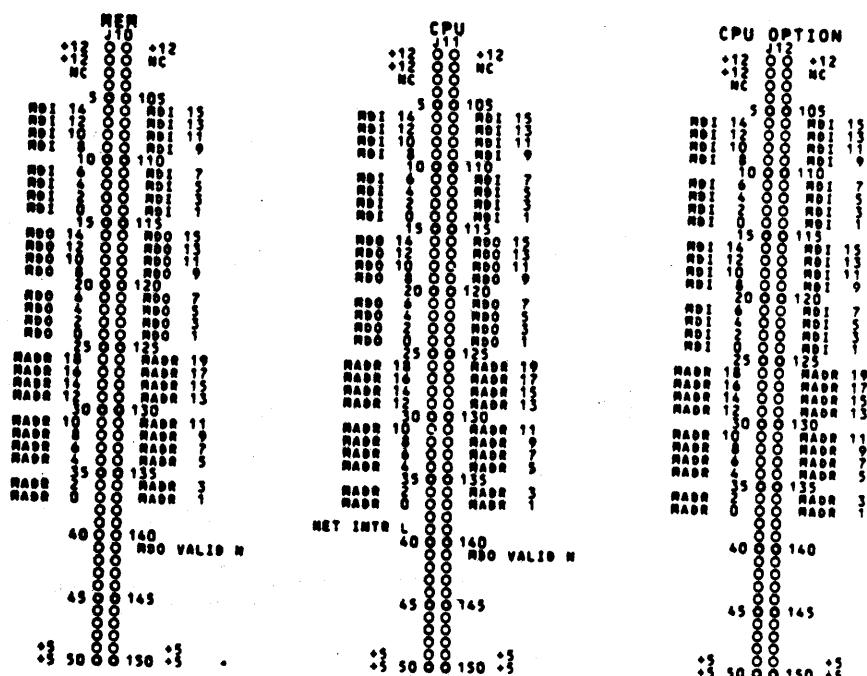
6.2.2 Motherboard layout T2 model - continued

PAGE RESERVED FOR ARTWORK

## 6.2 PCIe2 connectors - General information

#### **6.2.3 Motherboard connector details for T1 model - continued**

Note: Connector details may be changed during production



## 6.2 PEGQ2 connectors - General information

6.2.3 Motherboard connector details for T1 model - continued

**Note:** Connector details may be changed during production.

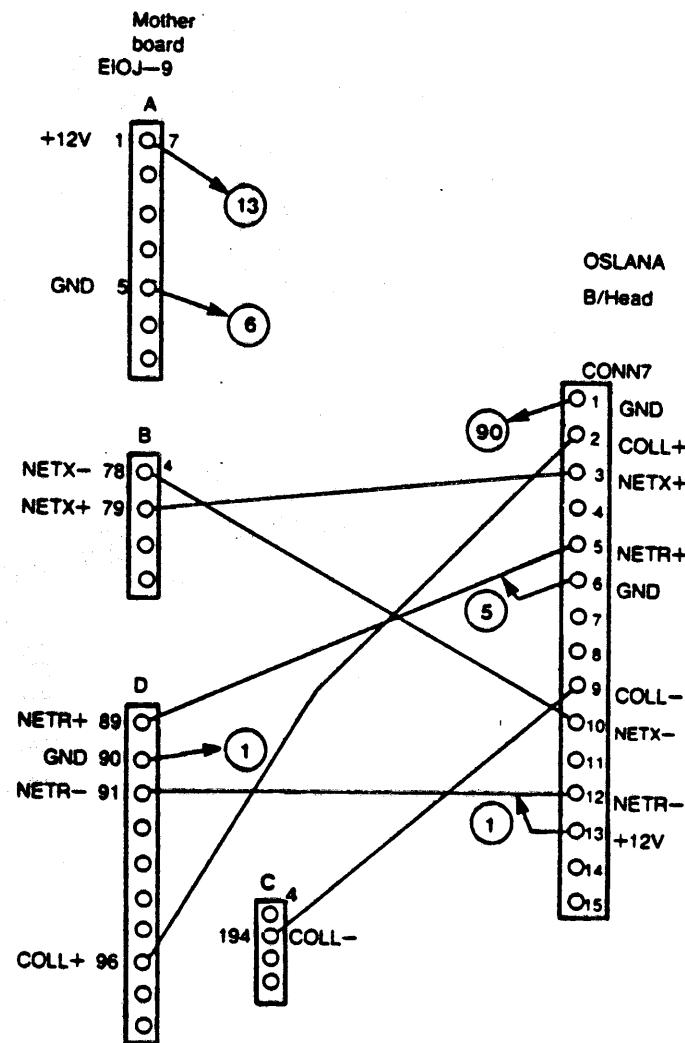
RS232		DISPLAY	
GND	1 0	J4	1 0
TD	2 0 0 0 14		2 0 0 0 20
RD	3 0 0 0 15 TC		3 0 0 0 21
RTS	4 0 0 0 16	TEMP CPT	4 0 0 0 22 GND
CTS	5 0 0 0 17 RC		5 0 0 0 23
DTR	6 0 0 0 18	SPEAKER	6 0 0 0 24
GND	7 0 0 0 19		7 0 0 0 25
DCD	8 0 0 0 20 DTR	8 0 0 0 26 → 55	
	9 0 0 0 21	LOOP THRU	9 0 0 0 27 → 55
	10 0 0 0 22 RI		10 0 0 0 28
	11 0 0 0 23		11 0 0 0 29
	12 0 0 0 24		11 0 0 0 30
	13 0 0 0 25		12 0 0 0 31 GND
		H SYNC	13 0 0 0 32 GND
		H SYNC GND	14 0 0 0 33 GND
		V SYNC	15 0 0 0 34 GND
		V SYNC GND	16 0 0 0 35 GND
		VID OUT	17 0 0 0 36 VID GND
		COAX BRAID GND	18 0 0 0 37 VID GND

## 6.2 PEGQ2 connectors - General information

6.2.5 OSLAN A connections

The drawing shows the general arrangement of connections between the motherboard J9 GRAUNCH connectors and the bulkhead connector 7.

Note: Connector details may be changed during production.

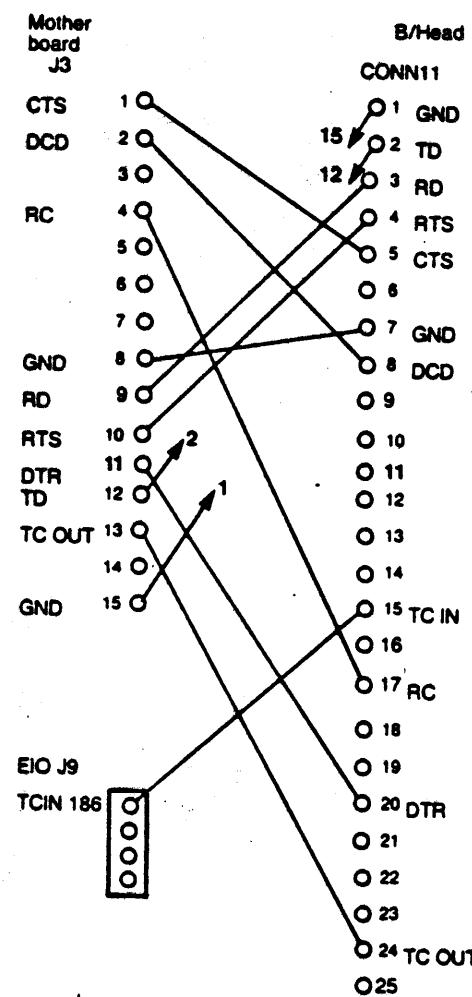


## 6.2 PERQ2 connectors - General information

## 6.2.7 RS232B connections

The drawing shows the general arrangement of connections between the motherboard J3 and J9 and the bulkhead connector 11.

Note: Connection details may be changed during production.

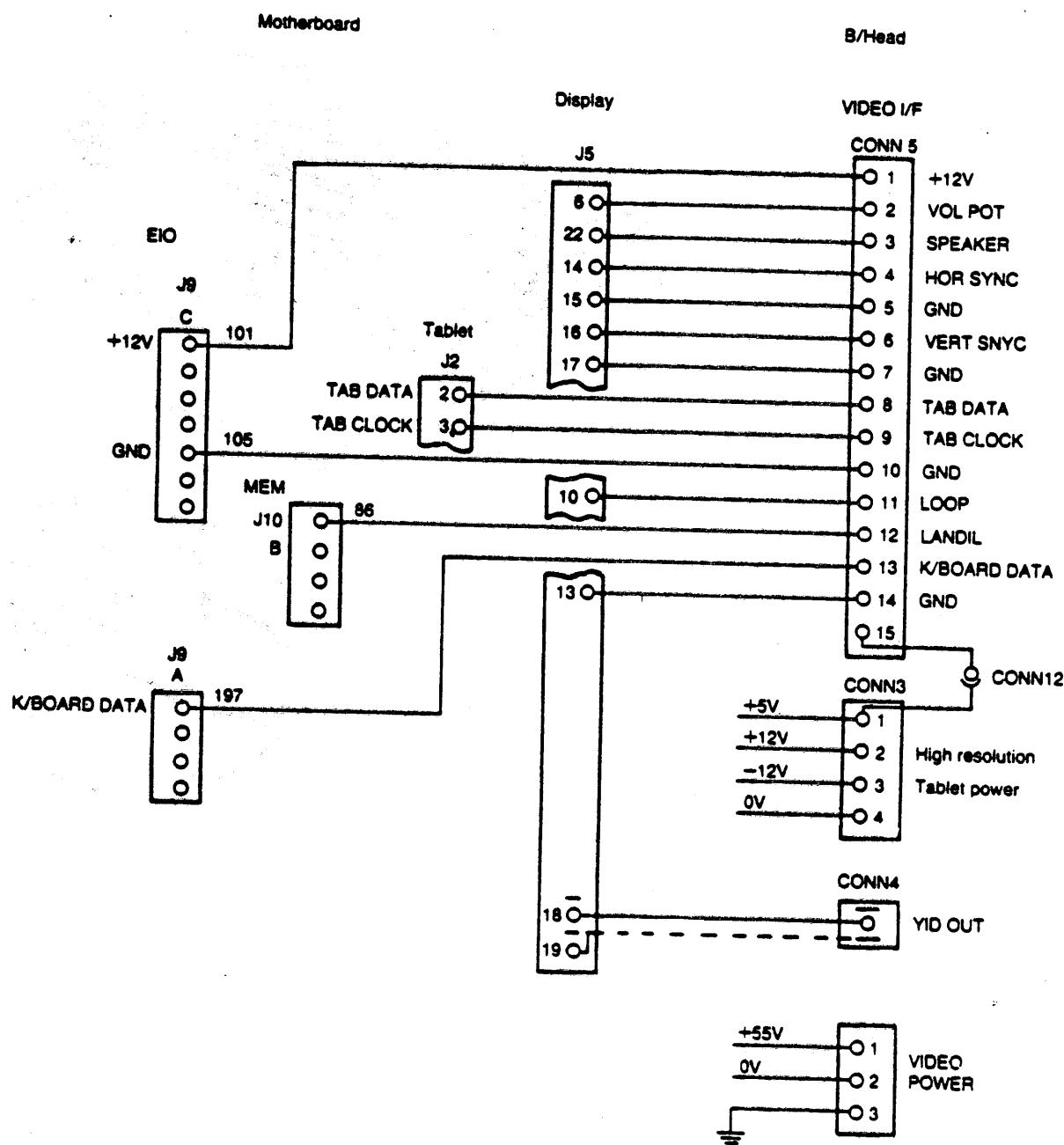


## 6.2 PEGQ2 connectors - General information

6.2.9 Video interface connections

The drawing shows the general arrangement of connections between the motherboard J2, J5, J9 and J10, and the bulkhead connectors 3, 4 and 5.

Note: Connection details may be changed during manufacture and may be modified to suite different models.



## 6.3 PERQ2 Fixed disc drive - General information

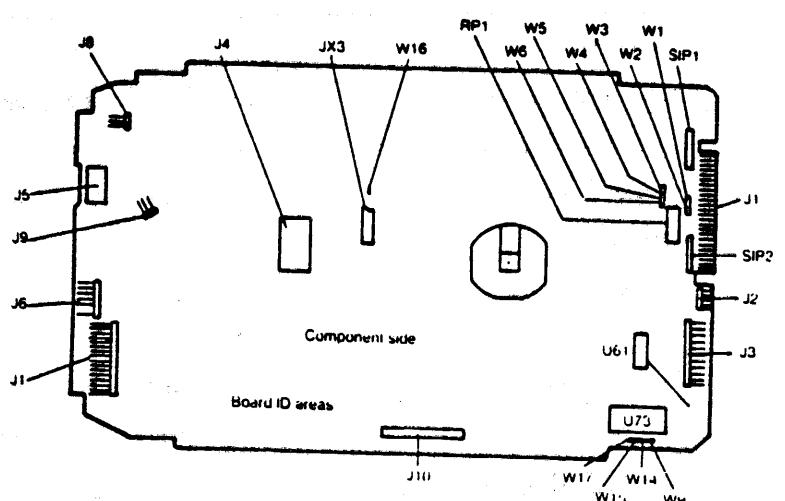
## 6.3.1 Device electronics board layout early TI models

Part no. 100482-XX-X XX-A-TVIC-XX  
Configuration options

Option codes (see below)

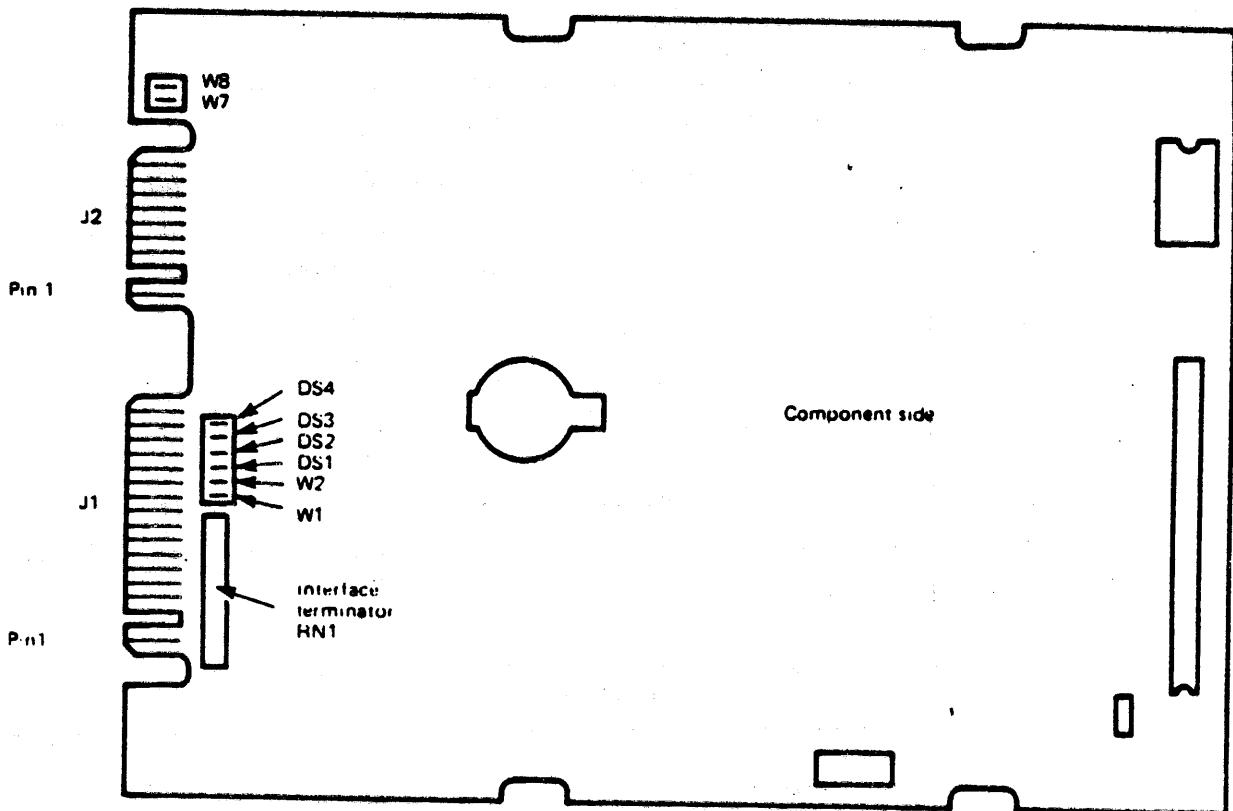
Option	Option characteristic	Option code	Description (* see below)	Option methodology
A	Drive address	0	Unit 0 *	Jumper 680-0202-1 at: W3 W4 W5 W6 X           X      X
			Unit 1	X           X      X
			Unit 2	X      X      X
			Unit 3	X      X
T	Interface termination	1	Used *	RP1: P/N 115-0001-4, SIP1: P/N 116-0003-8, and SIP2, P/N 116-0001-2 installed
		2	Not used	RP1, SIP1, and SIP2 omitted
V	Interface terminator voltage	1	Local	Jumper 680-0202-1 at: W2 W1 X      X
			Remote *	X      X
I	Sector Pulse at Index time	1	Generate *	Jumper 680-0202-1 at W16
		2	Omit	W16 omitted
C	Control program firmware	1	Standard firmware per spec. 100198	Jumper 680-0202-1 at W9 and W17; no jumper at W14 or W15. PROM 800063-01 at U73
XX	Number of sectors/revolution	0-98	Program Sector Pulse Generator for desired no. of sectors XX	Sector Program Plug Assy 100411-XX (specified when ordered), factory installed in JX3

\* Asterisk shows the "normal" configuration. If the unit is daisy-chained with other drives, remove the interface terminators except on the last drive and configure each drive to a different drive address, starting at 0.



