All correspondence should be addressed to:

Customer
Services Acorn
Computers Limited
Fulboum Road
Cherry Hinton
Cambridge CB1
4JN

Information can also be obtained from the Acorn Support Information Database (SID). This is an on-line viewdata system available to registered SID users. Initially, access SID on Cambridge (0223) 243642: this will allow you to inspect the system and use a response frame for registration.

Contents

About this manual

This manual is intended to provide the information required to diagnose and rectify faults in the Acorn Archimedes 400/1 series and later model R140 computers derived from the 400/1.

The information is structured to enable faults to be traced to modules, with the option to either replace or repair the faulty module (where repair is possible).

Where full service facilities and test equipment are available, reference should be made to the component level fault finding and repair information for the main PCB in the chapter entitled 'Main PCB fault diagnosis and repair'.

This manual is divided into the following chapters:

• Technical Specification
• System Description
• Disassembly and assembly
• Fault finding information
• Main PCB fault diagnosis and repair
• Appendices.

Updates to the Service Manual, together with other relevant information, are made available through Technical Service Bulletins, the first of which are included in the Appendices. Check these for later information before you start a repair job.

Technical specification

Computer main unit

Processor

- **4/8** MHz ARM (Acorn RISC Machine) 2μ processor
- 24 MHz main system clock
- 96 MHz master clock oscillator
- System performance is typically 4 MIPS.

RAM Memory

Model	Capacity
410	1 Mb, 8Kb page
420	2 Mb, 16Kb page
440	4 Mb, 32Kb page
R140	4 Mb, 32Kb page

ROM Memory

Four 32-pin sockets are fitted. The options are shown below:

Capacity	Format
256K	4 off 64K x 8bit ROM/EPROM (eg 27512)
512K	4 off 128K x 8bit ROM (eg 62301 ROM)
1024K	4 off 256K x 8 bit ROM/EPROM (standard)
2048K	4 off 512K x 8 bit ROM/EPROM

Real-time clock

Powered by internal batteries while the computer is switched off.

Non-volatile RAM

240 bytes of static RAM which maintains preferred machine configuration. Powered by internal batteries while the computer is switched off.

Internal batteries

Two LR06 (AA size) 1.5 V Manganese Alkaline cells fitted inside computer main unit. Batteries require replacement once a year.

Controls

- Mains on/off switch at rear of unit, integral with PSU
- Floppy disc eject button(s) on front panel
- System reset button (on rear of keyboard unit).

Indicators

- Green LED on front panel indicates mains power on
- Amber LED on floppy drive indicates drive activity
- Amber LED below power LED indicates hard disc drive activity.

Connectors

'Power inlet

IEC 320/CEE 22 Dower inlet connector.

	Min	Nominal	**Max**	Units
Operating voltage	198	220/240	264	VAC
Frequency	47	50/60	63	Hz
Rating		70		VA

Power Outlet

IEC 320/CEE 22 power outlet connector.

This outlet is unswitched (ie not controlled by the PSU on/off switch) and is live whenever power is applied to the power inlet. Power rating 3 Amps maximum continuous, 80 Amps maximum surge.

Expansion card bus

A four position backplane is fitted as standard via a 96-way DIN 41612 connector to the main PCB. The backplane is fitted with four expansion card

connectors. Three of these are 64-way DIN 41612 connectors (connector rows a and c only loaded), into which any suitable non-coprocessor expansion cards may be plugged. The remaining connector is a 96-way with all rows a, b, and c loaded, into which any expansion cards including a coprocessor can be plugged.

Parallel printer

```
 13 12 11 10 9  8  7  6  5  4  3  2  1
 ┌─────────────────────────────────────┐
 │ O O O O O O O O O O O O O │
 │  O O O O O O O O O O O O  │
 └─────────────────────────────────────┘
   25 24 23 22 21 20 19 18 17 16 15 14
```
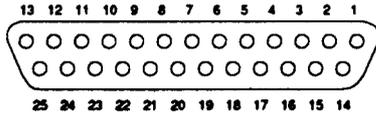
1	STB	8	D6	15	n/c	22	OV
2	DO	9	D7	16	n/c	23	OV
3	D1	10	ACK	17	OV	**24**	OV
4	**D2**	11	BSY	18	OV	25	OV
5	D3	12	n/c	19	OV		
6	D4	13	n/c	20	OV		
7	D5	14	n/c	21	OV		

Vol. = 0.5 Volts at 24 mA
Voh = 2.4 volts at 24 mA

ACK and BSY
Vol. = 0.8 Volts
Voh = 2.4 Volts

Serial port

9-way D type plug:

```
   1   2   3   4   5
  ┌─────────────────┐
  │ O   O   O   O   O │
  │   O   O   O   O   │
  └─────────────────┘
      6   7   8   9
```
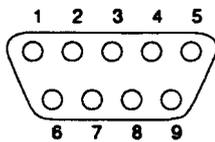
1	DCD	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	RI
5	0 Volts		

Colour analogue RGB video

8-way D type socket:

```
   5   4   3   2   1
  ┌─────────────────┐
  │ O   O   O   O   O │
  │   O   O   O   O   │
  └─────────────────┘
      9   8   7   6
```
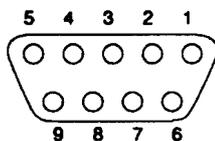
The red green and blue signals are analogue
outputs each designed to drive a 75 Ohm
terminated line

1	RED	6	0V
2	GREEN	7	0V
3	BLUE	8	0V
4	CSYNC	9	0V
5	n/c		

Red, Green and Blue into 75 Ohms:

0 Volts Minimum Level (Black)

0.7 Volts Maximum Level (White) H/Csync

or Vsync/Mode into 75 Ohms:

<0.2 Volts Sync LOW

>0.3 Volts Sync HIGH

H/Csync or Vsync/Mode unterminated:

<0.2 Volts Sync LOW

>2.4 Volts Sync HIGH

High Resolution Mono Video

Two BNC sockets (Video and Sync). Monochrome
composite video also available via internal links on
the Sync' BNC socket.

HI-Res Data into 75 Ohms 0

Volts   Black

0.7 Volts   White

SYNC

<0.2 Volts	Sync LOW
>2.4 Volts	Sync HIGH

Audio

3.5mm 320hm stereo jack socket for output to
suitable personal stereo headphones or hi-fi
system.
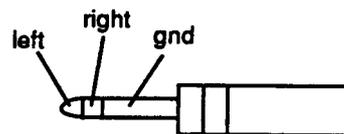
Econet
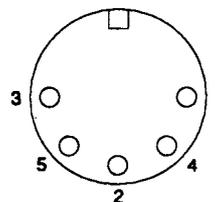
This socket provides the standard Econet

1	Data	2	0v
3	Clock	**4**	Data
5	Clock		

Keyboard

6-way miniature circular socket for keyboard connection.
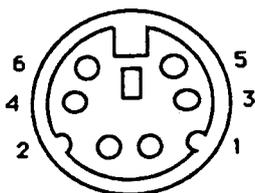
1	Reset	2	n/c
3	0 Volts	4	5 Volts
5	Serial data in	6	Serial data out

Mouse

Three-button mechanical mouse connects via a 9-way circular connector on the keyboard.
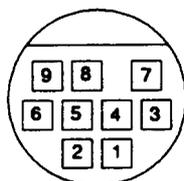
1	X reference	2	Switch 1
3	Switch 2	4	0V return
5	X direction	6	5V supply
7	Y reference	8	Switch 3

Dimensions

Main Unit

Dimensions	
Overall height	97 mm (excluding feet)
Overall width	362 mm
Overall depth	406 mm

Colour — Two-tone cream/warm grey

Finish — Fine texture

Materials — Painted metal. ABS, flame retardant to meet IEC950.

Keyboard

Dimensions	
Overall height	46 mm (excluding feet)
Overall width	485 mm
Overall depth	205 mm

Colour — Cream case with warm grey keys (in two shades).

Finish — Fine texture.

Case material — ABS, flame retardant to meet IEC950.

Keystrip holder — Clear plastic, flame retardant to meet IEC 950.

Weight — 8.1 Kg.

Optional equipment

Econet interface

Plug-in Econet module fits onto main PCB. Econet S-pin DIN socket fitted as standard (may be fitted with blanking plug prior to upgrade).

Expansion cards

Up to four expansion cards can be fitted. Without an Econet module, the machine can have up to four single, or two double-width expansion cards fitted. These are mechanically identical to single or double Eurocards. The expansion cards are fitted side by side and/or one above the other at the rear of the computer. If an Econet module is fitted, a half-width only expansion card (or one designed to fit around an Econet module, such as the I/O expansion card) can be fitted in the lower position. 400/1 systems can be fitted with any of the four categories of expansion card - simple, MEMC, External and, in slot 2 only. a co-

processor expansion card. Expansion cards available and planned for the Archimedes system include:

ROM expansion card, (AKA05), providing a capability for plug-in ROM based software.

I/O expansion card, (AKA10). This reproduces the BBC Model B/Master Series A to D port, User Port and 1 MHz bus.

Midi expansion card, (AKA16). This provides a MIDI control interface with music synthesisers.

A MIDI module, (AKA15), which can be added to an I/O expansion card, is also available.

SCSI, Floating point and Ethernet expansion cards are also available now, or likely to become so in the near future.
Contact Acorn Customer Service for details of new expansion cards available.

Environmental

Operating Temperature	5 to 35 C
Humidly	10% to 95% at 35 C non-condensing
Altitude	0 to 2500 metres above sea level
Storage Temperature	–40 to 70 C
Humidity	10 to 95% RH non-condensing
Altitude	Up to 10,000 metres

Electrical safety

Designed, manufactured and tested to comply with the EEC Low Voltage Directive.

When fitted with PSU intended for 220/240 V operation:

BS415   (IEC 65)
BS5850   (IEC 380)

Operating system

The RISC OS Operating System is described in detail in the RISC OS 'Programmer's Reference Manual'.

Screen modes

Twenty-eight *screen* modes are supported. The first eight modes provide compatibility with the BBC Microcomputer 6502 based range MOS:

Mode	Pixel Resolution	Logical Colours	Text
0	640 x 256	2	80 x 32
1	320 x 256	4	40 x 32
2	160 x 256	16	20 x 32
3	TEXT ONLY	2	80 x 25
4	320 x 256	2	80 x 25
5	160 x 256	4	20 x 32
6	TEXT ONLY	2	40 x 25
7	TELETEXT	TELETEXT	40 x 25
8	640 x 256	4	80 x 32
9	320 x 256	16	40 x 32
10	160 x 256	256	20 x 32
11	TEXT ONLY		80 x 25
12	640 x 256	16	80 x 32
13	320 x 256	256	40 x 32
14	TEXT ONLY	16	80 x 25
15	640 x 256	256	80 x 32
16	TEXT ONLY	16	132 x 32
17	TEXT ONLY	16	132 x 25

Multiple frequency scanning rate monitor modes:

Mode	Pixel Resolution	Logical Colours	Text
18	640 x 512	2	80 x 64
19	640 x 512	4	80 x 64
20	640 x 512	16	80 x 64
21	640 x 512	256	80 x 64
24	1056 x 256	256	132 x 32
25	640 x 480	2	80 x 50
26	640 x 480	4	80 x 50
27	640 x 480	16	80 x 50
28	640 x 480	256	80 x 50

Hi-resolution monochrome mode:

Mode	Pixel Resolution	Logical Colours	Text
23	1152 x 864	2	144 x 54

In all modes except Teletext, the colours can be chosen from a palette of 4096 colours, with some restrictions in the 256 colour modes.

Note: Modes 24 to 28 can also be used with certain VGA-type monitors.

Packaging and installation

The computer main unit, keyboard and mouse are supplied in a moulded two-part polystyrene packing in a cardboard carton. Also included are the Applications Suite, a Welcome Guide, a BBC BASIC Guide, a User Guide, a BASIC editor Keycard and a guarantee card. An optional colour or monochrome monitor is purchased and packed separately.

Do not use the computer system in conditions of extreme heat, cold, humidity or dust or in places subject to vibration. Do not block the ventilation slots in the main unit casing. Ensure that no foreign objects are inserted through any openings in the casing.

System description

Introduction

The Archimedes 400/1 series computer is built around the A Series chip set, comprising the Acorn RISC Machine (ARM), the Memory Controller (MEMC), Video Controller (VIDC) and Input Output Controller (IOC).

For a detailed explanation of the system, see the 'RISC OS Programmer's Reference Manual'. The following is intended to provide the salient features of the system for guidance.

A block diagram of the Archimedes 400/1 series is shown below.

General

The ARM IC is a pipelined, 32 bit reduced instruction set microprocessor which accepts instructions and manipulates data via a high speed 32 bit data bus and 26 bit address bus giving a 64Mb uniform address space. The ARM supports virtual memory systems using a simple but powerful instruction set with good high-level language compiler support.

MEMC acts as the interface between the ARM,

VIDC, IC, Read-Only Memory (ROM) and Dynamic memory devices (DRAM), providing all the critical system timing signals, including processor clocks.

1,2 or 4Mb of DRAM is connected to MEMC which provides all signals and refresh operations. A Logical to Physical Translator maps the Physical Memory into a 32Mb Logical address space (with three levels of protection) allowing Virtual Memory and Multi-Tasking operations to be implemented. Fast 'page mode' DRAM accesses are used to maximise memory bandwidth. The VIDC requests data from the RAM when required and buffers it in one of three FIFOs before using it. Data is requested in blocks of four 32-bit words, allowing efficient use of paged-mode DRAM without locking the system data bus for long periods.

MEMC supports Direct Memory Access (DMA) operations with a set of programmable DMA Address Generators which provide a circular buffer for Video data, a linear buffer for Cursor data and a double buffer for Sound data.

The Video Controller (VIDC) takes video data from memory under DMA control, serialises it and passes it through a colour look-up palette and converts it to analogue signals for driving the CRT guns. VIDC also controls all the display timing parameters and controls the position and pattern of the cursor sprite. In
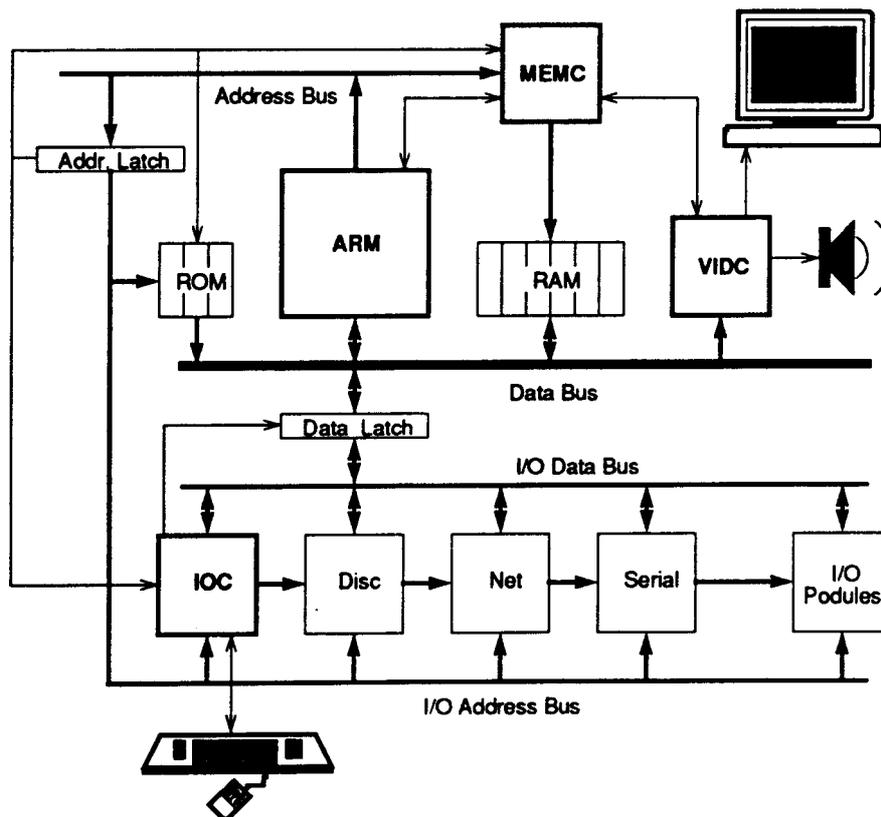
addition, it incorporates an exponential Digital to Analogue Converter (DAC) and stereo image table for the generation of high quality sound from data in the DRAM.

The VIDC is a highly programmable device, offering a very wide choice of display formats. The colour lookup palette which drives the three on-chip DACs is 13 bits wide, offering a choice from 4096 colours or an external video source.

The cursor sprite is 32 pixels wide and any number of rasters high. Three simultaneous colours (again from a choice of 4096) are supported and any pixel can be defined as transparent, making possible cursors of many shapes. It can be positioned anywhere on the screen. The sound system implemented on the device can support up to 8 channels, each with a separate stereo position.

The Input Output Controller (IC) controls the 10 bus, expansion Podules and provides basic functions such as the keyboard interface, system timers, interrupt masks and control registers. It supports a number of different peripheral cycles and all 10 accesses are memory mapped.

The I/O system

The I/O system is controlled by IC and the Memory Controller. The I/0 Bus supports all the internal peripherals and the expansion cards.

System architecture

The 10 system (which includes expansion card devices) consists of a 16 bit data bus (BD[0:15]) a buffered address bus (LA[2:21]) and various control and timing signals. The I/O data bus is independent from the main 32-bit system data bus, being separated from it by bidirectional latches and buffers. In this way the I/O data bus can run at much slower speeds than the main system bus to cater for slower peripheral devices. The latches between the two buses and hence the 1/0 bus timing are controlled by the I/O controller, IC. The IC caters for four different cycle speeds (slow, medium, fast and synchronous).