6.3 PERQ2 Fixed disc drive - General information

6.3.1 Device electronics board layout of Micropolis 1300 series 5.25 inch discs - continued



## 6.3 PERQ2 Fixed disc drive - General information

6.3.4 Power and status connectors early T1 models

## Power connector J3 (J103)

## Pin      Signal Name

1	+24v sense
2	Ground sense
3	-12v sense
4	+5v sense
5	+5v return
6	-12v return
7	+5v
8	-12v
9	+24v return
10	+24v

## Status connector J2

1	Ground
2	Drive ready status (RDY)
3	Ground
4	Seek complete (SKCMP)
5	+5v
6	Drive selected (SLTD)
7	Ground
8	Index pulse (IDX)
9	Ground
10	Sector pulse (SECP)

## Device Interface connector J1 (J101)

Ground	Signal	Signal Name
1	2	Reserved
	3	Reserved
4	5	DATA + Bi-directional R/W data
	6	DATA -
7	8	DS 1 Drive select (encoded)
9	10	DS 0 Drive select (encoded)
11	12	BUSEN Bus enable
13	14	BA 1 Bus address (encoded)
15	16	BA 0 Bus address (encoded)
17	18	ENABLE
19	20	Reserved
21	22	Bus 7 Data bus
23	24	Bus 6 Data bus
-	25,26	+5v +5v terminator voltage (option)
27	28	Bus 5 Data bus
29	30	Bus 4 Data bus
31	32	Bus 3 Data bus
33	34	Bus 2 Data bus
35	36	Bus 1 Data bus
37	38	Bus 0 Data bus
39	40	RDY Drive ready
41	42	FLT Fault
43	44	ILADR Illegal head/Cylinder states
45	46	SFIMP Seek incomplete
47	48	IDX Index pulse
49	50	SECP Sector pulse

## 6.3 PERQ2 Fixed disc drive - General Information

6.3.5 ContinuedDrive InterfaceInterface connectors and electrical characteristics

There are two drive interface connectors, J1 and J2. The two connectors are physically part of the Device Electronics board and are used for interfacing the drive to a host controller/formatter. Both connectors are pin and plug compatible with the "industry standard" configuration for 5 1/4-inch Winchester disc drives.

Control Signal Connector J1:

J1 is a 34-pin, PCBA edge connector; pin 1 is on the component side of the board, away from Data Transfer Connector J2. The control signals and the status signals on J1 are listed below:

## Control signal connector J1 signal assignments

J1 connector Pin signal	ground	Signal name	Source
2	1	reserved	-
4	3	HEAD SELECT 2 <sup>2/</sup>	Host
6	5	WRITE GATE/	Host
8	7	SEEK COMPLETE/	Drive
10	9	TRACK 0/	Drive
12	11	WRITE FAULT/	Drive
14	13	HEAD SELECT 2 <sup>0/</sup>	Host
16	15	Reserved (to J2 pin 7)	-
18	17	HEAD SELECT 2 <sup>1/</sup>	Host
20	19	INDEX/	Drive
22	21	READY/	Drive
24	23	STEP/	Host
26	25	DRIVE SELECT 1/	Host
28	27	DRIVE SELECT 2/	Host
30	29	DRIVE SELECT 3/	Host
32	31	DRIVE SELECT 4/	Host
34	33	DIRECTION IN/	Host

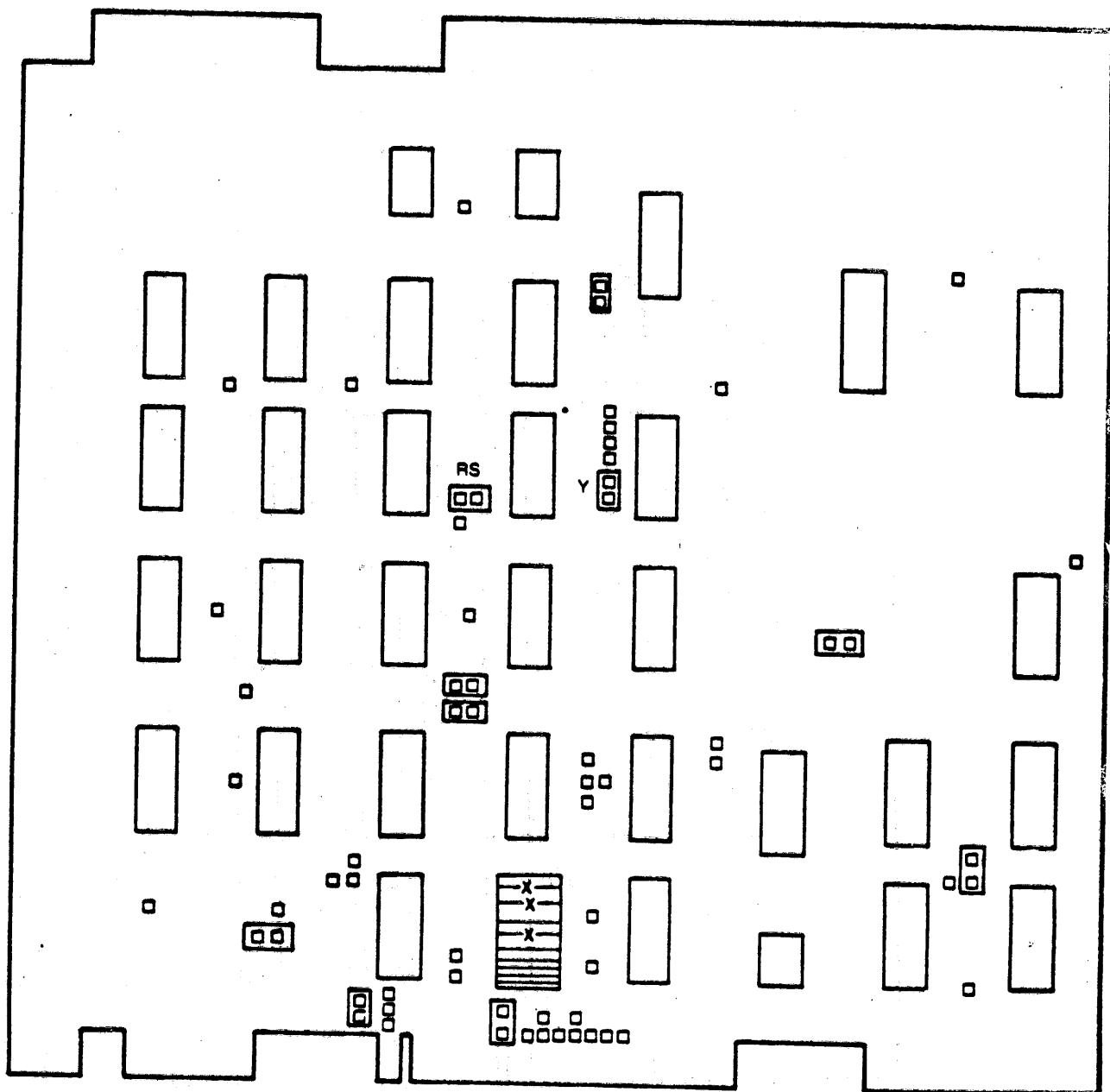
6.4 Floppy disc drive

6.4.1 Control board links

This drawing shows the links that must be fitted to the Shugart floppy disc drive control board when used with PERO systems.

- DENOTES LINK SHOULD BE FITTED

[ ] - DENOTES LINK SHOULD BE FITTED.



## 6.5 PERQ2 Display unit

6.5.1 Cables and connectors

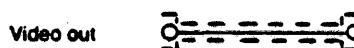
This drawing shows the connections for the T1 and T2 Portrait and landscape displays and the PERQ2 Bulkhead interface panel.

B/Head  
Video I/F

Video I/F

CONN5	CONN1	T1	T2
1	1	POWER T +12V	As T1
2	2	VOL POT	As T1
3	3	SPEAKER RETURN	As T1
4	4	HOR SYNC	As T1
5	5	GND	As T1
6	6	VERT SYNC	As T1
7	7	GND	As T1
8	8	TAB DATA	+5V
9	9	TAB CLOCK	As T1
10	10	GND T	As T1
11	11	LOOP	As T1
12	12	LANDSCAPE (L)	As T1
13	13	K/BOARD DATA	As T1
14	14	GND	As T1
15	15	+5V	TAB DATA

CONN4



T1

T2

Video in

As T1

Video Power CONN2



T1

T2

NOTE:  
T1 has 3-way  
connector. T3  
has 4-way  
connector.



T1

OV RTN



0V RTN

+24V



SAFETY EARTH

SAFETY EARTH



PIN 4 Spare

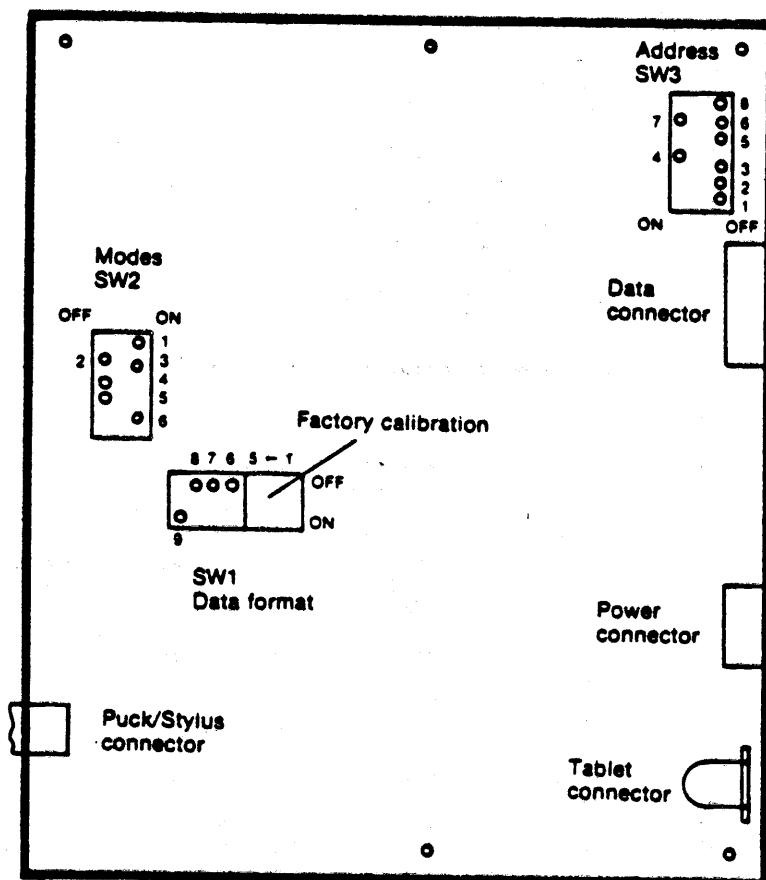
## 6.7 High resolution tablet - General information

6.7.1 Switch settings

PERQ systems normally use a GPIB interfaced version of the Summagraphics high resolution tablet. The details shown here are for the 01-0017-002 version. Switch settings and layout may change for different modules.

These units are factory set for - English mode  
 Continuous stream mode at maximum sampling rate (200/sec)  
 Device and address  
 No service request  
 Tektronix GPIB format  
 Device 8 address

Switch 2 should now be set to 40 samples/second as shown below.



## 6.8 3185 Printer - General information

6.8.1 Option selection switches

Three sets of switches are provided to select the OKI printer operational mode. These are mounted on the printed circuit boards and are accessed by removing the printer top cover.

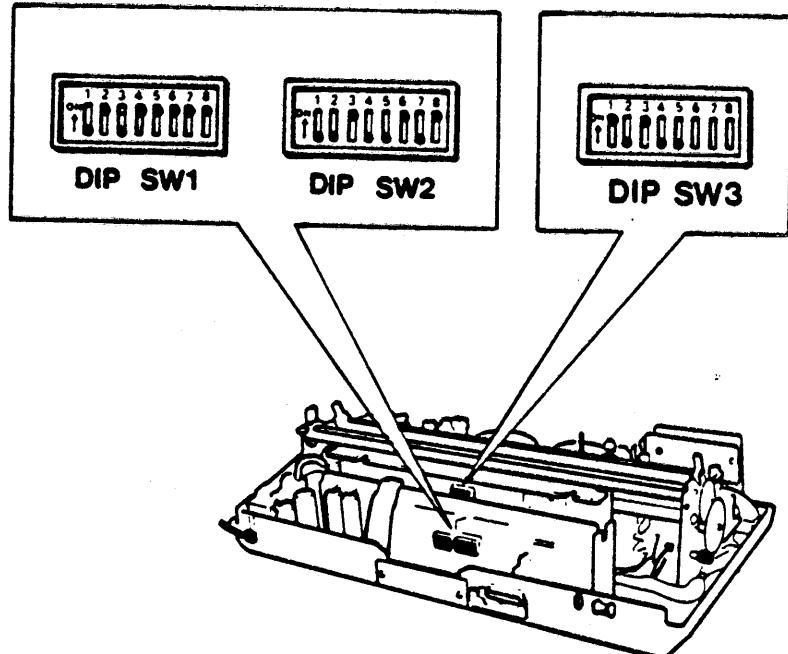
The switch settings for operation when connected to a PERO RS232 interface are given in the table below. The function of all the switches is shown in the tables following.

Switch settings for PERO

<u>Switch no.</u>	<u>Switch block 1</u>		<u>Switch block 2</u>		<u>Switch block 3</u>	
	<u>Setting</u>	<u>Means</u>	<u>Setting</u>	<u>Means</u>	<u>Setting</u>	<u>Means</u>
1	OFF	Even parity	OFF	Centronics	ON	7 bits
2	ON	Parity not selected	OFF	unblock	OFF	Auto LF off
3	OFF	7 bit data	ON		OFF	Ignore DEL
4	ON		OFF	Sp ON SW ON if sel.	OFF	Not used
5	ON	9600 baud	OFF	Mark at busy	OFF	
6	ON		ON	Ready if CD is sp	ON	U.K. Character set
7	ON	CR code	OFF	RS232C	OFF	
8	ON	Low threshold	ON	Two wire	OFF	

## External switches

Form length 1 is ENABLED  
the others do not matter



## 6.8 3185 Printer - General information

## 6.8.1 Option selection switches - continued

<u>Protocol</u>	<u>Switch position</u>		
	1	2	3
Simplex busy	ON	ON	ON
Simplex acknowledge	OFF	ON	ON
Centronics RS232	ON	OFF	ON
Centronics unblocked	OFF	OFF	ON
Undefined	ON	ON	OFF
Centronics blocked duplex	OFF	ON	OFF
DEC duplex	ON	OFF	OFF
Local test	OFF	OFF	OFF

Switch block 3

<u>Switch number</u>	<u>ON</u>	<u>OFF</u>
1	7 bit data	8 bit data
2	Auto LF when CR received	No data LF
3	Acknowledge DEL	Ignore DEL
4	Not used	Not used
5		
6	Language variants, see below	
7		
8		

<u>Language</u>	<u>Switch position</u>				<u>Notes</u>
	5	6	7	8	
USA: Canada	OFF	OFF	OFF	OFF	
UK: Netherlands	OFF	ON	OFF	OFF	
Germany: Austria: Switzerland	ON	ON	OFF	OFF	
France: Belgium	OFF	OFF	ON	OFF	
Sweden: Finland	ON	OFF	ON	OFF	
Denmark: Norway	OFF	ON	ON	OFF	
Italy	ON	OFF	OFF	ON	
Spain: Latin America	OFF	OFF	OFF	ON	If the printer has an additional character ROM these variants may be selected
Portugal: Brazil	ON	ON	ON	OFF	
German (alternative)	OFF	ON	OFF	ON	

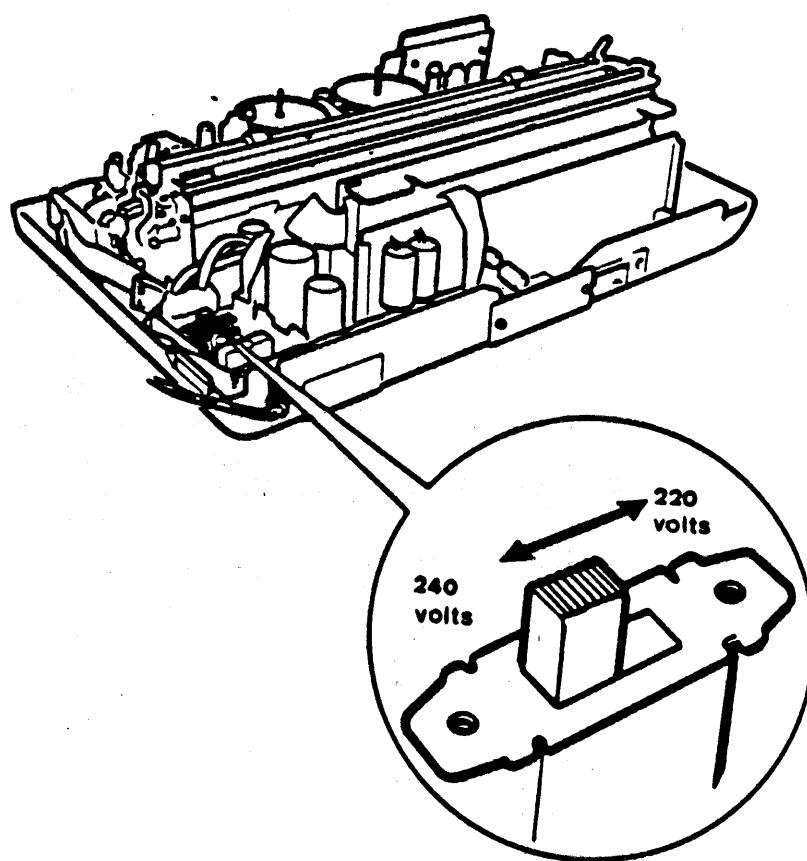
## 6.8 3185 Printer - General information

### 6.8.3 Mains voltage switch

The 3185 printer may be used on either a 220v 50 Hz or a 240v 50 Hz supply, for UK use.

Selection is made by setting a slider voltage selection switch to the local supply.

This switch is mounted at the rear right hand side of the chassis as shown in the diagram.



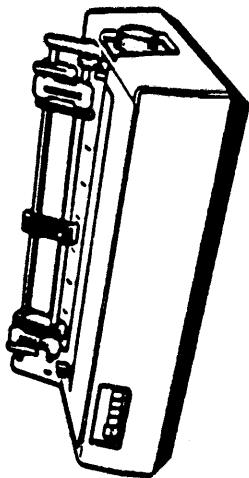
## 6.8 3185 Printer - General information

## 6.8.5 Installation card

**1 Prepare the printer**

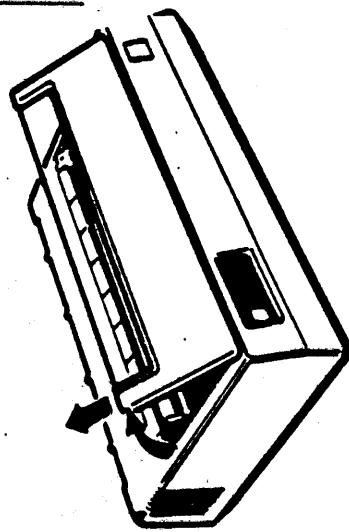
- Unpack your printer and check that nothing is missing or damaged. You should receive:

- 1 Printer
- 2 User's Manual
- 3 Ribbon
- 4 Empty reel
- 5 Fuses (2 amp and 3 amp)
- 6 Platen knob
- 7 Tractor unit

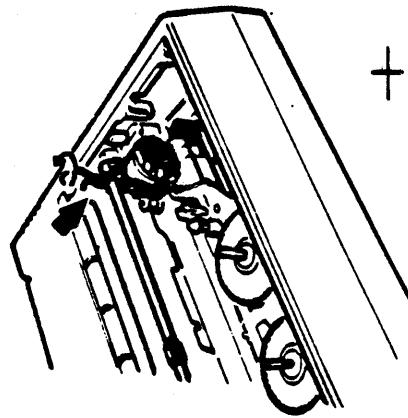
**Installing your 3185 printer**

**ICL PERQ**

- Remove the access cover



- Remove the fastener used to secure the print head during transit



Keep the packing materials if you have a contract that requires you to return your printer for service or repair  
Caution  
BLACK

These instructions cover installation and connection of your optional printer to an ICL PERQ. Use these instructions in preference to those given in the User's Manual supplied with the printer.

**Materials required**

- Interface cable: 12396/02 (PLRQ 2)

The application kit containing the cable also includes the publication "ICL 3185 Matrix Printer on PLRQ" (R10135/00). You should file this in the "options" section of your PERQ User Guide.

- Small, bladed screwdriver
- Small, cross-headed screwdriver (for example, Pozidrive, size 2) with a shaft at least 3.25 inches long

Please follow these instructions carefully

## 6.8 3185 Printer - General information

## 6.8.5 Installation card - continued

- Fit a suitable mains plug. In the UK, the plug should have a 5 amp fuse

**WARNING**  
THE MAINS PLUG SHOULD BE FITTED ONLY BY A QUALIFIED ELECTRICIAN OR EQUIVALENT TRAINED PERSON

**WARNING**  
THIS EQUIPMENT MUST BE EARTHED

**IMPORTANT** The mains plug shall be connected as follows.

The wires in the mains lead are in accordance with the following code.

Europe	USA/Canada
BLUE	WHITE
BROWN	NEUTRAL (N)
GREEN/YELLOW	LIVE (L)
	Earth (E) or

As the colours of the wires in the mains lead may not correspond with the colour markings identifying the terminals on your plug, proceed as follows:

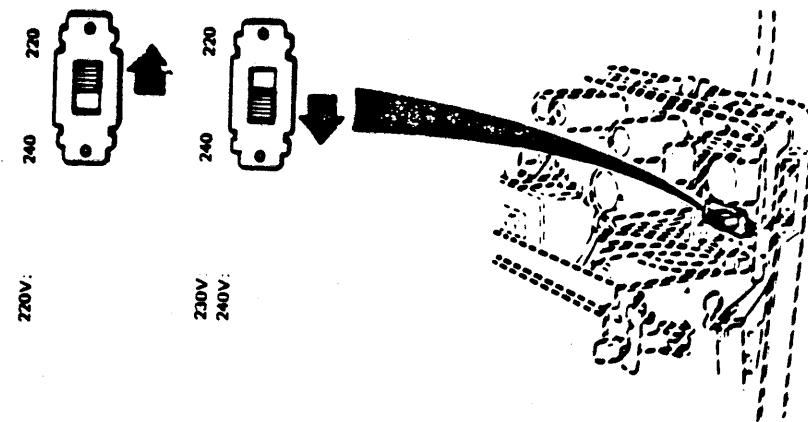
The wire that is coloured BLUE or WHITE must be connected to the terminal that is marked with the letter N or coloured BLACK

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

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

**IMPORTANT** Your printer and PRO processor must be powered from the same phase of mains supply and share a common safety earth. In the UK, for example, a twin 13 amp socket outlet is ideal

- Select the correct operating voltage to match your supply (220/240V models only)
- Replace the covers
- Fit the platen knob



## 6.9 6202/02 Printer (GPIB) - General information

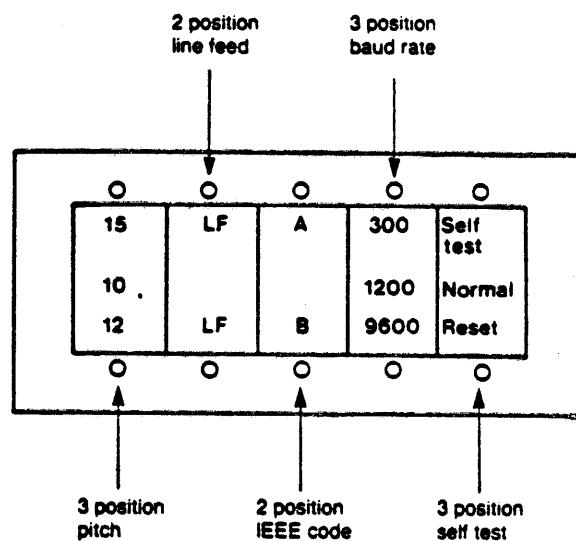
## 6.9.1 Option selection switches (GPIB)

This information is for RICOH 1600 printer with an APTEC interface board connected to the PERQ GPIB.

Prior to operation the printer is configured by means of one externally mounted switch, located at the rear of the printer adjacent to the interface connector and two internally mounted DIL switches located on the foremost PCB.

## External switch settings

cpi - Not used  
line feed to LF  
IEEE code to UP  
baud - Not used  
test to normal



## Internal switch settings

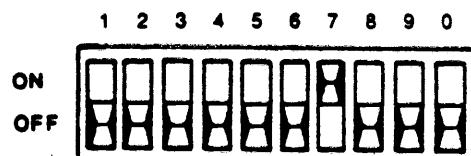
\*Indicates that the switch is overridden by the external switch

## switch block 1

## Sw.no. Function when ON

1	14
2	13
3	12
4	11 IEEE - 488 Addresses
5	10 (Not used)
6	9
7	4
8	Not used
*9	15 cpi
0	Auto bi-directional (Not used)

SW1

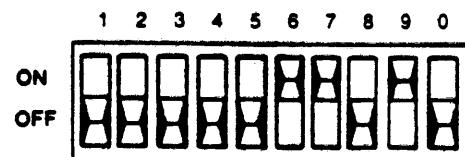


## switch block 2

## Sw.no. OFF ON

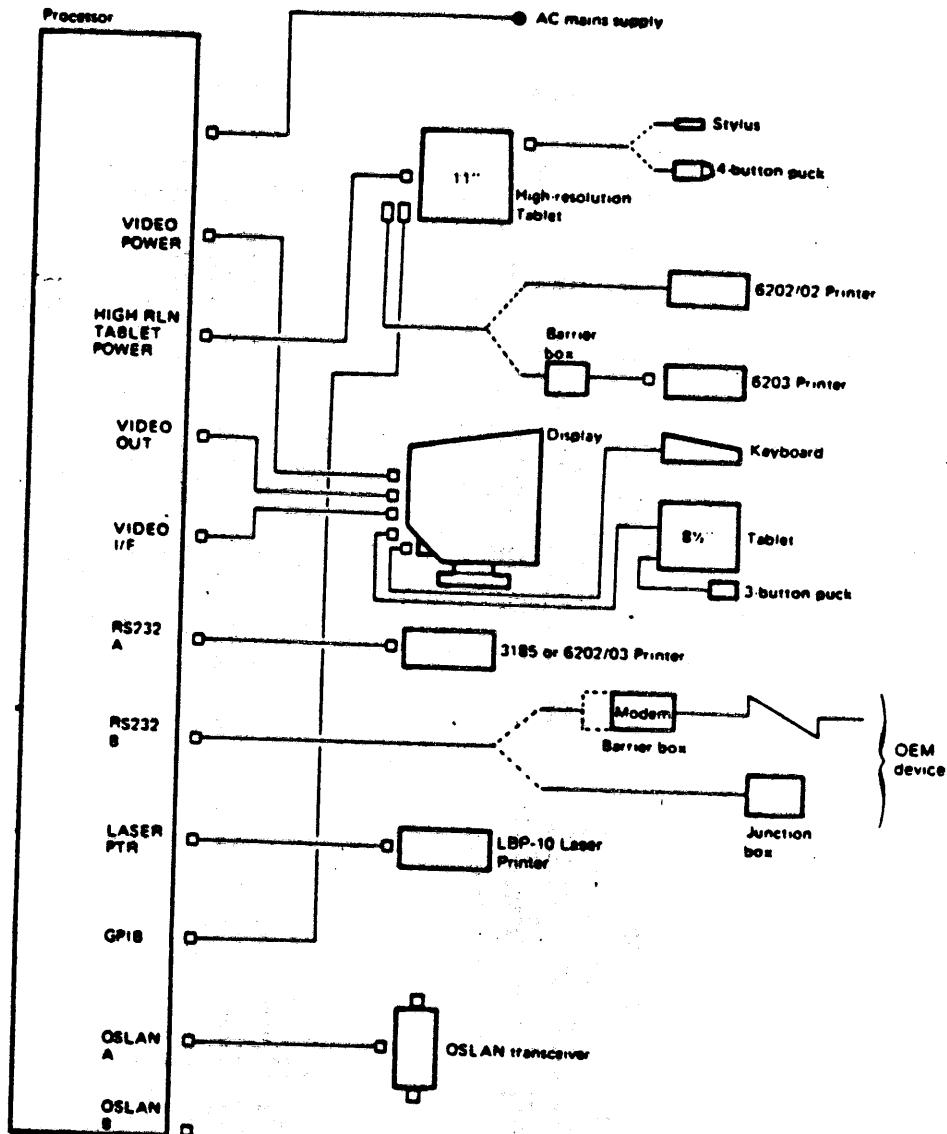
*1	No self test	Self test
*2	No auto linefeed	Auto linefeed
*3	12 cpi	10 cpi
*4,*5	Baud rate selection	
6	Parity disable	Parity enable
7	Odd parity	Even parity
8	DC1/DC3 disabled	DC1/DC3 enabled
9	#	f
0	Not used	

SW2



## 6.9 6202/02 Printer (GPIB) - General information

## 6.9.2 Installation card (GPIB) - continued



Reference information

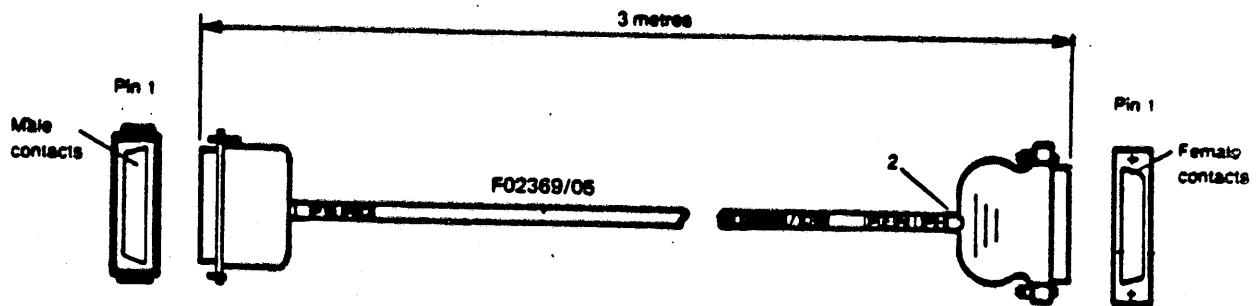
6.10 6202/03 Printer (RS232) - General information

6.10.2 Interface cable

This drawing shows the general arrangement of connections of the RS232 interface cable F2396 used to connect the RICOH RP1600 printer to the PERQ processor.

Note: Cable type F2396/ will have different sub-references after/depending on length, type of connectors etc.

F2396/05 has a screw-lock connector for PERQ2.

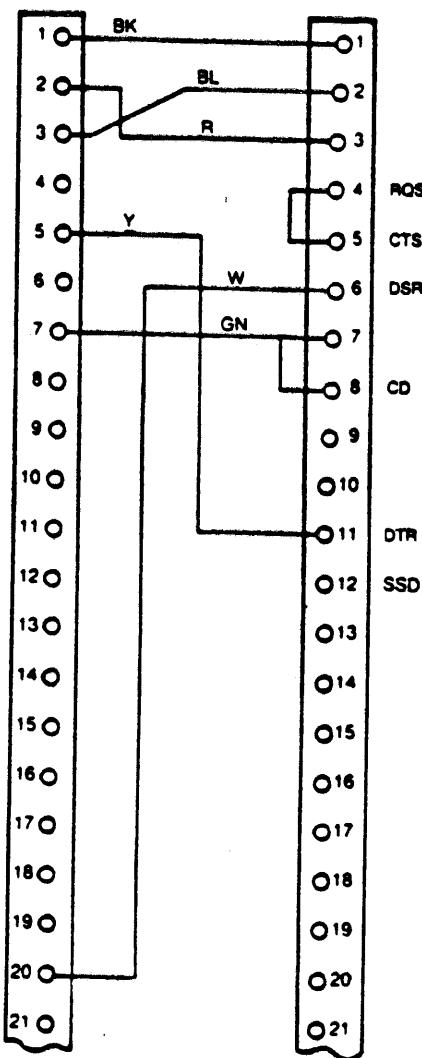


To PERQ

88011437

To PRINTER

Safety earth  
Tx Data  
Rx Data  
Request to send  
Clear to send  
Data Set Ready  
Signal 0 volts  
Received Line Signal Detector  
  
Tx Signal Element Timing  
Rx Signal Element Timing  
Data Terminal Ready



NOTE:

Pin to pin  
connections may  
vary for different  
applications

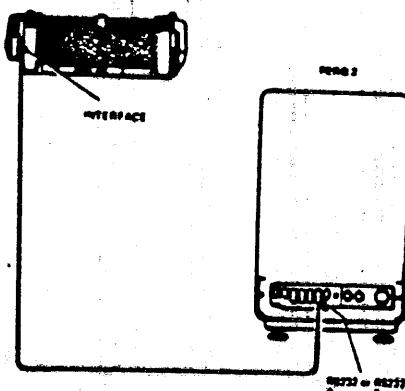
6.10 6202/03 Printer (RS232) - General information

6.10.3 Installation card - continued

**2 Connect the printer to your PERQ**

- Connect the interface cable end labelled PERQ to the RS232 socket on your processor, and secure the plug
- Connect the other end to the INTERFACE socket at the rear of the printer. Tighten the plug's screws to secure it

Keep these instructions for future use

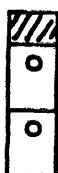


## 6.11 6203 Printer/plotter

6.11.2 Switch settings

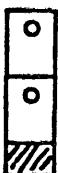
This information covers the switch settings required to support the Versatec V80 Printer/Plotter when attached to PERQ using PNX, particularly to newly installed systems where it may be used in 'plot' mode under window manager.

The diagrams show the correct switch settings for the V80, these switches are located inside the V80 on the 'Interface' PCB. 'P10' etc. indicates the relative position of the switch on this board.

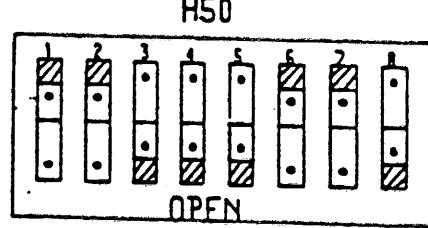
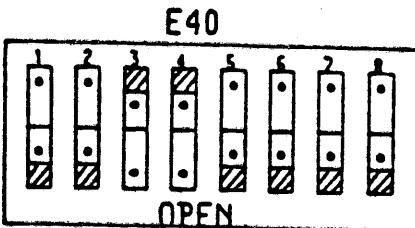
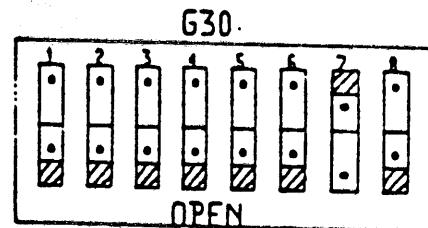
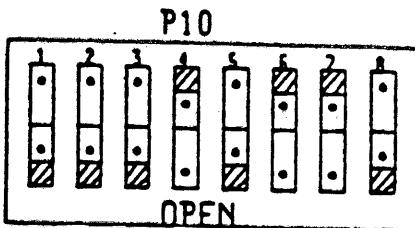


← The shaded part indicates the part of the rocker switch which protrudes.