A typical I/O system with expansion cards fitted is shown in the diagram below. The expansion cards are controlled by 1C, and the MEMC expansion cards share the I/O Controller interface with IC. For clarity, the data and address buses are omitted from this diagram.
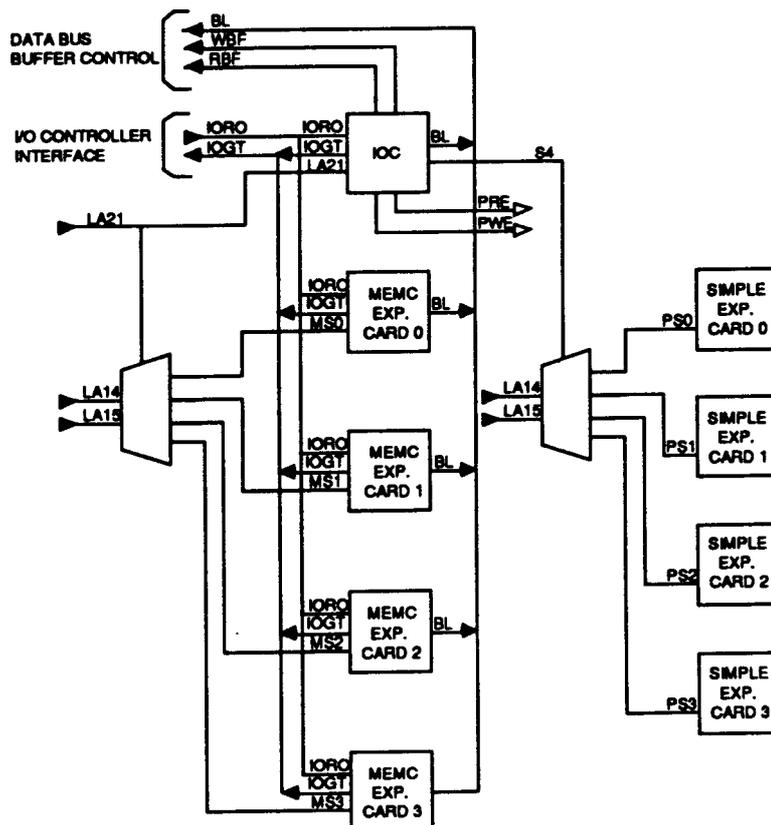
Read	Write	Hex address
ROM (high)	Logical to Physica Translator	3FFFFFF 3800000
ROM (low)	DMA Address Generators	3600000
	Video Controller	3400000
Input/Output	Controllers	3000000
Physically Mapped RAM		2000000
Logically Mapped RAM		0000000

Non-IOC devices

IC is mapped to control devices in the upper half of the I/O space. The lower half of the I/0 space may be used by other devices which are not mapped through, or timed by the IOC. Such devices (normally MEMC expansion cards) share the same handshaking control lines to the MEMC as does the IC. The advantage of devices in this class are that they are not tied to one of the four possible IC cycle types.

System memory map

The system memory map is defined by the MEMC, and is shown in the diagram above. Note that all system components, including I/O devices, are memory mapped.

The sound system

The sound system is based on the VIDC stereo sound hardware. External analogue anti-alias filters are used which are optimised for a 20 kHz sample rate. The high quality sound output is available at a 3.5mm stereo jack socket at the rear of the machine which will directly drive personal-stereo headphones or alternatively an amplifier and speakers. A mono mix of the sound output is sent to the internal loudspeaker. In addition, an unfiltered stereo signal is available at the Auxiliary Audio connector on the main board.

Hard disc drive and interface

All functions of the hard disc drive are controlled by the Hitachi HD63463 hard disc Controller chip (IC65). Reference should be made to the manufacturer's data sheet for further details of the controller chip function.

Host CPU connection

This device is connected to the system CPU by means of the 16 bit I/O bus. It is memory-mapped from address &032D0000 to &032D0028. The only unusual feature of this circuit is the use of an address line for the HD63463 read/write line. This is necessary to allow the host CPU to simulate DMA cycles, during which this line reverses its function.

Reset is provided by the host system, as is the 8 MHz clock from which all host communication signal timing is derived.

ST506 hard disc interface

The connection to the hard disc drive is an implementation of the standard ST506 interface. Drive control signals are provided on a 34-way bus which may be daisy-chained for up to four hard disc drive units, and data is transferred on a separate 20-way cable for each drive in the system.

Before any data transfer can take place between the hard disc drive and the HD63463, the correct drive and correct read/write head in that drive must be selected. This is achieved by two drive select lines and three head select lines, all buffered by a 7406 (IC39). Having selected the drive, the HDC (Hard Disc Controller) will check the READY line before proceeding with the required function. A failure of this signal (or the SEEK COMPLETE signal) may result in a polling action (ie repeated attempts to select) by the HDC. All control signals on the 34-way bus from a hard disc unit will only be active when the drive is selected.

If a seek is required before selecting the read/write head then the direction signal DIR will be set high or low to indicate movement in or out and the requisite number of step pulses transmitted on the STEP control line. The HDC must then wait for the SEEK COMPLETE (SC) signal to be returned from the drive unit. As previously mentioned, the HDC may go into a polling action while waiting for this signal.

All control signals to the drive are buffered by the 7406 (IC39) and all signals from the drive are buffered by a 74HCT14 (inverting Schmitt trigger), IC38. Demultiplexing and buffering of the direction (DIR), step and reduced write current (RE+WC) signals is achieved by a 7438 (IC40).

Read data path

Read data is received from the drive as a differential signal and applied to the differential receiver 26LS32 (IC44). From he-e it passes through a multiplexer 74HC51 (IC47) (this circuit can control two hard disc drives) and onto the data separator circuit.

Data separator

The data from the hard disc drive takes the form of a stream of pulses whose position with respect to a clock signal defines their meaning, binary 1 or 0. The nominal frequency of this clock is 10 MHz, although it may have to vary slightly to compensate for variations in disc speed and/or disc wobble. Since this clock signal is not provided by the hard disc drive it has to be generated by the interface circuitry. The Data-Separator contains a voltage controller oscillator (VCO), some filter components and an input for a crystal controlled 10 MHz clock. When the HDC is not trying to read data from the hard disc drive, the VCO is locked onto the 10 MHz crystal clock.

To read data, the HDC first asserts the read-gate signal (RGATE), this causes the data-separator DP8455 (IC85) to attempt to adjust the VCO

frequency and phase until the VCO cycles are in quadrature with the data pulses when they are present.
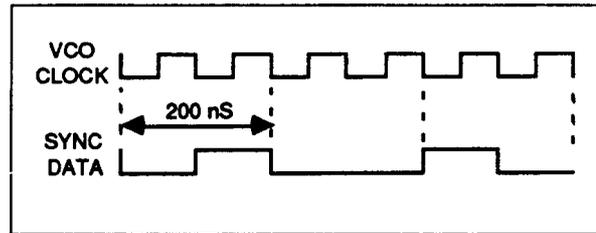
When the data separator has detected valid preamble (a special pattern of 0s and 1s) it asserts lock-detect (LD) which enables the now synchronised data stream to the HDC. In turn, when the HDC sees a special data pattern called an address mark it asserts SYNC. This signal is linked back to the data separator and used to slow down the tracking action of the VCO during the actual read process.

Write data

Write data timing is synchronised to the 10 MHz crystal oscillator. The data emerges from the bidirectional data pin RWDATA on the HDC and is fed to a delay line (IC46) which is a 50 nS 5-tap device. This gives three identical versions of the write data stream separated in time by 10 nS. These three signals are fed to a multiplexer 74HCT153 (IC45) which selects the appropriate version of the write data stream when manipulated by the write-precompensation control lines EARLY and LATE. Finally, the data is passed through a differential driver 26LS31 (IC28) before going on to the hard disc drive itself.

Format

Data is stored in the form of sectors. There are 32 sectors on each track and 4 tracks in each cylinder.

A sector has an ID (identity) field and a DATA field. The ID field contains the sector's number and the DATA field contains the data stored in that sector.

Before data can be written to the data field of a sector, the correct sector must be located by repeated reading of ID fields on the track until the required sector is found.

Disassembly and assembly

DANGER:

BEFORE REMOVING THE TOP COVER, ENSURE THAT THE COMPUTER SYSTEM HAS BEEN SWITCHED OFF AND THE MAINS PLUG REMOVED FROM THE SUPPLY.

REMOVING THE TOP COVER GIVES ACCESS TO THE POWER SUPPLY. ALTHOUGH THE POWER SUPPLY IS DESIGNED TO COMPLY WITH BS5850 CLASS 1, YOU MUST STILL TAKE CARE TO ENSURE THAT NO METAL OBJECTS FALL (OR ARE PUT) INTO THE POWER SUPPLY UNIT THROUGH THE VENTILATION HOLES.

Introduction

This chapter tells you how to break down the computer into its serviceable modules, in order to carry out basic checks and replace modules found to be faulty.

The main unit houses the main PCB, the PSU, the cooling fan, the hard disc drive and 3.5" floppy disc drive.

The keyboard, mouse and monitor are separate units. See the appropriate third-party service information for the monitor. The mouse is a service replacement only item.

Removing the top cover

1. Switch off and disconnect the computer from the mains supply and the disconnect all peripherals, including the keyboard.
2. Place the main unit, with the rear panel facing you, on a work-surface with a clean, soft covering.
3. Remove the top cover:

- Remove the two screws in the sides of the top cover, immediately behind the front moulding.
- Remove the three screws along the top of the rear panel and remove the top cover by sliding it off from the rear of the unit.

Removing the main PCB

1. Unplug the following cables from the main PCB:
- Speaker/LED connector PL8.
- Battery connector PL10.
- Fan connector PL12*.
- Four power tags - PL11 (yellow, +12V), PL5 (black, 0V), PL6 (red, +5V) and PL7 (mauve, -5V).

*Note: If a hard disc drive is fitted, proceed through steps 2 to 7 and partially withdraw the main PCB until the fan connector is accessible.

2. Unplug the floppy disc drive cable from SK9 on the main PCB.
3. Unplug and remove any expansion cards fitted -see the section entitled 'Upgrading' in the Appendices. Remove the two backplane mounting screws, unplug the backplane and rest it on top of the PSU. There is no need to disconnect the power leads.
4. Unplug the hard disc 34-way (SK11) control and 20-way (SK10) data connectors from the main PCB.
5. Stand the unit up on its left side and remove the two screws and star washers from the underside

securing the rear bus bars.
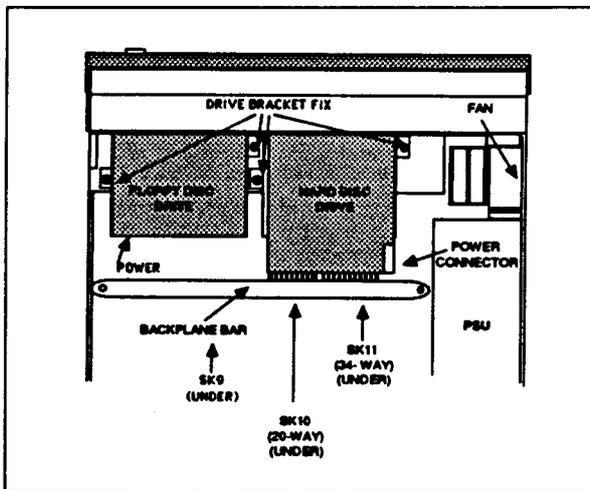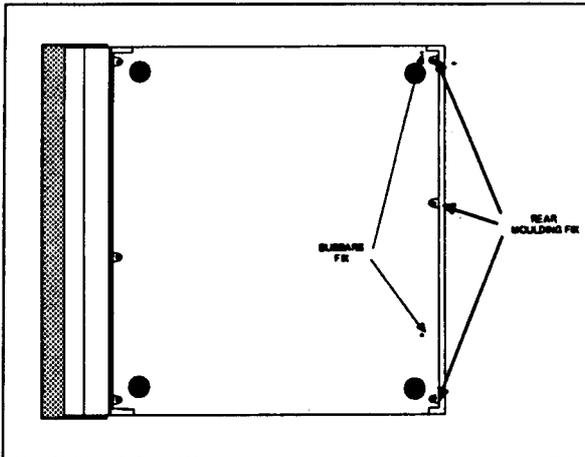
6. Remove the three screws from the underside
   securing the rear moulding.
7. Stand the unit back on its feet and begin to withdraw the rear
   moulding, with the main PCB attached, out of the case.
   When it becomes accessible, remove the nut securing the
   earth strap to the drive
   support bracket from the main PCB. Continue
   withdrawing the main PCB, supporting the front edge
   of the PCB as soon as it is accessible.

Floppy disc drive

A single internal floppy disc drive is fitted as
standard. To remove the drive, see the Second floppy disc
drive installation instructions in the Appendices.

Power supply unit

> CAUTION: DOUBLE POLE/NEUTRAL FUSING
> The PSU is fitted with a double-pole switch and
> both the Live and Neutral lines are fused.

To remove the PSU, first remove the top cover as detailed
above. Ensure that all low voltage captive leads are
disconnected and free from restraints. Remove the fan then
remove the four M3 x 6 mm fixing screws from the underside
of the base metalwork. Slide the PSU forward to clear the
rear moulding, then lift it clear. When installing a PSU, the
system should be tested for satisfactory earth
continuity in accordance with IEC 950.

Note The PSU is a service replacement only item.

> DANGER:
> WHEN REFITTING OR FITTING A
> REPLACEMENT ASSEMBLY, CHECKS
> SHOULD BE MADE FOR EARTH
> CONTINUITY BETWEEN THE EARTH PIN OF
> THE MAINS PLUG AND THE FOLLOWING:
> * THE BASE METALWORK
> * THE REAR PANELS (INCLUDING
>   BLANKING PANELS)
> * THE TOP COVER
> USE AN EARTH CONTINUITY TESTER SET
> TO 25 AMPS.

Front moulding assembly

1. First remove the top cover as detailed above.
2. Remove the two screws securing the front moulding
   assembly at each side.
3. Stand the unit on one side and remove the three screws
   securing the front moulding assembly to the base
   metalwork.
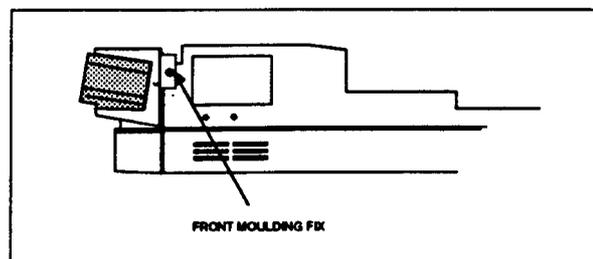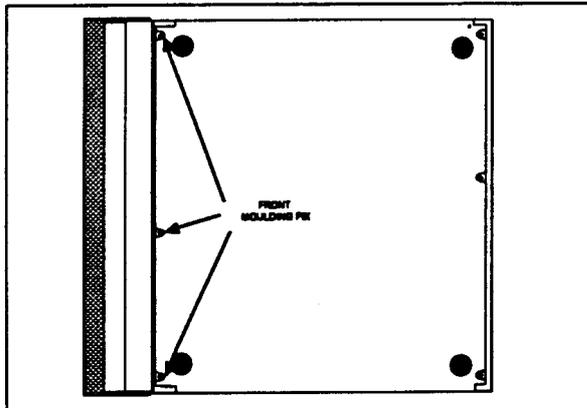
4. Stand the unit back on its feet and unplug the LED/speaker connector PL8 from the main board.

5. Grasp the front moulding assembly at each end and use a straight, steady pull to withdraw it from the front of the unit.

   For access to the indicator LEDs, locate and remove the two self-tapping screws at each end inside the main front moulding and slide the sub-moulding away from the main moulding.
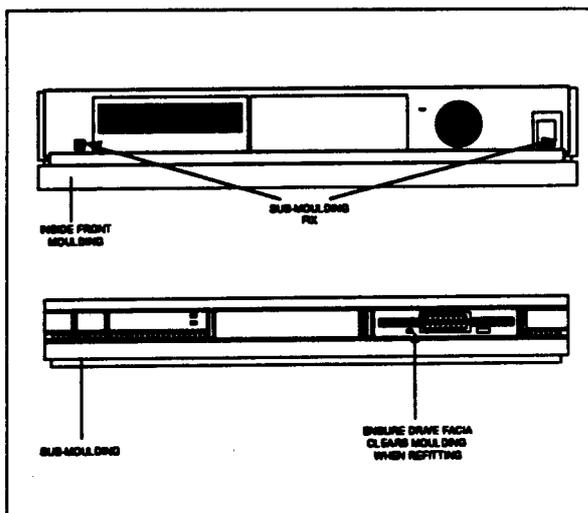
Fan assembly

1. First remove the top cover as detailed above. The cooling fan is mounted against the front left side of the casing (viewed from the front), alongside the battery holder.

2. Remove the two nuts securing the filter clamp; carefully withdraw the clamp and the filter from the fixing bolts.

3. Unplug fan power connector PL12 from the main PCB', then remove the four nuts and withdraw the fan from the fixing bolts.

4. When refitting, ensure that the two filter nuts are fitted diagonally opposite each other.

   *Note: If a hard disc drive is fitted, the main PCB must be partially withdrawn to gain access to connector PL12. See 'Removing the main PCB', above.

Main unit assembly

Assembly is generally the reverse of the disassembly procedures, but take care with the routing of cables and ensure that leads are not trapped when refitting assemblies to the main unit.

Keyboard

Disassembly

1. Invert the keyboard and place it on a soft, level surface.

2. Remove the eight Pozidriv screws securing the two halves of the case and carefully lift the base moulding away.

3. The PCB is fixed to the top moulding by four No. 6 x 0.25" screws, two at each end of the metal PCB support tray plus, on some units, three further screws at A, B and C . Remove the three extra screws first, if fitted, then remove the two screws from the end nearest to the keyboard cable. Loosen the two remaining screws and lift the board clear.

   Note that the reset switch cap must be removed from the original keyboard and fitted to the replacement.
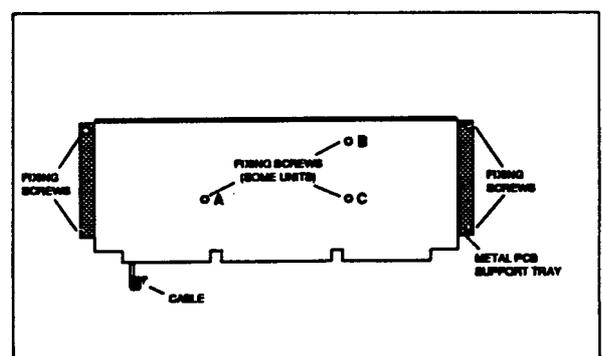
Assembly

Keyboard assembly is generally in reverse order, with the following notes:

Slot the PCB support tray under the two fixing screws at the end furthest from the keyboard cable, then insert the remaining screws. Check that all keys clear the cutouts in the top moulding before finally tightening all PCB fixing screws.

Mouse

The mouse is a service replacement only item.

Fault-finding information

Introduction

This chapter is a guide to the diagnosis and repair of basic faults in the Archimedes 400/1 series and later R140 computer systems.

It consists of algorithms to enable you to trace and remedy faults in a 'dead' computer, followed by instructions for running the Archimedes functional test software, which is designed to isolate faults in a computer which is working.

The next chapter 'Main PCB fault diagnosis and repair', is designed to help repair centres to diagnose and repair faults at component level on the main PCB.

Test equipment required

- 100 MHz Oscilloscope
- DC Voltmeter
- Earth Continuity Tester
- Test Disc, Acorn part no. 0283, 090
- Serial Port Loopback Plug
- Headphones (32 ohm impedance)
- Chip extraction tools (68/84 pin)
- Standard hand tools, such as screwdrivers and pliers.

It is a recommended requirement that anti-static precautions should be utilised at all levels of servicing, ie antistatic matting and wrist-straps.

In all instances, follow through the checks until the fault is located and identified.

Refer to the previous chapter, 'Disassembly and Assembly' for information on how to gain access to the components mentioned.

DANGER:
WHEN REFITTING OR FITTING A REPLACEMENT ASSEMBLY, CHECKS SHOULD BE MADE FOR EARTH CONTINUITY BETWEEN THE EARTH PIN OF THE MAINS PLUG AND THE FOLLOWING:
- THE BASE METALWORK
- THE REAR PANELS (INCLUDING BLANKING PANELS)
- THE TOP COVER
USE AN EARTH CONTINUITY TESTER SET TO 25 AMPS.