= OPEN



= CLOSED

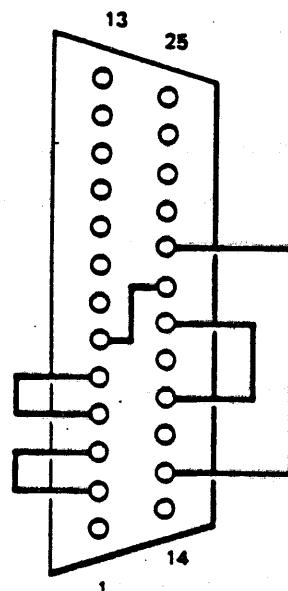


## 6.13 RS232 Communications - General information

6.13.1 Loop-back plug

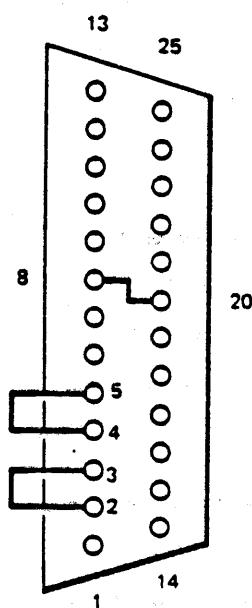
This plug is supplied as service aid 86011474 for use with the RS232 loop-back I/O confidence test. Early systems use service aid 7730360. Wiring is shown for both type numbers.

These pins are linked on the 25-way type D connector.



service aid 7730360

Male contacts



service aid 86011474

Reference information

6.13 E8232 communications - General information

6.13.3 MODEM cables

The table gives the 25 way connector pin allocation for British Telecom Modems.

Datel Service		200			600					1200DX	
Modem		2B+2C	13	21	1C + 1D			1F + 20		27	
CCITT CCT.No.	TO DTE / TO MODEM				Model 3	Model 4	Model 5	Model 3 TG2391	Model 4 TG2392	Model 5 TG2393	
102	COM	7	7	7	7	7	7	7	7	7	7
103	TD	2	2	2	2		2	2+14		2+14	2
104	RD	3	3	3		3	3		3+16	3+16	3
105	RTS	4		4	4		4	4+19		4+19	
106	RFS	5		5	5		5	5+13		5+13	5
107	DSR	6		6	6	6	6	6	6	6	6
108/1	CDSTL	20		20	20	20	20	20	20	20	
108/2	DTR	20		20				20	20	20	20
109	DCRLSD	8	8	8		8	8		8+12	8+12	8
110	SQ										
111	DSRS				11	11	11	11+23	11+23	11+23	
113	TSET										24
114	TSET										15
115	RSET										17
116	SSBY										
117	SBY1										
118	TBCD				2				14+2		
119	RBCD				3			16+3			
120	TBCLS					4			19+4		
121	BCR					5			13+5		
122	BCRLSD				8			12+8			
125	CI	22		22	22	22	22	22	22	22	22
128	STF	11									
140	RDL										
141	LAL										
142	T1										25

PAGE RESERVED

Entry to the problem

Isolating the problem

Functional diagrams

Overview

Operating information

Reference information

7

## **Procedures**

Technical notes

This section contains information to help in the repair and enhancement of the system generally by unit replacement. The information is also useful where fault investigation requires access within the system units.

Be aware of the **WARNINGS** and **CAUTIONS**.

<u>Section</u>	<u>Heading</u>
7.1	<b>WARNINGS and CAUTIONS</b>
7.1.1	Warnings
7.1.2	Cautions
7.2	<b>Replacement parts - General information</b>
7.2.1	PERQ Field replacements parts
7.3	<b>Processor covers</b>
7.3.1	Processor movement
7.3.2	Covers
7.4	<b>AC distribution</b>
7.4.1	The Processor mains isolator switch
7.4.2	Diagnostic display PCB
7.4.3	Processor fan replacement - general
7.5	<b>Power supplies</b>
7.5.1	Processor power supply
7.6	<b>Motherboards - General information</b>
7.6.1	Motherboard replacement
7.7	<b>Processor unit PCB replacement</b>
7.7.1	General procedure
7.8	<b>PERQ2 disc replacement</b>
7.8.1	Introduction
7.8.2	PERQ2 T1 replacement procedure
7.8.3	PERQ2 T2 replacement procedure
7.8.4	Drive addressing for Micropolis 1300 series 5.25 inch discs
7.9	<b>Floppy disc drive replacement</b>
7.9.1	General procedure
7.10	<b>Display unit replacements</b>
7.10.1	PERQ2 T1 and T2 replacements
7.11	<b>PERQ2 keyboard replacement</b>
7.12	<b>Tablet unit replacements</b>
7.12.1	High resolution tablet
7.12.2	Standard tablet

## Procedures

### 7.1 Warnings and cautions

#### 7.1.1 Warnings

##### **WARNING**

###### **Dangerous voltages within video terminals**

Extra high voltages are generated for the CRT within video terminals and mains voltages are present even when power is switched off at the terminal mains switch. The surest way of removing power from a unit to be worked on is by withdrawing the mains input plug.

Remove the unit from its normal place of use if there is any danger of users being exposed to high voltages.

###### **Adjusting CRT displays**

Some adjustments to CRT displays have to be done with the circuits exposed and power switched on. Such adjustments should be carried out only by trained engineers who must observe good engineering practices to avoid injury and to ensure their survival in the event of accidental shocks.

###### **Residual EHT charges**

It has been found that a very high voltage charge can migrate to the EHT connector on a CRT even though mains power is removed and the terminal has been repeatedly earthed. At all times, avoid touching the terminal on the tube either directly, or through metallic tools.

###### **Glass hazard**

Mechanical shock to a cathode ray tube may cause the tube to implode violently. Take extra care when handling tools near to the CRT and shield the glass with a cloth or felt restraining medium. An implosion could severely injure you and colleagues nearby.

7.1.2 Cautions**CAUTIONS****Electrostatic damage**

Some components on printed circuit boards can be damaged by excessive voltages, regardless of current flow. Such components are referred to as electrostatically sensitive devices (ESDs). To avoid damage to such devices from movement generated charges on the body:

- avoid unnecessary handling of boards
- wear an earthed wrist strap when handling boards
- always transport boards in an authorised container
- keep board in container until required
- slit the container with a knife; do not tear it open
- if they are supplied, carefully remove edge connector shunts and reapply to the replaced board

**Screen optical coatings**

Some video terminals have a special anti-glare coating applied to their screens. Try to avoid fingering these screens. If a screen is contaminated by oils from the skin, use only the recommended cleaning pads to remove the oils and wipe the screen dry with a soft paper tissue or a lint-free cloth.

**Field repair strategy**

Board or whole unit replacements are the expected methods of on-site repairs to equipment covered by this guide. Subunit replacements will normally be done by service centres; only in unusual situations will subunits like mains transformers and cathode ray tubes be replaced on site.

**CAUTIONS****Handling floppy discs**

Always handle a floppy disc carefully. In particular

- Do not bend
- Do not touch recording surfaces
- Do not use paper clips or staples to attach notes or labels
- Always store in protective dust covers
- Avoid cold or excessive heat; store disc within temperature range 0 to 52°C (50 to 125°F)
- Keep discs away from magnetic fields

## **Procedures**

### **Transporting disc units**

**For TI machines with 8 inch Micropolis disc drives.**

**Before moving a fixed or exchangeable disc unit lock its read-write heads. Avoid jarring the unit while you are accessing the locking mechanism.**

### **CAUTION PWRQ2 overtemperature**

**There is no overtemperature sensing. When servicing always check:**

- . fan tray connector pushed well home**
- . all fans are running**

## 7.2 Replacement parts - General information

### 7.2.1 PERQ2 replacement parts

The table shows those parts of T1 (8222/xx and T2 (8223/xx) systems held as spares and indicate which systems they are for. The sub-section references are to procedures for on-site replacement of faulty assemblies.

<u>ICL PART</u>	<u>System</u>	<u>Description</u>
86009847	T1	T2
86009849	T1	
86009850	T1	T2
		Processor cover moulding front
		Processor cover moulding top
		Processor cover moulding rear
80048844	T1	T2
80046581	T1	T2
88808149	T1	
7739646		T2
7738671		T2
		Mainbs ON/OFF switch
		Fan axial
		Diagnostic display PCB (K149)
		Diagnostic display PCB (K148)
		Cable DDS to motherboard
86011422	T1	
7734940		T2
80019515	T1	T2
5060340	T1	T2
7778674		T2
		PSU assembly (Wren)
		PSU assembly
		5A Fuse HRC 250V (FS1)
		10A Fuse HRC 250V (FS2)
		2A Fuse HRC 250V (FS3)
		10A filter 115/250V
88808115	T1	
7734941		T2
		Motherboard (K155)
		Motherboard (K155)
80043035	T1	
80019910	T1	
80019910	T1	
7734951		T2
		CPU (4K) (8" fixed disc) K156
		CPU (16K) (8" fixed disc)
		CPU (16K) (8" fixed disc)
		CPU (16K) (5.25" fixed disc)
5154433	T1	
5154434	T1	T2
8880895	T1	T2
7734949	T1	T2
7734947	T1	T2
		0.5Mb memory PCB (Portrait)
		1Mb memory PCB (Portrait)
		2Mb memory PCB (Portrait)
		1Mb memory PCB (Landscape)
		2Mb memory PCB (Landscape)
5155496	T1	T2
7738617		
		EIO PCB (links for T1 or T2 see note 1)
		Battery 3.6V for EIO PCB
5155092	T1	T2
5155093	T1	T2
		OIO PCB Link/Canon/Ethernet (BA92)
		OIO PCB Link/Canon (BA93)
80019837	T1	
5155480	T1	
86011101	T1	
		8" Fixed disc drive without adaptor
		Adaptor PCB for 8" drive (BB11)
		Cable EIO to BB11
7734938		T2
7734939		T2
7738676		T2
7746577		T2
		5.25" Fixed disc drive without adaptor
		Adaptor PCB for 5.25" drive
		Cable EIO to adaptor PCB
		Spacer for mounting adaptor PCB
679014	T1	T2
86011100	T1	
7738675		T2
		8" Floppy disc drive 240V 50Hz
		Cable EIO to Floppy
		Cable EIO to Floppy

#### Note

- 1 The same board is used for both T1 and T2 systems. But two links JP2 and JP3 must be fitted when used with T2 5.25 inch discs. Links JP2 and JP3 must not be present when the board is used with T1 8 inch discs. The jumper (handbag) links are ICL part 4901857601 and are also used on other boards, the floppy and fixed discs.

**Procedures**

<u>ICL Part</u>	<u>System</u>	<u>Description</u>
80019760	T1	Portrait display (Kent) No covers
80033605	T1 T2	Portrait display Cover moulding
80033606	T1 T2	Portrait display Bezel
86011524	T1 T2	Portrait display Base
86011082	T1	Portrait display (Kent) to B/H cable
86011313	T1 T2	Video interface cable
86011317	T1 T2	Coax cable
80033408	T1	Knob
7734644	T1	Regulator
7734645	T1	Display PCB
7734646	T1	CRT base PCB
7734647	T1	CRT
7734648	T1	Loudspeaker
7734649	T1	EHT connector
7734650	T1	Scan Coil
7734651	T1	Plug
7734652	T1	Variable resistor volume
7734653	T1	Variable resistor brightness
7734654	T1	Pincer connector plug
7734655	T1	Video connector socket
7734656	T1	DIN connector socket
7734942	T2	Portrait display (KRITZ) with covers
7734943	T2	Scan
7738701	T2	Yoke assembly
7738702	T2	CRT
7738703	T2	Loudspeaker
7738704	T2	7 Way DIN socket
7738705	T2	5 Way DIN socket
7738706	T2	Coax socket
7738707	T2	Video I/F socket
7738708	T2	EHT transformer
7738709	T2	Portrait display (KRITZ) to B/H cable
7738710	T2	100K Variable resistor
7738711	T2	50 Variable resistor
80019906	T1 T2	Keyboard (VT100)
679330	T1	11" High resolution tablet
679526	T1	Four button puck
7732919	T1	Bar magnet
679333	T1	Cable grip
679331	T1	Stylus
7734546	T2	Landscape display (Moniterm 20") complete
86011920 was 80019907	T1 T2	8" Tablet and puck 3 (Portrait)
7739278	T2	12" Tablet and Puck 3 (Landscape)
7738660	T2	GPIB cable. B/H to motherboard
7738664	T2	OSLAN A cable. B/H to motherboard
7738665	T2	RS232 A cable. B/H to motherboard
7738667	T2	RS232 B cable. B/H to motherboard
7738668	T2	Canon printer cable. B/H to motherboard
7738669	T2	Video outable. B/H to motherboard
7738670	T2	VideoI/F cable. B/H to motherboard

7.2.2 Alternate part numbers

This table provides a reference to other part and feature numbers by which replaceable items may be identified. Advice must be sought where any doubt exists regarding the compatibility of replacements.

Description	Part	Other numbers
Processor front cover	86009847	
Processor top cover	86009849	
Processor rear cover	86009850	
Mains switch	80048844	45265
Fan axial	80047552	4558N
DDS PCB T1	88808149	
DDS PCB T2	7739646	111216-00
DDS cable	7738671	111314-00
T1 PSU	86011422	
T2 PSU	7734940	111310-10
5A Fuse	80019515	820027-01
10A Fuse	9060340	
2A Fuse	7778674	610920-01
10A Filter		
T1 Motherboard	88808115	
T2 Motherboard	7734941	111285-00
T1 CPU PCB 4K	80043035	
T1 CPU PCB 16K	80019910	
T2 CPU PCB 16K	7734951	111332-00 F2360/04
T1 0.5Mb Memory (Portrait)	5154433	F2361/02
1Mb Memory (Portrait)	5154434	F2361/03
2Mb Memory (Portrait)	88800895	F2361/04
1Mb Memory (Landscape)	7734949	110134-00 F2361/05
2Mb Memory (Landscape)	7734947	110197-00 F2361/06
EIO PCB	5155496	110006-00
3.6V battery	7738617	840151-01
OIO PCB Link/Canon/Ethernet	5155092	100226-00 F2359/06 BA92
OIO PCB Link/Canon	5155093	100227-00 F2359/04 BA93
T1 Fixed disc	80019837	F2362/17
T1 Fixed disc adaptor	5155480	
T1 Fixed disc cable	86011101	BB11
T2 Fixed disc	7734938	111247-00
T2 Fixed disc adaptor	7734939	111224-00
T2 Fixed disc cable	7738676	111027-00
T2 Fixed disc spacer	7746577	750774-01

**Procedures**

<u>Description</u>	<u>Part</u>	<u>Other numbers</u>
Floppy disc drive 240V 50Hz	679014	111129-10 F2362/11
T1 Floppy disc cable	86011100	
T2 Floppy disc cable	7738675	111026-00
T1 Portrait display	80019760	F2362/22
Portrait display Cover	80033605	
Portrait display Bezel	80033606	
Portrait display base	86011524	
Portrait display knob	80033408	
T1 Portrait display Power cable	86011082	
Display to Bulkhead Video I/F cable	86011313	
Display to Bulkhead Coax I/F cable	86011317	
T1 Portrait display regulator	7734645	PP0014
T1 Portrait display Display PCB	7734645	MB1701
T1 Portrait display CRT base PCB	7734646	PB0057
T1 Portrait display CRT	7734647	PA0038
T1 Portrait display Loudspeaker	7734648	KE7005
T1 Portrait display EHT connector	7734649	PN0064
T1 Portrait display Scan coil	7734650	PC0071
T1 Portrait display Plug	7734651	PR0018
T1 Portrait display Volume	7734652	PR0020
T1 Portrait display brightness	7734653	PR0021
T1 Portrait display power con	7734654	PR0022
T1 Portrait display Video can	7734655	PR0024
T1 Portrait display Din can	7734656	KD8061
T2 Portrait display	7734942	111239-00 F2362/24
T2 Portrait display Scan PCB	7734943	110214-00
T2 Portrait display Yoke assembly	7738701	111365-00
T2 Portrait display CRT	7738702	700123-01
T2 Portrait display Loudspeaker	7738703	110227-00
T2 Portrait display 7 Way DIN skt	7738704	820512-07
T2 Portrait display 5 Way DIN skt	7738705	
T2 Portrait display Coax skt	7738706	820510-01
T2 Portrait display Video I/F skt	7738707	82001-06
T2 Portrait display EHT transformer	7738708	111364-00
T2 Portrait display Power cable to B/H	7738709	111326-00
T2 Portrait display 100K Varies	7738710	810400-01
T2 Portrait display 50 Varies	7738711	810401-01
Landscape display 240V 50Hz	7734546	110147-00 F2362/23
Keyboard (VT100)	80019906	111213-00
Tablet 11"	679330	F2362/03 01-0017-002
Pick 4 button	679526	01-0012-002
Bar Magent	7732919	01-153-1
Cable grip	679333	
Stylus	679331	F2362/01
Tablet 8" (Portrait) and Puck 3	86011920	F2362/04 80019907
Tablet 12" (Landscape) and Puck 3	7739278	111249-00 F2362/05
T2 Motherboard cable GPIB	7738660	111318-00
T2 Motherboard cable OSLANA	7738664	111319-00
T2 RS232A	7738665	111315-00
T2 RS232B	7738667	111316-00
Canon	7738668	111320-00
Motherboard Video coax	7738669	111331-00
Motherboard Video I/F	7738670	111317-00

## 7.3 Processor covers

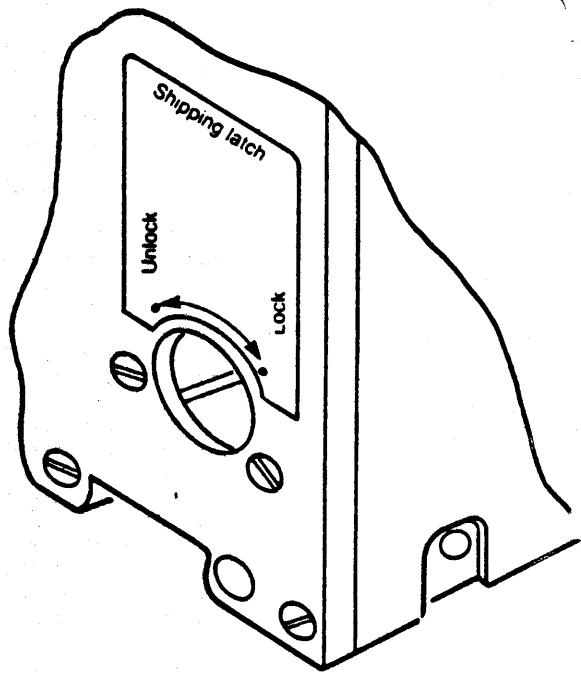
7.3.1 Processor movement**CADITION T1 PROCESSOR MOVEMENT**

Be very careful not to jar the processor cabinet when the 35 Mb disc drive heads are unlocked.