Checking a 'dead' computer

START

COMPLETE SYSTEM APPEARS TO BE DEAD? —YES→ CHECK MAINS SUPPLY, MAINS CABLE AND FUSE IN MAINS PLUG

NO

DISPLAY VISIBLE ON MONITOR? —NO→ CHECK MONITOR LED ON; BRIGHTNESS CONTROL → OK NOW? —YES→

YES

NO

COMPUTER POWER LED ON? —NO→

YES

SUBSTITUTE KNOWN GOOD MONITOR AND CABLE

CHECK ROMS FITTED CORRECTLY & THAT LK 7A/7B & LK8 ARE SET OK. See Appendix.

PSU EMITTING CLICKING NOISE? —YES→

NO

OK NOW? —YES→ REPLACE/REPAIR MONITOR & CABLE ON TEST

NO

DOES KEYBOARD RESPOND (CAPS LOCK KEY LIGHT LED)? —NO→

YES

PERFORM 'DELETE' POWER-ON (See PCB Functional Test)

TYPE CTRL G - BELL SOUND? —NO→

YES

OK NOW? —YES→

NO

CHECK FOR PL5 0V PL6 5V PL7 −5V OK? —NO→ REPLACE PSU

YES

REPLACE PCB OR: 1. SEE 'NO SOUND' FLOWCHART 2. PERFORM PCB SYSTEM FAILURE TESTS & REPAIR

WITH WHITE DISPLAY, CHECK SKT 1 PINS 1, 2 & 3 EQUAL AT ABOUT 1 V —NO→ REPLACE PCB OR PERFORM PCB VIDEO FAILURE TESTS & REPAIR

YES

DISPLAY OK? —NO→ REPLACE MONITOR & CABLE

YES

END

No sound

```
                    ┌─────────┐
                    │  START  │
                    └─────────┘
                         │
        ┌────────────────────────────┐
        │ TYPE* AUDIO ON [↵]          │
        │ * SPEAKER ON   [↵]          │
        │ PRESS CTRL G                │
        └────────────────────────────┘
```

```
BELL SOUND?     NO →    CHECK FOR        →    POWER SUPPLIES     NO →    RESTORE
                        PL5 0V                ALL OK?                    POWER/
                        PL6 +5V                                         REPLACE
                        PL7 -5V                                         PSU

YES                                           YES

                REPLACE          YES     TRY A
        YES ←   LEAD/SPEAKER  ←          KNOWN GOOD
                & RE-TEST.                SPEAKER
                OK NOW?                   AND REPEAT TEST
                                          OK?

RUN TEST              NO                       NO
PROGRAM* - ALL   NO →
CHANNELS
WORKING?

YES

┌─────────┐                          REPLACE PCB OR
│  END    │                          PERFORM AUDIO TESTS
└─────────┘                          ON PCB AND REPAIR
```

*TEST PROGRAM:

```
10 REM > Check all channels
20 VOICES 8
30 FOR channel=1 TO 8
40 OSCLI("Channelvoice "+STR$(channel)+" "+STR$(2))
50 NEXT
60 FOR channel = 1 to 8
70 SOUND channel, -15, 100,24
80 PRINTchannel
90 k=GET
100 NEXT
```

**RUN PROGRAM.
PRESS A KEY AND REPEAT 8 TIMES.
PRINTS CHANNEL NUMBER ON
SCREEN AND PLAYS VOICE 2 FOR
EACH CHANNEL.**

Functional testing

The following information gives details of how to isolate faults to individual modules, using the Acorn Test Disc, part no. 0283,090, on machines which are working, but exhibiting faults. The tests included on the disc for the 400/1 series are as follows:

• Main PCB functional test
• Hard disc drive tests
• Other tests
• Keyboard test
• Expansion tests.

Note 1: Please read the following section 'General test procedure' before you carry out any of the tests.

Note 2: All 400/1 series computers have a hard disc interface fitted as standard on the main board. In addition, models 420, 440 and R140 have a hard disc drive fitted as standard. The 'Hard Disc Upgrade' test listed in the 'Podules and Upgrades' test menu should be ignored for these models. Hard disc drive and interface tests are included as part of the 400 series main PCB functional tests.

Note 3: For details of how to repair the main PCB, see the chapter entitled 'Main PCB fault diagnosis and repair.

General test procedure

IMPORTANT
A suitable work area should be provided for servicing, together with test equipment as listed in the introduction to this chapter.

The Archimedes computer, keyboard, mouse, backplane, expansion cards, test disc, ADFS 800k formatted disc, serial port loopback plug, Port Tester assembly and Econet cables are designed and specified by Acorn Computers Ltd and may not be changed without written consent from Acorn. All items should be complete with the correct cables so that you can connect them to the Archimedes computer.

Removing the top cover of the computer unit

Remove the top cover of the Archimedes computer as detailed in the previous chapter, 'Disassembly and Assembly'.

Safety

Some of these tests require that you remove the top cover of the Archimedes computer. Although the power supply unit is designed to comply with BS5850

Class 1, you must still take care to ensure that no metal objects fall (or are put) into the power supply unit through the ventilation holes.

Connecting and disconnecting the power
• You must CONNECT the power ONLY when you have made all the other connections
• You must DISCONNECT the power BEFORE removing any other connections.

Validating the test equipment

Before carrying out any of the tests in this section, validate the test equipment using a known good unit. If the test equipment fails, you should repair the test equipment and retest on a known good unit.

Before you start
Before the start of each day or testing session, you must first:

• Adjust the colour monitor to ensure adequate contrast
• Inspect all the mechanical parts of the test equipment and replace any parts as necessary.

Also, if required:
• Ensure that the printer has sufficient paper Connect the printer and monitor to the mains supply.

Do NOT turn on.

The test disc

The test disc contains various options which are selected from menus. For example, the first menu is:

```
Dealer Test Menu
1 A300/A400 Tests
2 Podules   Upgrades
3 Load/Save CMOS RAM
4 Keyboard Test
5 Quit to desktop
SELECT OPTION :
```

To select an option, type its number. Some options lead to further menus, other options run tests immediately. See the relevant test procedure. Note that, in the test software menus, expansion cards are referred to by their former name 'Podules'.

There are two types of tests — subjective and non subjective. The test program passes or fails the equipment on the non-subjective tests; however, you must judge whether the equipment passes or fails the subjective tests.

Error messages
• If a message is expected and has not appeared within 30 seconds, you must record the fault, disconnect the machine and repair before retesting.

• If a test fails, then you should record the fault and attempt to continue with the tests. You should also note any other failures, but bear in mind the possibility that these failures are caused by the first recorded failure.

Performing soak tests

At the end of each test, you should carry out a soak test. To do this, leave the unit under test powered up for eight hours, or alternatively, overnight. After carrying out the Soak test, it is advisable to retest the unit.

Repairing faults

When repairing an Archimedes computer, you should repair the faults in the order in which they occurred during the test (ie repair the first recorded failure FIRST).

For further information on checking for component level faults on the main PCB and carrying out repairs, refer to the chapter entitled 'Main PCB fault diagnosis and repair'.

Disconnecting the equipment

IMPORTANT

If you have completed service or tests on the system and are about to move the computer and/or return it to the user, the following MUST be done BEFORE switching off:

• Park the hard disc heads (if a hard disc drive is fitted) - details are given after each relevant test.
• Load the contents of the CMOS RAM back into the machine - details are given after each relevant test.
   1 Switch OFF the power to the Archimedes computer (at the mains switch on the rear of the machine).
   2 Switch OFF the power to the rest of the equipment.

It is important to disconnect the equipment from the computer in the correct order, ie disconnect the:

• Archimedes computer from the mains supply
• monitor from the mains supply
• Hi-res. monochrome monitor from the 'Mono' and ' Sync' sockets AND/ OR
• analogue RGB monitor from the 'Analogue RGB' socket
• headphones from the 'Headphones 32ohms' socket
• printer from the 'Parallel Printer' port
• serial port 'loopback' plug from the 'RS423' socket
• keyboard from the front panel connector.

Packing

After servicing, repack the Archimedes computer in its box. To avoid damage, do NOT send the computer through the post or by courier unless it is in its original packaging.

Main PCB functional test

Setting up
Equipment required
- Computer with PCB to be tested
- Keyboard (known to be working)
- 3.5 inch test disc, part number 0283,090 (write protected)
- Two ADFS 800k formatted, write enabled, 3.5 inch discs
- serial port loopback' plug
- Epson FX80 or Olivetti JP101 printer
- pair of 32Ohm stereo headphones
- high resolution monochrome monitor
- analogue RGB monitor.

Note: You can replace the specified printers with any other manufacturers direct functional equivalent (in terms of BOTH hardware interface and software).

Connecting up the equipment
Connect the:
- keyboard to the front panel connector
- serial port 'loopback' plug to the 'RS423' socket
- printer to the 'Parallel Printer' port
- headphones to the 'Headphones 32Ohm' socket
- hi-res. monochrome monitor to the 'Mono' & 'Sync' sockets
- analogue RGB monitor to the 'Analogue RGB' socket
- monitors to the mains supply
- computer to the mains supply.

Running the tests
The tests alter the contents of the battery backed RAM that holds the computer's configuration data. These must be saved before any of the tests are run, and restored when the last test is over.