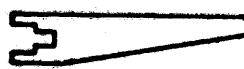
On T1 system the shipping latch should be locked if the cabinet is to be moved. If this is not possible for final positioning, under a table or against a wall, great care is needed to avoid damage.

To operate the shipping latch:

- Disconnect the mains power
- Remove the processor cabinet bustle
- Use the special tool to turn the latch (see drawing). A screwdriver that is too small will break the latch
- Turn the latch clockwise to lock the heads
- Turn the latch anticlockwise to unlock the heads



Special tool

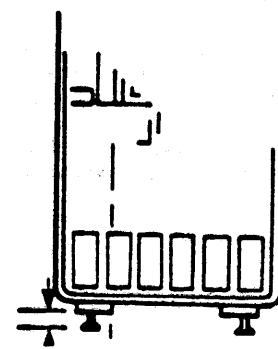
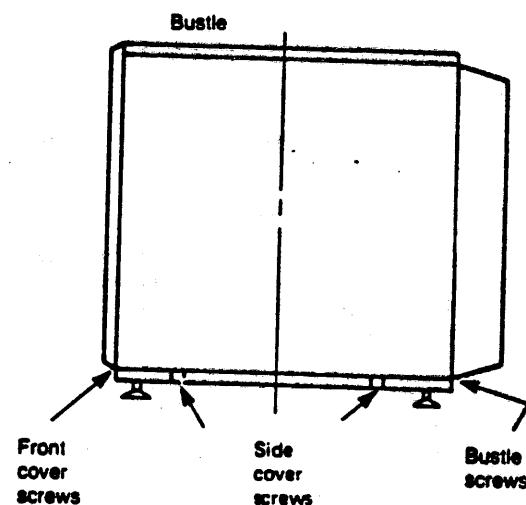


On T2 systems using Micropolis 1300 series 5.25 inch drives, an area of the discs not used for data storage is reserved for landing the heads. When power is removed from the drive, the heads are automatically returned to this landing zone; an automatic latching mechanism then locks the positioner in place.

**Procedures**

**7.3 Processor covers**

**7.3.2 Covers**



## 7.3 Processor covers

7.3.2 Covers - continued

The bustle at the back of the processor is secured by two large posidrive screws near the bottom edge (see diagram).

Removing the bustle gives access to:

- The 240VAC mains connector
- The signal and DC connectors to the other units
- The T1 fixed disc transit latch

Removing the bustle does not expose any unshielded electrical connectors or moving parts. But the bustle forms part of the air flow ducting and must always be replaced.

**WARNING 240VAC**

Remove the mains power supply before taking off the covers.

**Cover removal and replacement**

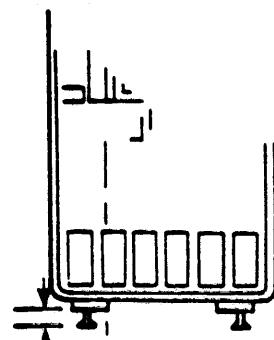
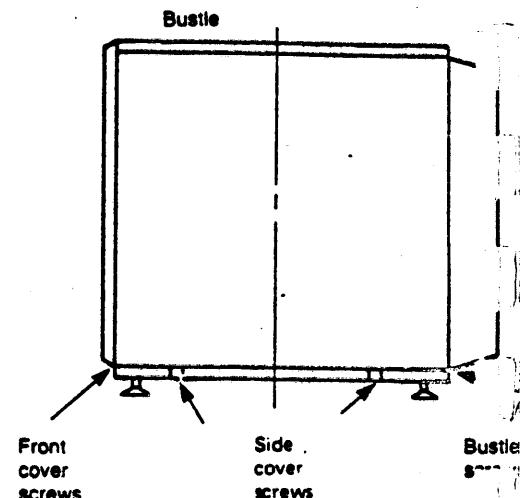
The front and side covers are each secured by two screws near the bottom edge. Support their weight while removing them.

When refitting the covers:

- Check the wire mesh EMC strips on the frame are not displaced
- Lift the side covers up to close the gap to the top moulding

**Processor leveling**

The feet leveling screws should be adjusted to give about one inch clearance between the processor and the floor. Small adjustments only should be needed to prevent rocking. Tighten the lock nuts with the special tool after levelling the processor in its final position.



**Procedures**

**PAGE RESERVED**

#### 7.4 AC distribution

This information is for replacing the PERQ2 AC distribution components and fans.

##### WARNING 240V AC

Disconnect the mains lead before removing covers.

###### 7.4.1 The processor mains isolator switch

Access is by removing the front and right hand side covers. No soldering is involved as the wiring has push-on connectors.

Compress the four plastic barbs on the switch to remove it from the mounting bracket.

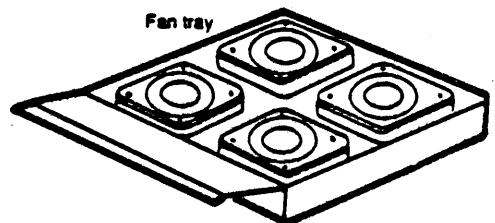
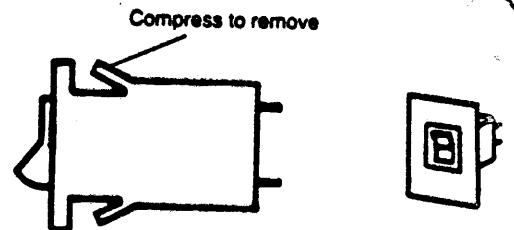
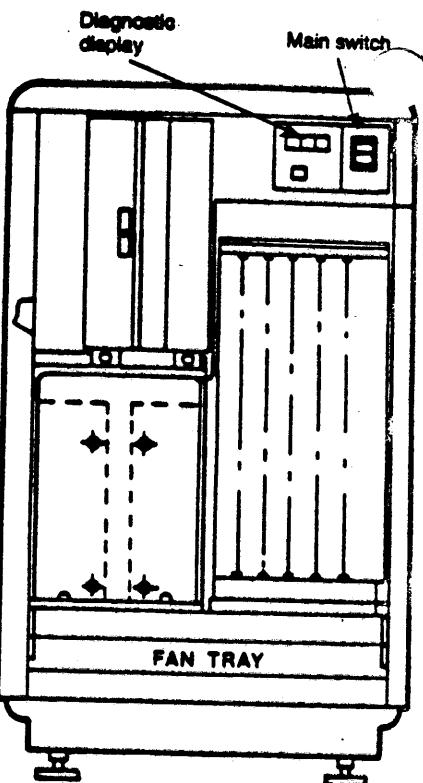
After replacing the switch check the earth lead connection is screwed down securely and the other switch connections are pushed fully home. Check the switch is the right way up. Terminal numbers 1 and 2 on the right as seen from the front of the switch.

###### 7.4.2 Diagnostic display PCB

This board holds the boot button and shares the mains isolator mounting. Check the mains lead is disconnected.

Access is by removing the front and right hand side covers. No soldering is involved as connections are made by a strip-line connector with pin 1 uppermost.

Four nuts and washers secure the board to its mounting bracket. When reassembling, be sure to refit the insulating strip so that it can prevent the mains wires on the isolator switch from touching the diagnostic display PCB even if they become detached.



**Procedures**

**7.4 AC distribution**

**7.4.3 Processor fan replacement - General**

**PAGE RESERVED FOR FIGURE 7.3**

## 7.4 AC distribution

### 7.4.3 Continued

This information is for replacing the four fans part number 80047552 mounted in the fan tray at the bottom of the processor cabinet.

Note: In subsequent system development different models may use different fans with different part numbers.

#### **WARNING 240V AC**

Disconnect the mains lead before removing covers.

#### **Removing the fan tray**

Access is by removing the front and left hand side covers. Then:

- Reach in at the left of the cabinet and unplug the mains connector at the back of the fan tray
- From the front of the cabinet remove the three screws securing the fan tray to the frame
- Slide the tray out of the cabinet while supporting its weight

#### **Removing the fan**

Remove the appropriate side of the fan tray for easy access to the fan fixing nuts.

#### **CAUTION Fan types**

Fans from both Etric and Papst are used. All four fans must be from the same manufacturer to avoid beat frequencies since the Etric and Papst fans have different rotational speeds.

#### **Fan replacement**

Mount the fan to blow air upwards as indicated on the fan moulding. When securing tighten screws to compress rubber gromets sufficiently for lock washers to act.

#### **Fan replacement checks**

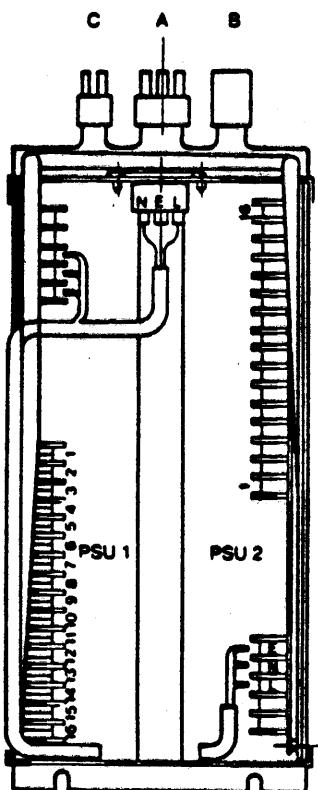
After replacing a faulty fan check that:

- The line and neutral connectors are pushed well home and the earth connector is screwed down securely
- The replacement fan blows air upwards into the cabinet
- That all four fans are functional

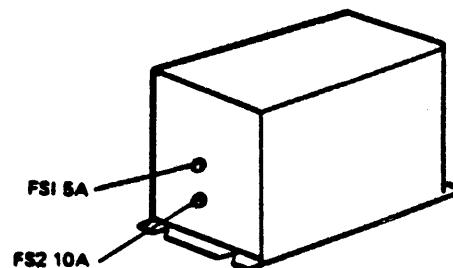
## Procedures

### 7.5 Power supplies

#### 7.5.1 Processor power supply



80019515  
T1 Power unit  
DO NOT ADJUST  
8222/xx systems only



80019635

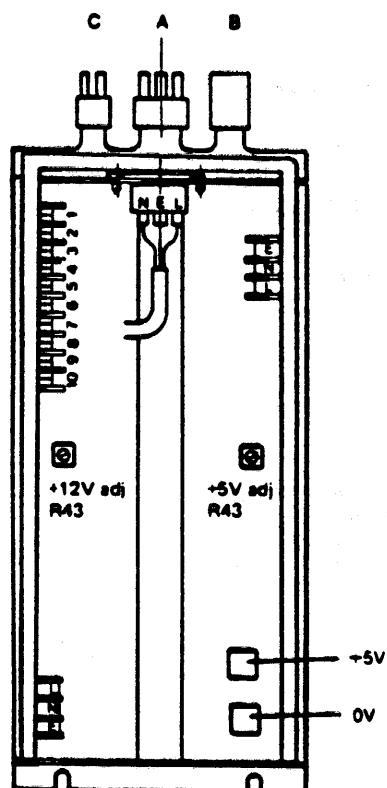
PSU 1

1	+5V sense
2	+5V
3	+5V
4	0V
5	0V
6	0V(+5V sense)
7	+24V
8	0V
9	+12V
10	0V
11	+12V
12	0V
13	
14	
15	
16	

80019636

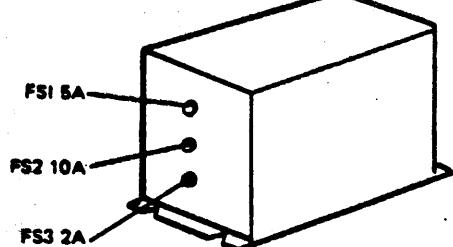
PSU 2

1	+5V sense
2	+5V
3	+5V
4	0V
5	0V
6	0V(+5V sense)
7	0V
8	-12V
9	
10	
11	
12	
13	
14	
15	
16	



7734940  
T2 Power unit  
8223/xx systems only

1	+55V
2	0V
3	+24V
4	0V
5	0V
6	-12V
7	Sense return
8	0V
9	+12V
10	+Sense



### 7.3 Power supplies

#### 7.3.1 Processor power supply

This information is for the PERQ2 composite power supply unit mounted in the processor cabinet.

##### **CAUTION**

The power units for T1 and T2 are not interchangeable.

The T1 unit is part number 86011422, this has two fuses on the front and contains Weir assemblies. The T2 unit is part number 7734940, this has three fuses on the front and contains NPT assemblies.

##### **WARNING 240V AC**

Disconnect the mains lead before removing covers.

##### **Fuses**

The replaceable fuses mounted on the front of the power supply are:

PS1 5 ampere part number 80019515. This protects the +5 volt supply to the keyboard, diagnostic display, the floppy disc drive, and high resolution tablet if fitted.

PS2 10 ampere part number 5060340. This protects the plus 5 volt supply to the fixed disc drives.

PS3 T2 units only are fitted with 2 amperes fuses part number ?????. This protects the plus 12 volt supply to tablet unit.

See section 4.3 for details of the power distribution.

##### **PSU removal**

To remove the power supply unit:

- Remove the front and left hand side processor covers
- Reach in at the left of the cabinet and unplug the three DC connectors A, B, C and the mains connector at the back of the power supply unit
- From the front of the cabinet remove the two screws securing the power unit assembly to the processor frame
- Slide the unit out of the front of the cabinet while supporting its weight

##### **PSU replacement**

The unit is replaced by the reverse of the removal process. In case of doubt as to the cause of the failure plug in connectors A,B and C first with the unit outside the processor and check the power unit outputs. See section 4 for details of the power unit connections.

## Procedures

### 7.3 Power supplies

#### 7.3.1 Processor power supply - continued

##### T1 CAUTION

Units containing two Weir power supplies have been balanced to share the +5 volt supply load. No attempt should be made to replace the individual units or to adjust the supplies on site.

##### T2 power supply adjustment

All the dc outputs are individually adjustable but it is only practical to adjust the plus 5 volt and plus 12 volt outputs on site.

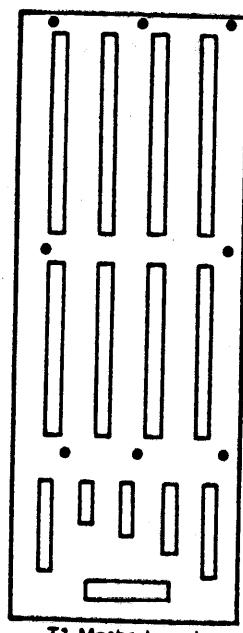
Set the plus 5 volt supply to 5.22 volts measured at the output terminals.

Set the plus 12 volt supply to 12 volts measured at the output terminals.

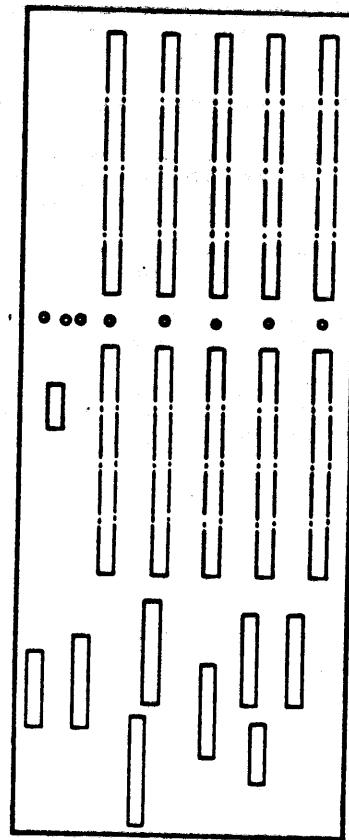
The output controls are mounted on the same side of the unit as the output terminals and both are labelled R43 V1 adjust.