1 Insert the test disc into the floppy disc drive.
2 If your screen is showing the desktop environment, press function key f12 for the RISC OS supervisor
  • prompt.
3 At the RISC OS supervisor prompt, type the following;

      DRIVE 0 <RETURN>

      CMOSLS <RETURN>

4 Type 'S' to save the contents of the RAM.
5 When prompted, replace the test disc with an ADFS 'D' formatted 800k write enabled disc (the data disc).
6 Type the filename to use, followed by <RETURN>.
7 When prompted, remove the data disc and put it in a safe place. Do NOT use this disc for the later floppy disc test.

8 Type '0' to quit this option.
9 Switch off the computer ONLY (leave the monitor ON).
10 Press and hold down the DELETE key (NOT the BACKSPACE key) and switch on the computer. Keep holding down the DELETE key until a momentary red border around the screen confirms that a 'DELETE power-up' is taking place. (This action clears the CMOS RAM and resets the configuration defaults to the manufacturer's original specification).
11 The Desktop environment will now appear. Insert the test disc into the floppy drive (drive 0). Press and hold down the CTRL, SHIFT and * keys, then press and release the BREAK key. Release the remaining keys.
12 The first test is the computer type/model test. This test is extremely fast and the type and model number of the computer is displayed immediately:

               This computer is an
                 ARCHIMEDES nnn

                CHECK FRONT LABELS
          THEN PRESS <SPACE> TO CONTINUE

You should check that the number displayed on the screen is the same as on the label on the front of the computer.

NOTE: For 400/1 series machines, the machine type displayed as:

Annn/1
where nnn is the basic machine type, eg 410, 420 and 440.
The '/1' indicates that the machine has RISC OS and MEMC1A fitted.

If an earlier machine has been upgraded, it will be recognised as its equivalent 400/1 series model.

For example:
An A310 upgraded with RISC OS and MEMC1A would be recognised as an A410/1.

An A440 upgraded with RISC OS and MEMC1A would be recognised as an A440/1.

An A410/1 fitted with a 1 MByte upgrade would be recognised as an A420/1.

A model R140 will be recognised as an A440/1.
- If the number is NOT the same, (or correct for the upgrades fitted), check inside the machine for the amount of RAM fitted. If the test is giving the wrong result there is a fault in the memory areas.

ACTION: Either change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair'.

NOTE: Incorrect model data or other problems resulting from this test are an indication that the machine has a major system fault. As this test software is designed for use on a machine which is at

least 'working', ensure that the machine passes the basic checks for a 'dead' computer before proceeding further with these tests.

13 If the number IS the same, press the Space Bar to continue.

The next display is the first menu of the test disc:

```
          Dealer Test Menu
1    A300/A400 Tests
2    Podules and Upgrades
3    Load/Save CMOS RAM
4    Keyboard Test
SELECT OPTION:
```

Select the option 'A300/400 Tests'. The software will have determined the correct machine type from the previous test automatically.

The next menu is therefore displayed for A400/1 series machines:

```
    A300/A400 Test Menu
1    Hard Disc Formatter    A400's only
2    Hard Disc Verifier     A400's only
3    Hard Disc Soak Test    A400's only
4    Copy HFORM             A400's only
5    Hard Disc Park         A400's only
6    Other Tests
7    Return to main menu
SELECT OPTION:
```

Select the test required. For all tests other than the hard disc drive, see the section entitled Other Tests, later in this chapter.

Hard disc drive tests

The hard disc drive tests should be carried out after you have repaired or replaced the main PCB or when you have repaired or replaced a hard disc drive. These tests enable you to check the formatting and operation of a hard disc and its interface.

WARNING:
Running these tests on a hard disc will destroy all the data currently held on the disc. Ensure that users are aware of this and that they give you their consent before you start.

Hard disc formatter

Note: Unless otherwise stated, the formatter enters the default value for you after a request to enter a value. Unless you wish to change the default value, just press <RETURN>.

If the 12 hour soak test is used, the hard disc MUST be formatted using the old map. Then, when the soak test is complete, the drive should be reformatted with the new map. If the soak test is performed with a new map format, any new defects will not be recorded properly and the defects list will be corrupted. Always reformat the disc to the new map AFTER you have finished the soak test.

If you have not done so already, follow the sequence under 'Running the tests' above, to save the contents of the CMOS RAM and reset default values. At the Dealer Test Menu, select option 1, 'A300/A400 Tests'. Now select option 1, 'Hard Disc Formatter, A400's only'. The following is displayed:

```
HARD DISC FORMATTER   (V1.01 DEALER)
WARNING
Running this test on a hard disc that has
data on it will DESTROY ALL DATA currently
held on the disc.

Please ensure that users are aware of this
and give you their consent before you start.

Please ensure that a hard disc drive has
been fitted to this machine.

Please DO NOT continue with the test if the
hard disc has not been fitted or you do not
have the users consent.

Continue Y/N
```

Press Y if you wish to continue.

If you press N, the previous menu will be re-displayed.

The program will ask which drive is to be formatted (the default drive is 4), press <RETURN> or select

another drive number followed by <RETURN>. An attempt is then made to recognise the hard disc. One of three messages will be displayed:

1 If the program cannot identify the disc (id it cannot be read) choose the correct make from the list displayed, then go to step 4.

2 If the disc can be read, one of the following messages appears:

```
The shape written on the disc does not
match any of the standard drive shapes
known by this program. Do you wish to
retain this shape (Y/N) ?
```

Press Y <RETURN> if you wish to format a disc of a type other than those listed, then go to step 4.

Press N <RETURN> if you wish to format a previously unformatted disc which is one of those listed, then go to step 4.

OR (if the recognised format is that of, for example, a 20 Mb Tandon):

```
The shape written on the disc matches that
of a 20Mb Western Digital/Tandon disc

Do you wish to retain this shape (Y/N)?
```

Press Y <RETURN> to continue.

The message

```
Old or New map format (O/N) ?N
```
will then appear, where N is the default.
Note: O 'Old' format must be used if you are going to perform the soak test.

Press <RETURN> (N) for RISC OS if you are not going to soak test the disc.
Disc format values are then requested.
Note 1:
Where the disc format is for one of the drives listed in the program, default values are supplied by the program and should be used (as in the example for a 20Mb Tandon, below).

Note 2:

If the disc has been read but not recognised as having a standard drive shape, selecting the Y option to retain the shape will display the values read from the disc.

After each request, either press <RETURN> to enter the default value given, or enter the new value, followed by <RETURN>.

```
Sectors per track ?32
Heads ?4
Cylinders ?615
Low current cylinder ?1023
Precompensation cylinder ?1023
Parking cylinder ?663
```

The following is then displayed:
```
Current Defects (Cylinder,Head,Sector)
(Defects may be listed here)*
A: no more changes
B: add defect by cylinder, head, byte/sector
C: add defect by disc address (eg discerror)
D: remove defect?
```
If defects are listed, the hard disc is formatted. Check that the defects listed included all those on the label on the hard disc unit. If so, skip steps 1 and 2, which are described below, and proceed to step 3.

If no defects are displayed (eg the hard disc is unformatted), or the list does not include all the defects listed on the label on the drive:

• Type B to enter defect values, or C to enter as disc error information - see label on drive. Note that option C can also be used to enter ADFS error addresses to mark out known drive defects.

• Enter the defects recorded by the manufacturer on the label on the hard disc unit. Use option D to correct any mistakes made when making entries.

Once you have entered the defects, this part of the menu is restored to the display.

To format the hard disc:

```
Type A <RETURN>.
```
The screen then displays the message:
```
Do you want to soak test the hard disc for
defects (Y/N)?
```
EITHER:

Press Y <RETURN> to format and verify the drive, followed by a continuous soak test without display. As no defects will be reported, this soak test serves as a confidence test only.

The screen then displays the message:
```
Are you certain you want to format drive 4
(Y/N)?
```

Type Y <RETURN> and formatting begins. The 'H/DISC' LED will flash rapidly, with

```
Formatting XXX.
```
displayed, where XXX is the sector number.
After formatting is completed, the disc is verified automatically. A message indicates either verified OK or lists errors found on the disc.

The screen then displays the message:
```
   PRESSING THE SPACE BAR WILL CAUSE THE SOAK
      TEST TO END AT THE END OF THAT CYCLE
```

To quit the soak test, press the space bar - the test will end after a few minutes.
The screen then displays the message (new map only):
```
LARGE FILE ALLOCATION UNIT? 1024
```
Press <RETURN> to enter the default value given.
The main A400 test menu is then displayed.

OR:

Press N <RETURN> to format and verify only. The screen then displays the message:

```
Are you certain you want to format drive 4 (
Y/N) ?
```

Type Y <RETURN> and formatting begins. The 'H/DISC' LED will flash rapidly, with

```
   Formatting XXX.
```

displayed, where xxx is the sector number. After formatting is completed, the disc is verified automatically. A message indicates either verified OK or lists errors found on the disc.

The screen then displays the message (new map only):

```
LARGE FILE ALLOCATION UNIT? 1024
```

Press <RETURN> to enter the default value given. At the end of the verifying procedure, the main A300/A400 test menu is displayed.

Hard disc verifier

Select option 2, 'Hard Disc Verifier', from the A300/A400 Test Menu. A message appears:

```
HARD DISC VERIFIER (V1.02 DEALER)
WARNING
Please ensure that a hard disc has been
fitted to this machine.

Please DO NOT continue with the test if the
hard disc has not been fitted.

Continue Y/N
```

If you press N, the previous menu will be re-displayed. Press Y to continue. The following is displayed:

```
VERIFY DRIVE 4 OR 5? 4

Either press <RETURN> for the default drive
number 4, or enter the hard disc drive number
followed by <RETURN>.
```

The message:

```
VERIFYING...
```

will appear and the H/DISC LED will flash on and off. A message is then given indicating either :

```
VERIFIED OK
```

Press space bar to continue.
Press the space bar to return to the A300/A400 Test Menu

OR

listing errors found on the disc, for example:

```
Disc error 10 at : xxxxxxxx
```

where xxxxxxxx is the error address. These errors should be noted and the disc re-formatted with the errors entered as defects.