7.6 Motherboard - General information

7.6.1 Motherboard replacement



T1 Motherboard



T2 Motherboard

## Procedures

### 7.6 Motherboards - General information

#### 7.6.1 Motherboard replacement - continued

This general procedure is for replacing the PERQ 2 processor card cage motherboard. The motherboards differ for T1 and T2 systems; check that you have the correct part number

The T1 motherboard is part number 88008115 and has D type connectors for cables to the bulkhead. The T2 motherboard is part number 7734941 and has IDC connectors for cables to the bulkhead

#### WARNING 240V AC

Disconnect the mains lead before removing covers.

#### CAUTION

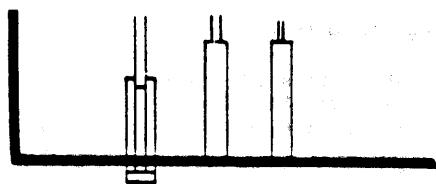
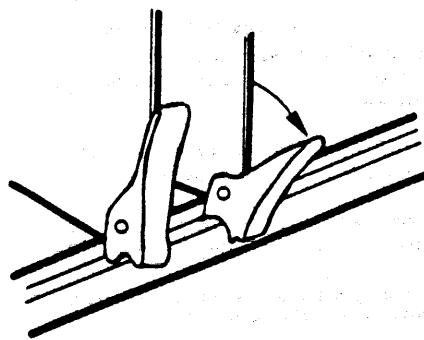
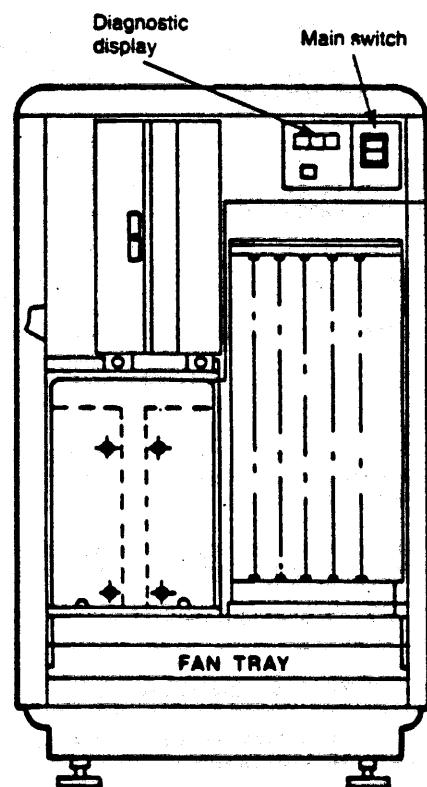
Special care is needed to avoid bending the motherboard pins, particularly while taking it out of the processor.

- remove the bustle, front, rear and left hand covers from the processor cabinet
- unplug the disc striplines and power connectors at the disc units
- remove the PCBs from the cardcage
- T1 lock the fixed disc shipping batch. (The T2 drives are self locking)
- remove the drive complete with the cabinet rear panel
- unplug the motherboard DC power wiring at the power supply
- T1 check that the GRAUNCH connectors on the motherboard pins are correctly identified and unplug them. See section 6.2 for details of these connections
- unplug all the cables from the motherboard to the bulkhead interface panel
- remove OV/safety earth connector from the mother board to the PERQ frame, at the frame
- remove the posidriv screws securing the motherboard to the cardcage
- remove the mother board complete with DC harness through the rear of the cabinet

#### Replacing the motherboard

This is the reverse of the removal process. Partially insert the PCBs to align motherboard connectors before tightening the securing screws.

## 7.7 Processor unit PCB replacement

7.7.1 General procedure

## Procedures

### 7.7 Processor unit PCB replacement

#### 7.7.1 General procedure - continued

##### **WARNING 240V AC**

Disconnect the mains power supply before taking off the covers.

##### **CAUTION Electrostatic damage**

Some components on printed circuit boards can be damaged by excessive voltages, regardless of current flow. Such components are referred to as electrostatically sensitive devices (ESDs). To avoid damage to such devices from movement-generated charges on the body:

- avoid unnecessary handling of boards
- wear an earthed wriststrap when handling boards
- always transport boards in an approved container
- keep the board in its container until required
- slit the container with a knife, do not tear it open
- if they are supplied, carefully remove edge connector shunts and transfer them to the replaced board

##### **Cover removal**

Only the processor unit front cover needs to be removed for access to the boards.

##### **PCB removal**

The boards are provided with colour coded inserter-extractors; the sticky tape securing these for processor transit should be removed.

To remove a board ease any off-card connectors free and pull the extractot ends nearest the centre of the board until they point towards you. The board is now free to slide out of its guides.

##### **PCB replacement**

To replace a board engage it into its guides with the component side to the right and the inserter arms pointing towards you. Slide the board in until the inserter-extractor hooks register in the bars across the front of the card cage. Lever the board into its mother board connector by bringing the inserter arms to lie along the front edge of the card. Refit any off-card connectors. Take particular care to ensure these are pushed fully home as no locking devices are provided.

## 7.7 Processor unit PCB replacement

### Cardcage PCB types

These are the ICL part numbers of boards for the cardcage. They are applicable to PERQ2 T1 and T2 systems. (Other numbers are given in brackets.)

#### CAUTION

Board revision levels, types or part numbers may change during future system development. Ensure a replacement board is compatible with the one being replaced and the users system.

### 7.7.2 CPU boards

The CPU board PROM circuits hold instructions for either the T1 8 inch fixed disc or the T2 5.25 inch fixed disc. Some system software needs a board with a 16K-word control store. See 6.1.5 for details of PROM types

	T1	Revision	T2	Revision
CPU 4K	80043035 (K156) (X15)		Not supported	
CPU 16K	80019910 (100023-00) (P2360/04)		7734951	D

## Procedures

### 7.7 Processor unit PCB replacement

#### 7.7.3 Memory boards

These boards have different memory capacities and drive either a portrait or a landscape display.

Memory Size	Portrait Display	Revision	Landscape Display	Revision
0.5Mb	5154433 (P2361102) T1 ONLY			
1Mb	5154434 (P2361103) (BA89)		7734949 (P2361105) (1101134-00)	
2Mb	88800895 (P2361104) (G895)	N	7734947 (P2361106) (110197-00)	

## 7.7 Processor unit PCB replacement

### 7.7.4 EIO board

The EIO board is part 5155496 (110006-00) and the revision level is A5.

Although the board is the same for both T1 and T2 systems the system fixed disc types must be defined by linking plugs.

For T2 5.25 inch disc two plugs JP2 and JP3 are fitted adjacent to circuits U6 and U7.

For T1 8 inch discs these plugs must not be fitted.

### Setting up the real time clock

Setting up the real-time clock on the PERQ2 EIO board. The procedure for setting up the real time clock is given in this section. A real time clock setting kit 86013115 is needed. This consists of:

- a physical tool (Dil clip) 86013116
- a floppy disc 80043716
- operating instructions 80043717

a Back-up copy of the floppy disc should be made and kept with the kit.

The crystal controlled clock-callendar chip MSM5832 with battery back-up is set during board test. The lithium battery's shelf life is approximately four years. If you have to change the battery or set the clock for a different time zone, follow this procedure.

#### All systems

- 1 Power 'OFF' system and remove front cover to gain access to the PCBs
- 2 Ensure switch on Real Time Clock (RTC) setting tool ICL 86013116 is in the "OFF" position
- 3 Observe Antistatic handling precautions and remove the EIO board, fit the RTC clip on U62 & U80, pin 1 of the clip on pin 1 of U62, make sure the clip is securely and correctly seated. Replace EIO PCB in the machine
- 4 Power the machine "On", and then switch "On" the switch on the clip

#### POS systems and PMX systems before Rel 4.1

- 5 Use "Shift V" on the keyboard to load the boot floppy (ICL 80043716). Enter date/time as DD MMM YY hh:mm
- 6 After the floppy is booted it will ask you to enter the date and time.  
Enter date/time as DD MMM YY hh:mm
- 7 It will ask to enter your name (just hit the return key)
- 8 It will ask: Do you wish to load Z80 firmware [Y] Answer N
- 9 It will ask: Do you wish to set RTC [Y] (hit the return key)

## **Procedures**

- 10 Enter the correct Data and Time as 6. above

Check that the correct date and time is displayed, if this is incorrect, the most likely reason is that the RTC clip is not correctly seated on the diliics U62 and U80, check this, and repeat procedure

- 11 Switch "OFF" the switch on the clip

- 12 Take floppy out. Continue at step 36 1.

**PXK systems Rel 4.1 and onwards**

- 5 When system prompts, correct date and time: DD MMM YYY hh:mm - confirm and ignore, login as superuser (ie root)

- 6 Set correct date and time: date-s YY MMM DD hh:mm (Enter)

Check that the correct date and time is now displayed, if this is incorrect, the most likely reason is that the RTC clip is not correctly seated on the diliics U62 and U80, check this, and repeat procedure.

- 7 Switch "OFF" the switch on DIL Clip. Continue at step 36 1.

**All systems**

- 13 Power the machine down

- 14 Observe Antistatic handling precautions, remove EIO PCB, remove RTC clip, and replace PCB

- 15 Switch on the machine and boot

- 16 Check that the time and date comes out correctly

## 7.7 Processor unit PCB replacement

### 7.7.5 OIO board

This board is only fitted for the PERO to PERO strip-line link or laser printer features. The OIO board is the same for both T1 and T2 systems and is part 5155093 (100227-00) (BA93). An OIO board part 5155092 (100226-00) may be used but this holds additional unsupported circuits.

## **Procedures**

### **7.8 PERQ2 Disc replacement**

#### **7.8.1 Introduction**

This procedure is for replacing the disc assembly of the 8 inch Micropolis drive fitted to PERQ2 T1 models and the 5.25 inch Micropolis drive fitted to PERQ2 T2 models.

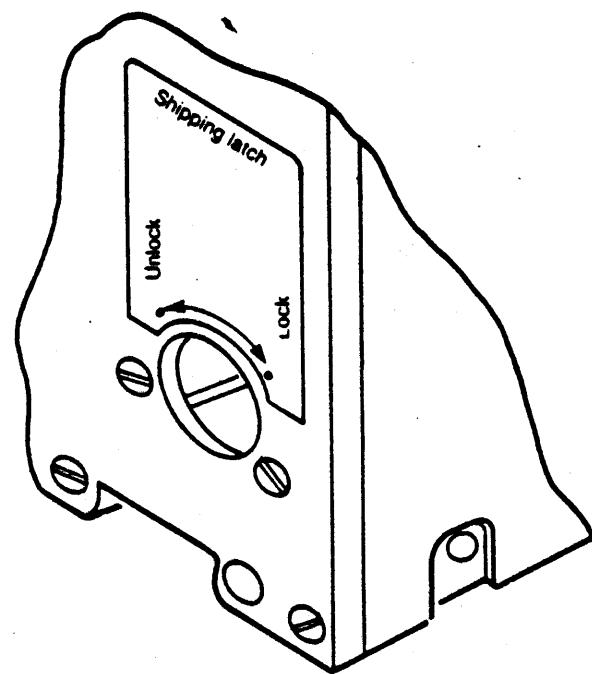
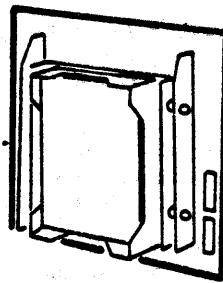
The first or only fixed disc drive assembly consists of the drive and an interface adaptor board which are replaced as separate items.

Some customers may be unwilling to allow a drive holding secret or confidential files to be removed by ICL staff. Under these circumstances, the replacement of boards etc. must be attempted on-site.

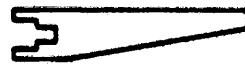
Apparent disc drive problems may be due to the I/O board cables or the power supply - check power and signal cables first. Try changing an I/O board before the drive. Prove the system works with a replacement drive before replacing boards on the drive.

7.8 PERQ2 disc replacement

7.8.1 PERQ2 T1 replacement procedures



Special tool



## Procedures

### 7.8 PERO2 Disc replacement

#### 7.8.2 PERO2 TI replacement procedures - continued

This information is for the 35 mbytes 8 inch Micropolis disc drive fitted in the PERO2 TI processor unit.

##### **CAUTION**

Be very careful not to jar the processor cabinet when the 35Mb disc drive heads are unlocked.

The shipping latch should be locked if the cabinet is moved. If this is not possible for final positioning, under a table or against a wall, great care is needed to avoid damage.

To operate the shipping latch:

- Disconnect the mains power
- Remove the processor cabinet bungie
- Use the special tool number 86011653 to turn the latch. A screwdriver that is too small will break the latch
- Turn the latch clockwise to lock the heads
- Turn the latch anticlockwise to unlock the heads

##### The replacement drive

The 35Mb Micropolis 1200 series slavedrive is identified as:

- ICL part number 80019837 (reference only - may change)
- Micropolis number 900-283-01-1B (reference only - may change)
- check the links on the device electronics board. This unit must be fitted with an ICL PERO interface adaptor board part number 5155480.

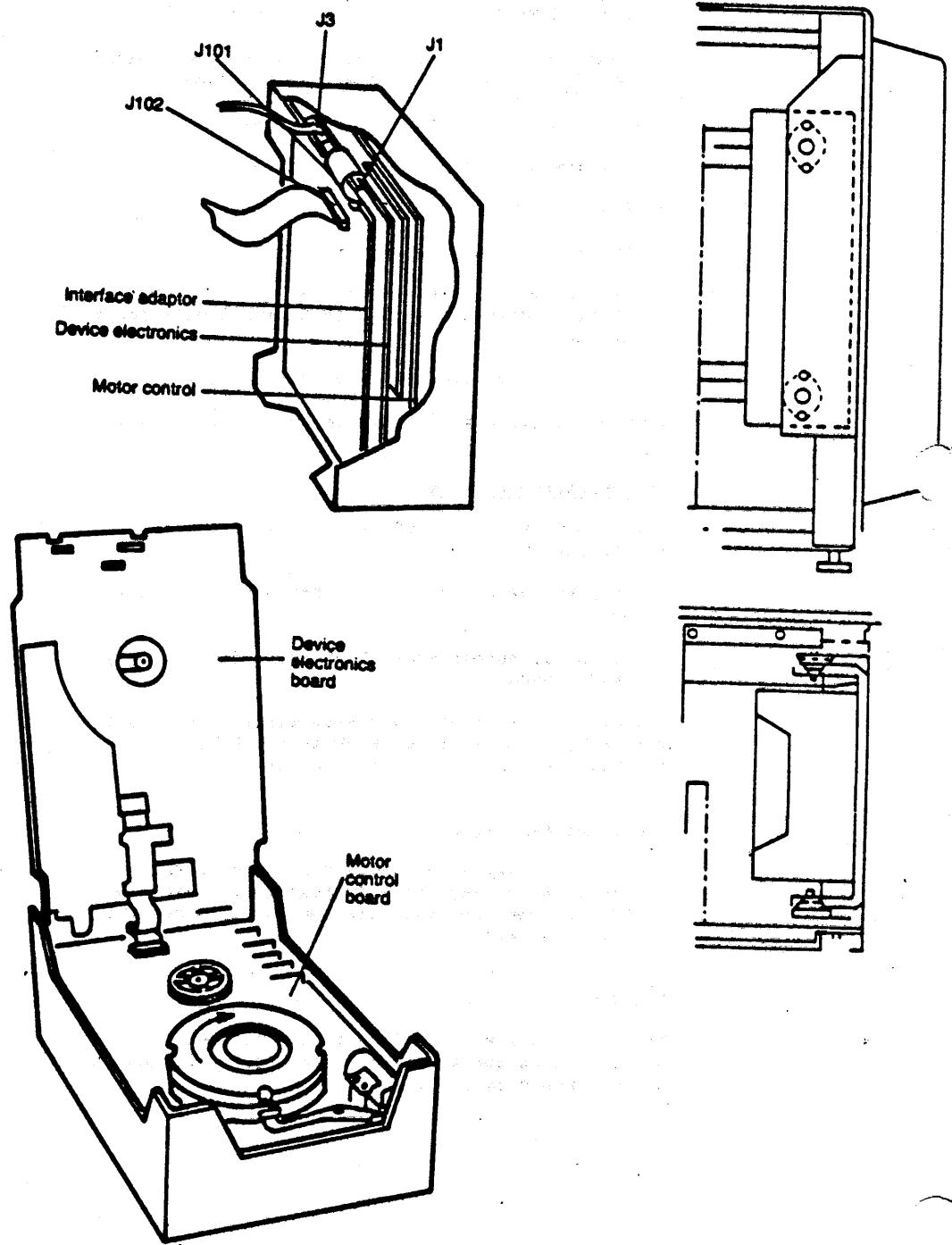
##### **Unpacking the drive**

The boxed drive, with banded corner protectors, is packed with its unpacking instructions inside an outer box. When packing, tie the corner protectors back in position.

##### **CAUTION**

Handle the drive carefully, it is very delicate. Do not unlock the shipping latch before fitting in the processor cabinet.

## 7.8 PERQ2 Disc replacement

7.8.2 PERQ2 TI replacement procedures - continued

## Procedures

### 7.8 PERQ2 Disc replacement

#### 7.8.2 PERQ2 TI replacement procedures - continued

The interface adaptor board 5155480 is mounted on top of the drive device electronics board. All interconnections are carried by a short 50 way stripline 86011208 and a power ribbon cable 86011209.

All part numbers are for reference only and may change during system development.

The interface adaptor board is secured to the device electronics board by four 7/64" allen screws.

Check the device electronics has fitted:

- Sector platform JX3
- Bad track PROM U61
- Interface terminators RP1, SP1 and SP2

Check the interface adaptor board is revision level.

#### Removing the drive

##### **CAUTION**

Be very careful not to jar the processor cabinet while the heads are unlocked.