After verifying the disc the 'Hard Disc System Soak Test' should be selected - see below.

Hard disc soak test

> WARNING
> Running this test on a hard disc will destroy all the data currently held on the disc. Ensure that users are aware of this and that they give you their consent before you start.

To start the soak test, select option 3 <RETURN> on the A300/A400 Test Menu

The screen displays a warning. The following is displayed:

```
HARD DISC SOAK TEST    (V1.01 DEALER)
WARNING

Running this test on a hard disc that has
data on it will DESTROY ALL DATA currently
held on the disc.

Please ensure that users are aware of this
and give you their consent before you start.

Please ensure that a hard disc drive has
been fitted to this machine.

Please DO NOT continue with the test if the
hard disc has not been fitted or you do not
have the users consent.

Continue Y/N
```

If you press N, the previous menu will be re-displayed Press Y<RETURN> if you wish to continue.
This followed by:

```
Test Drive?4
```

Press <RETURN> for default value or enter other drive number followed by <RETURN>.

The Soak test then starts and runs for approximately twelve hours. A record of any defects are displayed on the screen and the defects file on the hard disc is updated automatically. You can remove the floppy test disc while the Soak test is running, but you should not:
• subject the computer to any mechanical shock or movement
• turn off the computer unless the test has terminated, ie the PASSED/FAILED message is displayed and you have copied HFORM onto the hard disc.

During the Soak test the following information is displayed on the screen:

```
Acorn Computers Winchester Soak and Test (
 WIST)

Version 2.13 Dealer 21-June-1989 DFS
NoRetries Q-to quit

Elapsed time Test ends in...

Type          Read/ Write/ Format/
              Verify...Write

Serial Number Data Pattern

Precompensation
              Cylinder Working on track
Reduced Write Current

Cylinder      Seek errors
Heads         Re-reads Required
Cylinders     Reformats required
Park Cylinder Logged Defects
```

In the lower half of the screen there are four columns in which the cylinder, head and sector defects are listed as they are discovered. Any defects which the manufacturer or previous tests have logged on the drive are listed at the top of the left-hand column.

If any defects are detected

If any defects are detected during the Soak test, the figures for the Seek errors, Re-reads required, Reformats required, and Logged defects are highlighted in red. However, the fact that new defects are discovered does not necessarily mean that the Soak test will fail.

You do not need to update the defects file as this is done automatically, but you should write down the cylinder, head and sector defects on a piece of paper as a record. This should be retained so that, if the user wants to reformat the hard disc at a later date, the information can be checked against the defects list.

Note: If the soak test finds more than 20 defects in total, the program terminates immediately. The disc ha: then failed the soak test.

At the end of this period the program runs the Termination sequence. This is followed by a large banner display reporting either a PASS or FAIL.

If the test disc (0283,090) has been removed, it must be replaced in drive 0 before you continue.

When the soak test has finished you should reformat the disc using the new map. Refer to the previous section for instructions.

Press the space bar to return to the previous menu.

The display will return to the A300/A400 Test Menu. Action if test fails: If drive is faulty, replace it using the Hard Disc Upgrade instructions as a guide.

Quitting the soak test
If, for any reason, you need to quit the soak test before completion, press 0 to return to the A300/A400 Test Menu.

Quitting the soak test will leave the hard disc in a partially formatted state (ie unusable). It must therefore be formatted - select option 1 on the menu which appears.

Select option 5 to park the disc heads if testing is not to continue for any reason.

The final step is to copy the hard disc formatter program (HFORM) onto the hard disc.

Copying HFORM onto the hard disc

Select option 4 on the A300/A440 Test Menu
This program will:
• create a directory called LIBRARY on the hard disc
• copy the file HFORM into it
The following is displayed on completion:

```
Copy HFORM      (V1.00 DEALER)

HFORM copied

Press space bar to return to menu
```

Completing the tests
You have now completed the hard disc tests.
1 If no further tests are to be carried out, select option 5, 'Hard Disc Park', to park the hard disc heads. Then press the space bar to return to the A300/A400 test menu.
2 select option 7 to return to the main Dealer Test Menu, then select option 3, 'Load/Save CMOS RAM' to re-load the contents of the CMOS RAM.:

   When prompted, replace the test disc with the data disc on which the CMOS RAM contents were saved. Type 'L' to load the data into RAM.
     Type the filename to use, followed by <RETURN>.
3 Select 0 to return to the Dealer Test menu and select the 'Quit to desktop' option 5.

Other tests

If you have not done so already, follow the sequence under 'Running the tests' above, to save the contents of the CMOS RAM and reset default values. At the Dealer Test Menu, select option 1, 'A300/A400 Tests'.

Select the version of Other Tests required; select option 1 if no printer is connected, or option 2 or 3 for the printer in use. Ensure that the printer is known to be working correctly. After selecting and loading the required test program, the computer cycles through a series of tests:

Memory test

The first test checks the memory. The screen clears and displays the following:

Memory test
```
Phase one: Incrementing pattern....
Phase two: Cycling bits..............
```
If the test is passed,
```
All seems OK.....
```

is displayed and the program moves on to the next test. If the test fails, the 'Other tests' routine will be aborted.

Battery backed RAM

The test continues by testing battery backed RAM. The following message is displayed on the screen:
```
Battery Backed Ram (BBR) test running.
Press <SHIFT> to scroll
Reading BBR into main memory.
Checking read/write function of BBR.
Re-loading configuration parameters.
PASSED/FAILED message
PRESS <SPACE> TO CONTINUE
```

Press the Space Bar to continue the test.

Action if test fails: Check batteries, battery holders and connections. Re-run the test.

If test still fails, either change the main PCB, or see the chapter entitled PCB fault diagnosis and repair.

Time

The functional test continues by testing the time and date settings. A series of options are displayed on the screen:

```
DO YOU WANT TO ?
1. CHECK THE DATE AND TIME
2. SET THE DATE AND TIME
3. CHECK THEN SET THE DATE AND TIME
   PRESS 1 OR 2 OR 3
```
The normal procedure is to select option 1. If you want to reset the time or date you would select 2 or 3. For example, you can:
1 Type 1 to check the date and time.
2 Check that the time is correct and the seconds are incrementing correctly.
To continue with the test, press the Space bar.

Loudspeaker

The test continues by testing the operation of the loudspeaker. A short repeating sequence of eight musical notes is played and the following message is displayed:
```
LOUDSPEAKER TEST
LISTEN AND CHECK SOUND
THEN PRESS <SPACE> TO CONTINUE
```
You should:
1 Listen to the sequence of notes.
2 This is a subjective test, so if you detect any deviation, make a note of the fault.

Action if test fails: If no sound, check speaker connections. Substitute a known good speaker and retest. If OK, replace speaker. If test still fails,' change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair'.
3 To continue with the test, press the Space Bar.

Headphones

The functional test continues by testing the ' Headphones 32 Ohm' socket. The following message is displayed as the test proceeds:
```
HEADPHONE TEST RUNNING
LISTEN AND CHECK SOUND
THEN PRESS <SPACE> TO CONTINUE
```

The test consists of a repeating sequence of eight musical notes. The first four notes are played on one headphone and the next four notes on the other headphone.
1 Put on the headphones.
2 Listen to the sequence of notes.
3 This is a subjective test, so if you detect any deviation in either headphone, note down the fault.

Action if test fails: If no sound or poor/faulty sound on known good headphones, change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair'.
4 To continue with the test, press the Space Bar.

Standard colour monitor

This test consists of a series of screen displays. You proceed through the test at your own pace.

The first display consists of a series of white lines radiating from the top-left corner. A cursor, in the shape of a three-coloured bird, travels across the screen, starting from the bottom left and finishing at the top right. The features to check are:

• the accuracy of the lines
• the movement and integrity of the cursor
• the transparency of the bird image as it moves across the lines.

This is a subjective test, so make a note of any faults. When you have finished looking at the screen display, press the Space Bar to move to the next display.

The next screen displays consist of four test cards. There is a test card for each of the three colour guns, and a 'grey scale' to test the three guns. The four test cards are:

• Red scale
• Green scale
• Blue scale
• Grey scale.

Press the space bar to step through the colours. Each test card consists of 16 concentric circles beneath a horizontal band which is divided into 16 sections. A pale border highlights the leftmost eight sections of the band in order to distinguish the band from the background. The whole test card is surrounded by a contrasting border.

The purpose of the cards is to display 16 shades with the shade of the border as the middle of the range. You should observe:

• the 16 shades displayed
• the mid-coloured border
• the quality of the 'grey scale' display
• the integrity of each test card.

This is a subjective test, so make a note of any faults which you detect and when you are ready to continue press the Space Bar.

Colours incorrect or missing: With a full white screen, VIDC IC 8 pins 39, 40 and 41 should all have the same signal on them. If not, either change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair.

High resolution mono monitor

The high resolution monitor tests begin with the following display:

```
High resolution monitor tests
Check for linearity and a clean, noise
free display on high resolution monitor
Ensure Hi-res and standard RGB monitors
      are at least 500mm apart
   Run the Hi-res tests (Y/N)?
```

Press Y to continue.

A series of displays follows, with messages to check for linearity.

Press SPACE to move on to the next test.