The shipping latch should be locked before moving the cabinet: great care is needed to avoid damage if this is not possible.

The following steps are for removing the drive from the processor cabinet:

- Disconnect the mains power cable
- Remove the processor cabinet bustle and side covers
- Turn the shipping latch clockwise to lock the heads. Use the special tool 86011653
- Reach into the cabinet and disconnect the signal stripline and power connector at the drive
- Holding the drive upright remove the six screws securing the back of the cabinet to the frame
- Remove the back of the cabinet with the drive attached. Be careful not to allow the assembly to drop. A large positive screwdriver is needed
- Lay the assembly on a table with the drive upwards

These steps are for removing the drive from its PERQ mounting:

- The drive in the metal channel is removed from the shock absorbing mounts by taking out the screw at the centre of each mount, support the drive and channel while removing the four screws
- lay the drive and metal channel PCB side down on a table
- Remove the four screws securing the drive to the channel

## 7.8 PERQ2 Disc replacement

7.8.2 PERQ2 TI replacement procedures - continuedReplacing the drive

The new drive with interface adaptor board is fitted by the reverse of the removal process. Remember to unlock the shipping latch before reconnecting mains power, otherwise on booting the DDS will stop on a value corresponding to waiting for I/O.

The new drive is unlikely to hold a complete version of the PERQ system software. Before you or the user attempt to build a system run the confidence tests from the installation test floppy disc. The complete fixed disc test should be run and not abandoned before the write checks. See section 5 for details.

Disc drive board replacement

To replace a drive PCB the complete drive assembly is removed from the cabinet and placed on a table. See removing the drive.

The boards which can be replaced are:

## 1 The interface adaptor board.

This is ICL number 5155480 (reference only - may change)

## 2 The device electronics board.

Manufacturer's number 100482-01-C1 (reference only - may change)

This board must be fitted with:

- Interface platform JX3
- Bad track PROM U61. This PROM contains information for a particular drive's disc surfaces. The PROM must be fitted from the device electronics board being replaced. This PROM is unique to the mechanism and MUST stay with the mechanism NOT the device electronics board
- see section 6 for details of links fitted

## 3 The motor control board.

Manufacturer's number 100472-018-C3 (reference only - may change)

**CAUTION**

This board forms the physical seal of the clean air compartment of the drive. Only replace in clean conditions and reseal immediately.

No attempt should be made to replace the preamplifier board in the clean air compartment.

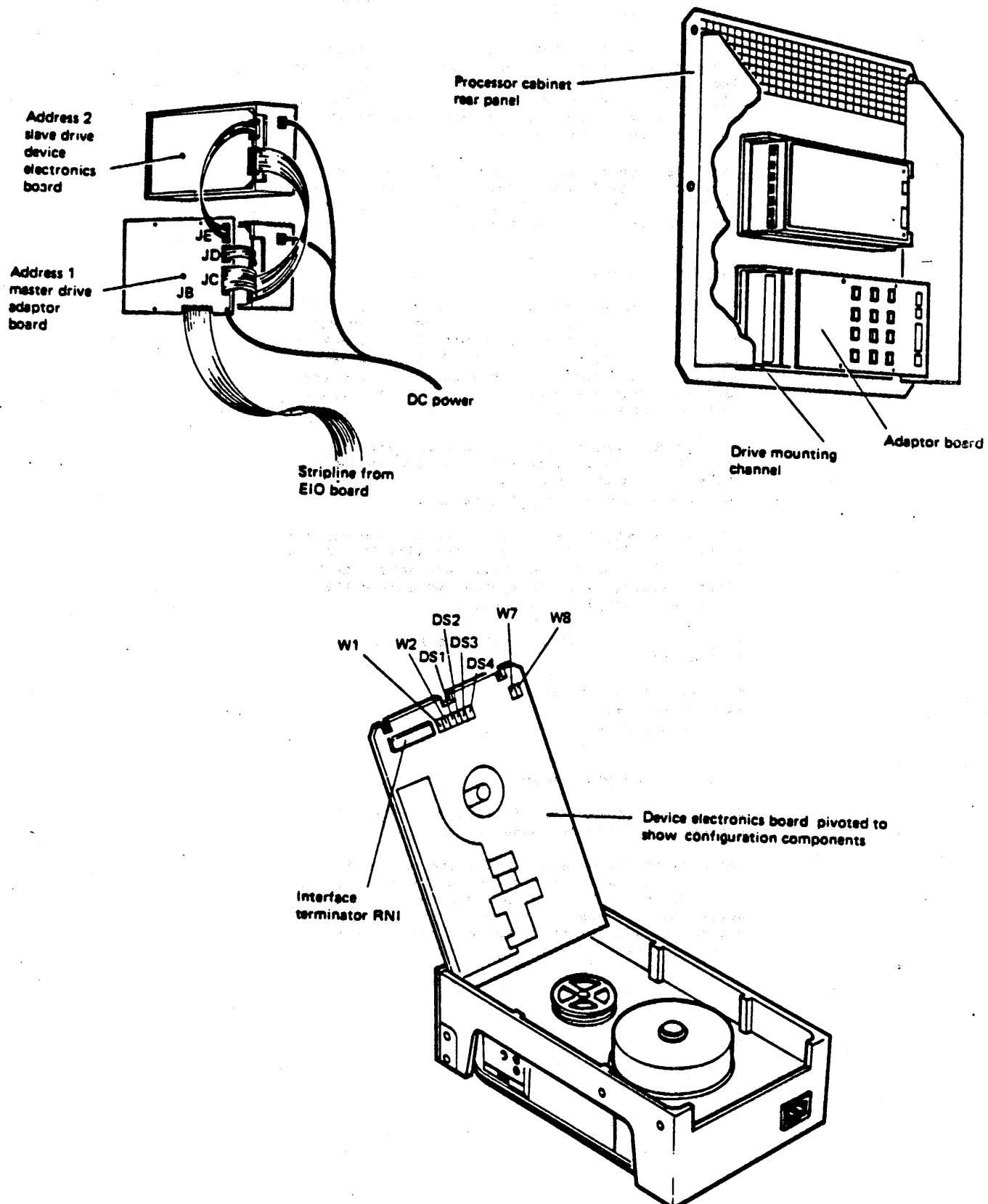
**Spare cable**

The 50 way stripline to the EIO board is held as part number 86011101, (reference only - may change) connections are in section 6.

## Procedures

### 7.8 PERQ Disc replacement

#### 7.8.3 The T2 fixed disc drives



## 7.8 PERQ2 Disc replacement

### 7.8.3 The T2 fixed disc drives

This section covers the replacement of the 5.25 inch fixed disc drives and their interface adaptor board. All T2 systems must have one of these drives, a second drive is optional.

The first master drive is fitted at the bottom of the processor cabinet rear panel. This drive has the adaptor board and connectors for a signal strip line from the EIO board and power from the processor power supply. A second slave drive can be fitted above the master and connected to it.

The 5.25 inch fixed disc drives for PERQ2 T2 systems are part number 7734938. The adaptor board mounted on the first or only drive is 7734939, these are supplied separately.

#### Drive configuration

All drives have positions for links and interface terminators on their device electronics boards. Before fitting a drive or adaptor board check the configuration of the drive. To do this it is necessary to remove the two screws securing the device electronics board and pivot it to view the component side of the board.

One and only one drive must have an interface terminator RN1. This is fitted in the second slave drive if present. Tape the spare terminator securely to drive 1 for future use.

Each drive must have one and only one address link fitted. The first drive must have link DS1 fitted (address 1). The second drive must have link DS2 fitted (address 2). The system recognises the drives as 0 and 1 respectively.

All drives for PERQ2 T2 must also have links fitted at:

- W1 - latched write fault
- W2 - daisy chain select
- W8 - radial data

#### Fitting an adaptor board

This board part 7734939 is fitted to the drive at the bottom of the processor cabinet.

The adaptor board is mounted above the device electronics board and secured to the drive frame by 4 screws. Each screw is fitted with a nylon spacer between the adaptor board and the drive frame. The adaptor board is connected to the device electronics board by two short striplines from connectors JC and JD.

## Procedures

### 7.8 PERO2 Disc replacement

#### 7.8.3 The T2 fixed disc drives - continued

##### Replacing a drive

The following steps are for removing a drive from the processor cabinet.

- disconnect the mains power cable
- remove the processor cabinet bustle and side covers
- reach into the cabinet and disconnect the signal stripline and power connector at the adaptor board on the drive at the bottom of the cabinet.
- disconnect the power connector to each drive fitted
- holding the drive upright remove the six screws securing the back of the cabinet to its frame. A large posidrive screwdriver is needed
- lay the assembly on a table with the drives upwards

If only one drive is fitted remove the four screws securing the drive to its mounting channel.

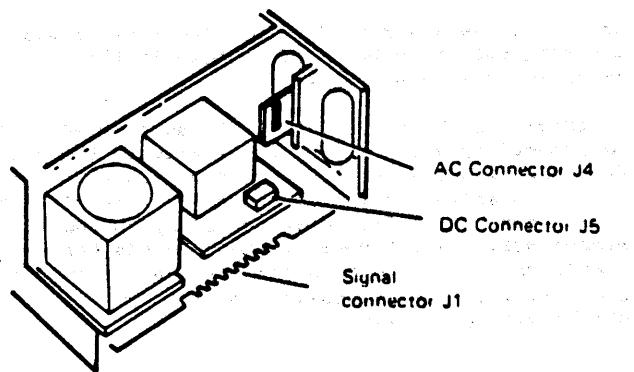
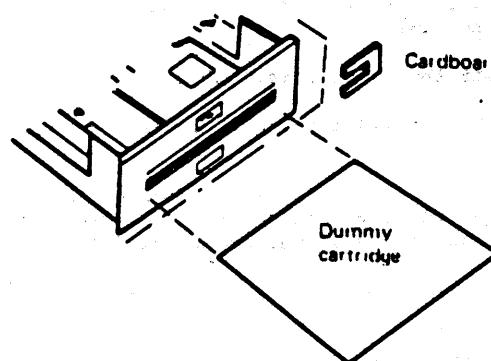
If two drives are fitted remove the four screws securing the drive mounting channel to the processor rear panel first.

If drive 0 is being replaced, the adaptor PCB must be removed from the drive, and fitted to the new drive received, using the same mounting hardware, and as detailed earlier in the section on fitting an adaptor board. This does not apply to the second drive, which does not have an adaptor board. Once the adaptor board has been fitted to the drive, it can be replaced by the reverse of the removal process.

##### CAUTION

The stripline connectors used on these drives are fragile, take special care to ensure they are correctly aligned and pushed well home without under force.

A replacement drive will not have a version of the PERO system software. Before you or the user attempt to build a system run the confidence tests from the installation test floppy discs. The complete fixed disc test should be run and not abandoned before the write checks. See section 5 for details.

**7.9 Floppy disc replacement****7.9.1 General procedure**

## Procedures

### 7.9 Floppy disc replacement

#### 7.9.1 General procedure - continued

This information is for the Shugart SA850 drive. ICL part number L0679014 (reference only - may change).

The unit is fitted in early PERQ2 processor cabinets and is also intended for general use in T2 systems.

#### **WARNING 240V AC**

Remove the mains supply power before taking off the covers.

#### Cover removal

Remove the front and left hand side covers.

#### Drive transportation

To prevent damage to the drive, a dummy cardboard floppy disc cartridge must be fitted. A U-shaped piece of cardboard or a screw secures the latch preventing accidental ejection of the dummy disc.

#### **CAUTION PERQ2**

Remove the signal strip-line first to avoid damage to the motherboard pins.

#### Drive removal

Remove the AC connector J4, the DC connector J5, and the signal connector J1 from the floppy disc drive. Remove the screws securing the drive to the processor frame, while supporting the weight.

#### Drive replacement

Check the replacement drive has the correct option links fitted on the PCB. See section 6.

Remove the U-shaped cardboard or screw from the latch, eject the dummy disc and retain for future use. Check that there are no foreign bodies in the mechanism.

Screw the drive to the frame. Refit connectors J1, J4 an J5 check the operation of the guide before refitting the covers. Run the Floppy test program, see section 5.

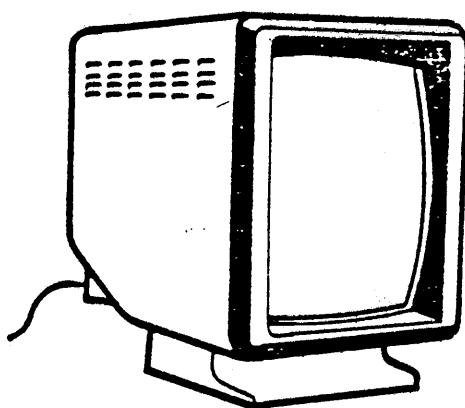
#### Spare cable

The 50 way stripline to the EIO board is held as part number:

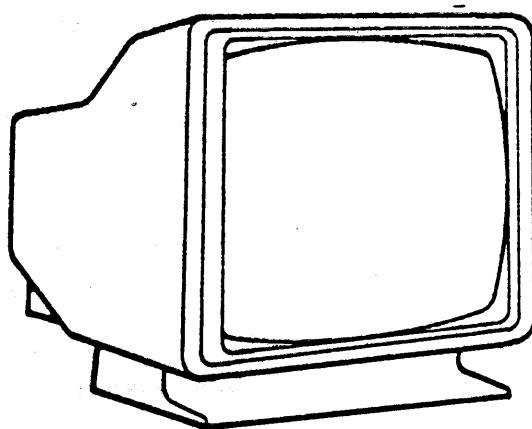
- PERQ2 86011100 (reference only - may change)

## 7.10 Display unit replacements

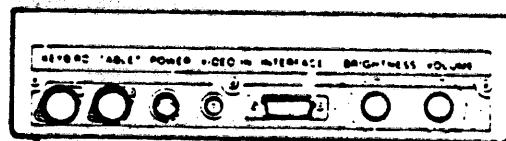
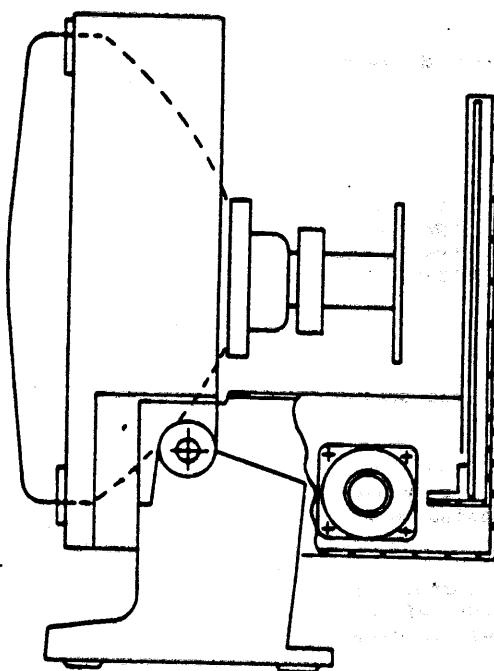
## 7.10.1 PERO2 T1 and T2 replacements



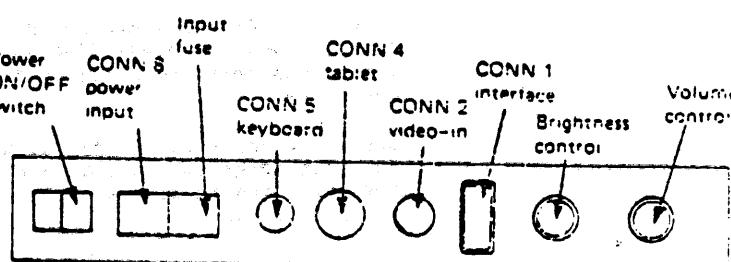
Portrait display 15 inch



Landscape display 20 inch



Interface panel for dc powered units



Interface panel for ac mains powered units

## Procedures

### 7.10 Display unit replacements

#### 7.10.1 PERQ2 T1 and T2 replacements - continued

The information in this section is for on-site replacement of the display unit assemblies used with T1 and T2 systems.

The display units consist of a display assembly box chassis fitted with base, bezel and cover mouldings. Repairs on-site are normally limited to the replacement of these parts.

The ICL system label with the display unit serial number is stuck onto the base moulding during manufacture. The serial number is recorded by the customer so that if a display unit with base moulding is removed from a site for repair it must be returned to that site.

To avoid a second site visit a replacement display assembly should be fitted with the customers covers including the base moulding carrying his serial number.

When a damaged base moulding is replaced the system label must be stuck to the new part.

Tell your service centre if you have to change the label on a unit still under warranty or find one that looks as if it has been changed.

#### **WARNING**

##### Dangerous voltages within video terminals

Extra high voltages are generated for the CRT within video terminals and mains voltages are present even when power is switched off at the terminal mains switch. The safest way of removing power from a unit to be worked on is by withdrawing the mains input plug.

Remove the unit from its normal place of use if there is any danger of users being exposed to high voltages.

##### Adjusting CRT displays

Some adjustments to CRT displays have to be done with the circuits exposed and power switched on. Such adjustments should be carried out only by trained engineers who must observe good engineering practices to avoid injury and to ensure their survival in the event of accidental shocks.

##### Residual EHT charges

It has been found that a very high voltage charge can migrate to the EHT connector on a CRT even though mains power is removed and the terminal has been repeatedly earthed. At all times, avoid touching the terminal on the tube either directly, or through metallic tools.

## 7.10 Display unit replacements

7.10.1 PERQ T1 and T2 replacements - continued**Glass hazard**

Mechanical shock to a cathode ray tube may cause the tube to implode violently. Take extra care when handling tools near to the CRT and shield the glass with a cloth or felt restraining medium. An implosion could severely injure you and colleagues nearby.

**CAUTION****Screen optical coatings**

Some video terminals have a special anti-glare coating applied to their screens. Try to avoid fingering these screens. If a screen is contaminated by oils from the skin, use only the recommended cleaning pads to remove the oils and wipe the screen dry with a soft paper tissue or a lint-free cloth.

**PERQ2 display unit types**

The T1 and T2 portrait display units although similar in appearance are not interchangeable. They must be fitted with the correct chassis assembly and power cable to the processor cabinet.

For T1 (8222/xx) systems the portrait display is P2362/22. This contains a KME chassis assembly 80019760 and the +55 volt power cable to the processor is 86011082.

For T2 (8223/xx) systems the portrait display is P2362/24. This contains a KRIZ chassis assembly 7734942 and the +24 volt power cable to the processor is 7738709.

T1 and T2 portrait displays both have these parts:

Cover moulding	80033605
Bezel moulding	80033606
Base moulding	86011524
Interface cable	86011313
Video cable	86011317

The Moniterm landscape display is P2362/23. The complete unit including covers is part 7734546. This unit can be used with T1 and T2 systems but a special interface cable is needed for T1 connections. Pins 8 and 15 are reversed to allow the keyboard to work. This cable is part of P2396/08 and is identified by a yellow band at each end.

The ac mains power cable is P2424/xx (previously P3123/xx) see 6.1 for details of bar numbers.

The Moniterm landscape display can accept a range of ac mains supplies. Check the orientation of the voltage selector PCB near the mains connector is correct for the mains supply. Access to the PCB is either by sliding the fuse panel on the interface panel or by removing the display unit cover.

## **Procedures**

### **7.10 Display unit replacements**

#### **7.10.1 PERQ2 T1 and T2 - continued**

##### **WARNING**

The Monitorm landscape display units are supplied with a mains fuse in the line only. In countries using reversible mains connectors, seek advice on fitting a fuse in the neutral from support

The KRIZ landscape display unit for T2 systems only is not yet available

##### **Removing the display unit cover**

- Switch off the processor and disconnect the mains power cable
- Tilt the display unit screen to vertical
- Switch off the display and disconnect the mains power cable (F2362/23 only)
- Unplug all the cables from the back of the display
- Undo the single screw at the back of the portrait unit (or two screws at the back of the landscape unit) securing the cover moulding to the display assembly chassis
- Slide off the cover

##### **Removing the base and bezel**

###### **For the T1 KME portrait display F2362/22**

- Remove the 10 screws securing the inner metal covers across the back fo the CRT.

###### **For the T2 KRIZ portrait or landscape displays F2362/24 or**

- Remove the CRT EHT connector and base
- Remove the bezel moulding by slackening or removing the four securing it to the display chassis
- Very carefully take out the four bolts securing the CRT and remove the CRT through the front of the assembly

###### **For all units**

- Feel the friction in the tilt mechanism you will need to adjust this when assembling the unit
- Remove the two lock-nuts, nuts and screws securing the display chassis to the base moulding through the friction plates of the tilt mechanism

## 7.10 Display unit replacements

7.10.1 PERQ2 T1 and T2 replacements - continued**Unit assembly**

Assembly is by the reverse of the removal processes but note:

- the T2 KRI2 assembly tilt mechanism can only be adjusted with the CRT removed and must be set for the unit to tilt easily but hold in any position with the weight of the CRT present
- the bezel moulding should be in contact with the face of the CRT and be a good fit to the cover moulding
- the function of the display unit is checked using the screen linearity test program. See 5.4
- for T1 system a poor quality display may be improved by connecting the video cable screen to 0 volts inside the processor bulkhead

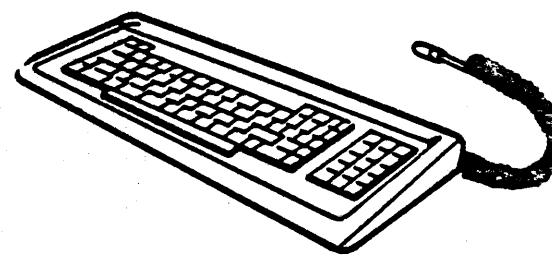
## Procedures

### 7.11 PERQ2 Keyboard replacement

This is the 85 key keytronics keyboard (VT100) with numeric block. The complete keyboard unit and cable are replaced as a single ICL part number 80019906 (reference only - may change).

Switch the processor unit off before unplugging the keyboard at the back of the display unit.

There are no field serviceable parts other than replacement of the signal cable.



### 7.12 Tablet unit replacements

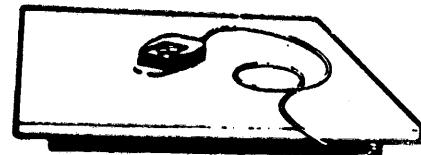
#### 7.12.1 High resolution tablet replacement

This information is for the Summagraphics tablet unit.

##### Replacement parts

The tablet unit assemblies that can be replaced are:

- L0678330 Bit pad module 488 (Tablet) (reference only - may change)
- L0679526 Cursor (Puck) (reference only - may change)
- L0679331 Pen stylus non-marking (reference only - may change)
- L0679333 Cable GPIB (reference only - may change)



#### 7.12.2 Tablet unit replacements

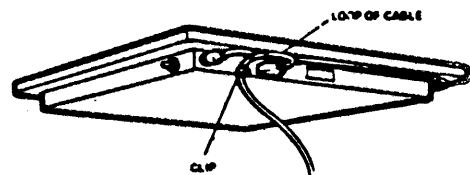
##### 7.12.1 Continued

###### Tablet unit replacement

**WARNING 240V AC**

Switch the processor unit OFF.

The tablet operational modes and interface options are selected by switches on the tablet PCB accessible by removing the cover under the tablet. See section 6 for the switch settings required for PERQ connection.

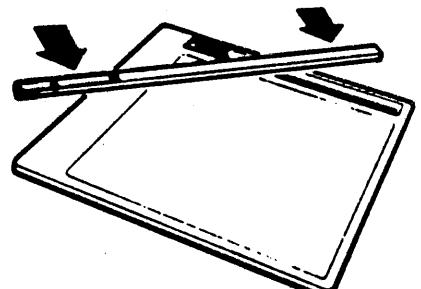


Take care when removing the cover not to slacken the screws securing the magnetoresistive wires.

###### Tablet biasing

The tablet must be magnetically biased for use. Hold the bar magnet provided as shown; the arrows must be uppermost and pointing towards you.

Place the magnet firmly against the surface and wipe diagonally from upper left to bottom right in one continuous motion.



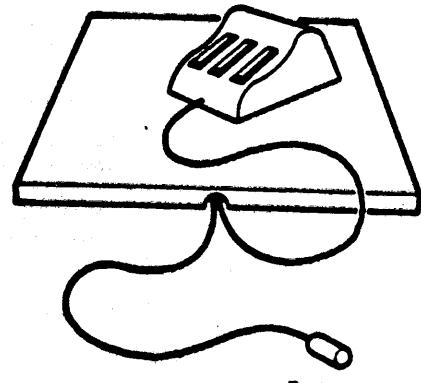
###### Caution

Store the magnet away from the tablet and magnetic storage volumes like floppy disc.

### 7.12.2 Standard tablet

This is the standard portrait or landscape tablet and puck which can be fitted to PERQ2 systems instead of the high resolution tablet. The tablet, puck and cables are replaced as a single ICL part 86011920 (was 80019907) for portrait 8 inch units and 7739278 for landscape 12 inch units.

Switch the processor off before unplugging the tablet at the back of the display unit.



Entry to the problem



Isolating the problem

Functional diagrams

Overview

Operating information

Reference information

Procedures

8

## **Technical notes**



This section in the guide is for you to include relevant information sheets, problem identification notices, and your personal notes.

We would like you to tell us about your personal notes so that they can be reflected in revisions of the guide planned. All contributions will be acknowledged.

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Section	Heading
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## ICL PERQ2 PUBLICATIONS NOTICE

R10143 ICL PERQ2 Service guide, First Edition (1) 1/12/84

### PERQ2 T2 Second disc installation

#### Purpose of the notice

This notice is to add an installation procedure for F2362/17. The feature adds a second 5.25-inch fixed disc drive to PERQ2 T2 (8223/xx) systems providing a further 34Mb of storage. This notice should be filed in front of the guides section 8 divider.

#### Contents of the notice

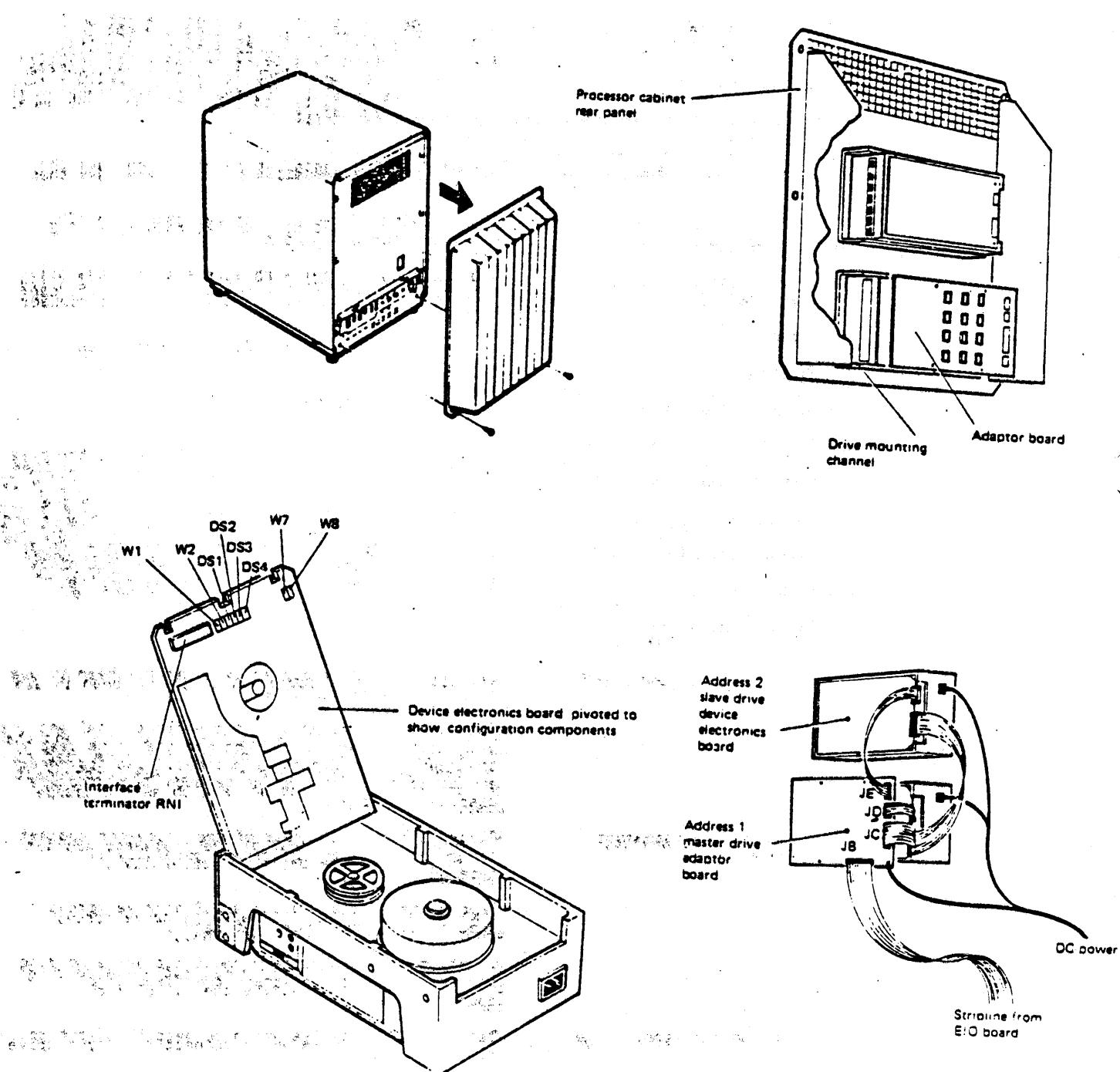
PERQ2 T2 Second disc installation  
Feature F2362/17

- 1 Drawings
- 2 Procedure
  - 2.1 Before installation
  - 2.2 Removing the first drive
  - 2.3 Mounting the second drive
  - 2.4 Configuring the drives
  - 2.5 Fitting the adaptor board
  - 2.6 Fitting the drives
  - 2.7 Testing the drives

## Procedures

### PERQ2 T2 Second disc installation Feature F2362/17

#### 1 Drawings



## Procedures

### PERQ2 T2 Second disc installation Feature F2362/17

#### 2 Procedure

##### 2.1 Before installation

This procedure is for installing the optional feature F2362/17. This adds a second 5.25-inch fixed disc drive to a PERQ2 T2 (8223/xx) processor cabinet to provide a further 34Mb of storage. The second drive is fitted to the processor rear panel above the first drive.

###### check the feature

Before starting installation check you have these parts:

- \* a 5.25-inch fixed disc drive, this is a 1300 series Micropolis unit
- \* a mounting channel with screws to fix the drive to the channel and the channel to the processor rear panel
- \* a 34-stripline cable (JC), this has three connectors
- \* a 20-way stripline cable (JE)

###### copy the defect map

Make a copy of the defect map attached to the base of the drive, as this is obscured once the drive is fitted. Record the information as it is on the drive, the form is head number, cylinder number and number of bytes from index. Later you will tape the defect map copy to the processor rear panel under the bustle so that it can be read when bad block information needs to be input to the machine.

##### 2.2 Removing the first drive

###### log off and power down

Log off the system correctly if it has been in use or files may be corrupted.

Switch the processor off at the front panel and the mains outlet socket. Disconnect the mains lead at the rear of the processor cabinet. Also disconnect any other mains powered units such as a landscape display and printers.

Clear access to the rear of the processor cabinet is needed, move the processor carefully if necessary.

Remove the bustle and the six Posidrive screws securing the processor rear panel.

Pivot the top of the rear panel out while holding the bottom secure to access the fixed disc connectors.

Disconnect the cables which connect the first drive to the processor:

- \* the 50-way stripline (From the EIO board.) at JB on the disc adaptor board
- \* the 3-way power connector at JA on the adaptor board
- \* the 4-way power connector on the drive

## Procedures

### remove the first drive

Carefully remove the processor rear panel complete with the 5.25-inch fixed disc drive and place on a suitable work surface.

Check that a copy of the defect map for the first drive has been made and is on the rear panel, if not make one now. Tape the defect maps for both drives to the rear panel.

### 2.3 Mounting the second drive

#### fit the drive to the rear panel

The second drive is mounted on the rear panel in the same way as the first drive and immediately above it.

### 2.4 Configuring the drives

#### remove the adaptor board from the first drive

Remove the 34-way stripline connecting JC on the adaptor board and J1 on the first drive.

Remove the 4 pozidrive screws securing the adaptor board to the first drive, take care not to loose the nylon spacers which separate the board from the drive.

Undo the two access screws (near the edge connectors) and pivot the device electronics board on both drives.

Remove the terminator RN1 from the first drive, check that a terminator is fitted in the second drive. If not fit the one from the first drive. If you have a spare terminator tape it securely to the side of the first drive

#### set the drive addresses

First drive DS1  
Second drive DS2

There are four positions for a drive address link DS1, DS2, DS3 and DS4. Make sure that only DS1 is fitted on the first (lower) drive and only DS2 is fitted on the second (upper) drive.

Three other links are fitted in the same positions on both drives.

W1 write latched fault  
W2 daisy chain select  
W8 radial data

No link must be fitted in position W7 on either drive.

### 2.5 Fitting the adaptor board

#### fit the adaptor board to the first drive

Close the device electronics board on both drives and secure each with two screws.

Refit the adaptor board to the first (lower) drive, ensure the four nylon spacers are fitted so as to separate the board from the drive.

Fit the new 34-way stripline from JC on the adaptor board to J1 on the first drive and onto J1 on the second drive.

Fit the old 20-way stripline from JD on the adaptor board to J2 on the first drive.

## Procedures

free the power cable for the second drive

Fit the new 20-way stripline from JE on the adaptor board to J2 on the second drive.

From the rear of the processor find the dc power connector for the second drive, the cable is secured to the processor frame on the left. Cut the ty-wraps to allow the connector to reach the second (upper) drive, but do not leave any cables hanging out of the back of the processor.

### 2.6 Refitting the drives

offer-up the rear panel

Put the processor rear panel back into position and pivot open to fit the cables to the drives.

fit and check the cables

Fit to the first (lower) drive:

- \* the 3-way dc power connector to the adaptor board
- \* the 4-way dc power connector to the drive
- \* the 50-way stripline from the EIO board to JB on the adaptor board. The red core is which goes to pin one is nearest to the power connector

Fit to the second (upper) drive, the 3-way power connector.

Check that all the connectors are pushed well home and the cables will not be trapped or strained.

Close and secure the processor rear panel with the six large pozidrive screws.

Fit the bustle.

### 2.7 Testing the drives

power on

Reconnect the mains supply to the processor and any other units you disconnected

run the fixed disc test

Switch on the processor and run the fixed disc test program, Test 1 of the installation tests. This will ensure the second disc is accessible and has a valid bad block map.

**CAUTION**  
do not try to reformat the drive call a specialist

The test should run without problems. However test failure may indicate the second disc needs reformatting and the bad sector information updating. You should not attempt to do this yourself without previous practice. This is a complex procedure with a real danger of over-writing the customers software or operating system on the first disc. Call your local specialist.