Floppy disc drive

The Floppy disc drive test consists of two parts. The first part of the test checks the write protect mechanism. The test disc must be write protected for this test to work. If the disc drive passes the following message is displayed:

```
FLOPPY DISC DRIVE TESTS

PASSED Write Protect

Insert Test disc 2 in drive 0
Then press SPACE
```

Replace the test disc with a BLANK, ADFS 'D' formatted, 800k write enabled disc.

The test continues with disc Read, Write and Erase tests. Each test gives a PASSED/FAILED message.

Action: If test fails, check that the configuration for 'STEP' and 'FLOPPIES' is correct. Check the disc drive ID switch is set to the correct position - normally '0' for single floppy drive, '1' for second floppy drive.

Swap the cable and drive for known good examples. Check power to drive. If fault persists, either change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair'.

Serial port

The RS423 port test is carried out automatically and gives a PASSED/FAILED message.

Action: If test fails, make sure that the configuration items "BAUD" and "DATA" are set to sensible values (see the User Guide). If test still fails, after you have ensured that the loopback plug is functional on another unit, either change the main PCB, see the chapter entitled 'PCB fault diagnosis and repair'.

If option 1 (Other Tests Except Printer) was selected on the A300/A400 test menu, the following is then displayed:

```
PRINTER NOT TESTED

PRESS <SPACE> TO CONTINUE
```

See the section entitled Completing the tests.

Printer

The Printer test sends a test pattern to the printer. The pattern comprises a repeated series of stepped lines each representing bits 0 to 7. You should look for missing or corrupted pattern. As this is a subjective test make a note of any faults that you detect.

At the end of the printer test, a list of failures, if any, is displayed.

Action: If the test fails with a known good printer and cable connected, check the configuration settings for 'PRINTER' and 'IGNORE' are correct. If fault still persists, either change the main PCB, or see the chapter entitled 'PCB fault diagnosis and repair'.

The printouts should look like this:
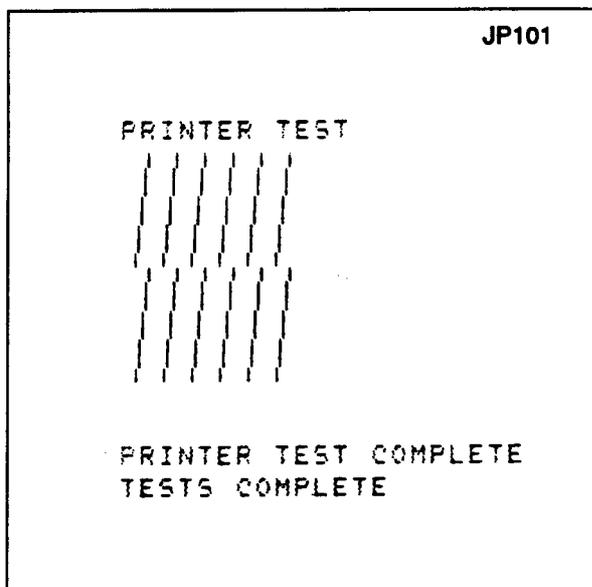
The display then shows:

```
Insert Dealer Test Disc 1
Then press SPACE
```

Replace the test disc and press the space bar. A final banner displays either

```
PASSED
```

in green, or

```
FAIL
```

in red if any non-subjective tests are failed, followed by:

```
TESTS COMPLETE
```
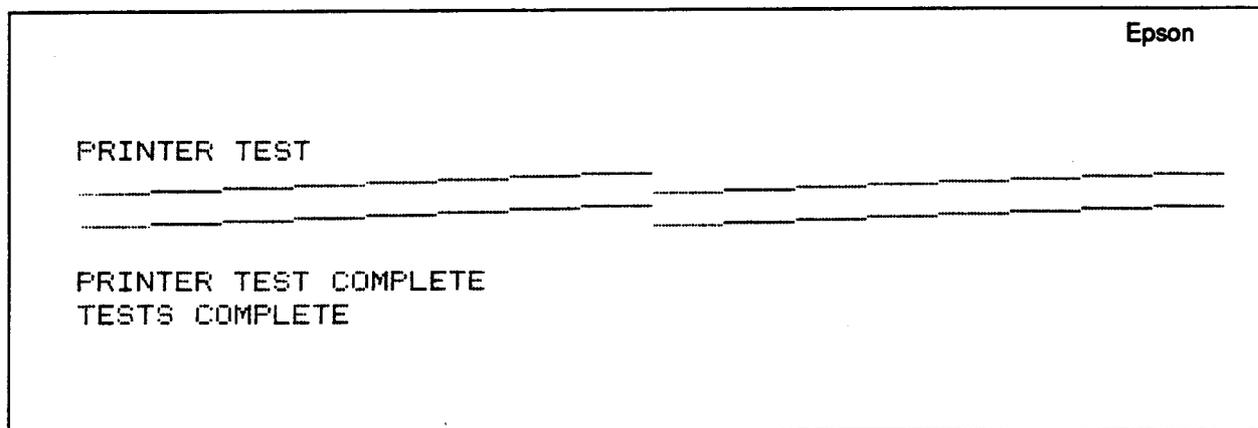
```
PRESS <SPACE> TO CONTINUE
```

Press the space bar to return to the A300/A400 Test Menu.

Completing the tests

1 If no further tests are to be carried out, select option 5, ' Hard Disc Park', to park the hard disc heads (if fitted). Then press the space bar to return to the A300/A400 test menu.

2 Select option 7 to return to the main Dealer Test Menu, then select option 3, 'Load/Save CMOS RAM' to re-load the contents of the CMOS RAM.:

When prompted, replace the test disc with the data disc on which the CMOS RAM contents were saved.

Type 'L' to load the data into RAM.
   Type the filename to use, followed by <RETURN>.

3 Select 0 to return to the Dealer Test menu and select the 'Quit to desktop' option 5.

Keyboard test

Introduction

This test should be carried out whenever you repair or replace either a 300 or a 400 Series keyboard. The test checks that:
• the keys are open and functioning
• the LEDs are functioning
• the mouse buttons are functioning

Equipment required

In order to carry out the tests, you will require the following equipment:
• Keyboard to be tested
• Mouse to be tested
• A known good keyboard
• A known good mouse
• Computer
• Known good mouse
• 3.5 inch test disc part number 0283,090 which is write protected
• Monochrome monitor

OR
• Analogue RGB monitor.

Connecting up the equipment

It is important to connect the equipment to the computer in the correct order. Connect the:
• mouse to test to the keyboard
• known good keyboard to the front panel connector
• monochrome monitor to the Mono Video' socket

OR
• analogue RGB monitor to the 'Analogue RGB' socket
• monitor to the mains supply
• computer to the mains supply.

Running the test

The tests alter the contents of the battery backed RAM that holds the computer's configuration data. These must be saved before any of the tests are run, and restored when the last test is over.
1 Insert the test disc into the floppy disc drive.
2 If your screen is showing the desktop environment, press function key F12 for the RISC OS supervisor prompt.
3 At the RISC OS supervisor prompt, type the following:

```
DRIVE 0 <RETURN>
CMOSLS <RETURN>
```

4 Type 'S' to save the contents of the RAM.
5 When prompted, replace the test disc with an ADFS ' D' formatted 800k write enabled disc (the data disc).
6 Type the filename to use, followed by <RETURN>.
7 When prompted, remove the data disc and put it in a safe place. Do NOT use this disc for the later floppy disc test.
8 Type '0' to quit this option.
9 Switch off the computer ONLY (leave the monitor ON).
10 Press and hold down the DELETE key (NOT the BACKSPACE key) and switch on the computer. Keep holding down the DELETE key until a momentary red border around the screen confirms that a 'DELETE power-up' is taking place. (This action clears the CMOS RAM and resets the configuration defaults to the manufacturer's original specification).
11 The Desktop environment will now appear. Insert the test disc into the floppy drive (drive 0). Press and hold down the CTRL, SHIFT and * keys, then press and release the BREAK key. Release the remaining keys.
12 The first test is the computer type/model test. This test is extremely fast and the type and model number of the computer is displayed immediately:

```
This computer is an
   ARCHIMEDES nnn


    CHECK FRONT LABELS
THEN PRESS <SPACE> TO CONTINUE
```

You should:
• Check that the number displayed on the screen is the same as on the label on the front of the computer.
• If the number is NOT the same, (or correct for the upgrades fitted), check inside the machine for the amount of RAM fitted. If the test is giving the wrong result there is a fault in the memory areas.
(See also 'Running the tests' under 'Main PCB functional test' for full details.)
The next display is the first menu of the test disc:

```
Dealer Test Menu
1    A300/A400 Tests
2    Podules and Upgrades
3    Load/Save CMOS RAM
4    Keyboard Test
SELECT OPTION:
```

Swap the known good keyboard for the keyboard and mouse to be tested; then select option 4, 'Keyboard Test'
.

Keys stuck

During this test, any keys or mouse buttons which are in a permanently closed position (ie stuck down) are displayed on the screen. If any keys are permanently closed, then it will be IMPOSSIBLE to continue the test.

If everything is normal and no keys are stuck then nothing is displayed on the screen and the test program passes straight on to the next test.

LEDs

This test checks that the LEDs on Caps Lock, Scroll Lock and Num Lock are working. To carry out this test:

1 Follow the instructions which appear on the screen. These tell you when to check that each LED is ON and OFF.

2 Note down any LED failures before continuing the test.

3 After each set of instructions press the BREAK key to move to the next instruction.

Mouse

This tests the three buttons on the mouse and the movement of the mouse to the left, right, up and down. Each of the mouse buttons (ie left, middle, right) are displayed on the screen in turn, together with a pointer.

You should:

1 Move the mouse until the pointer is within the displayed button on the screen.

2 Press the corresponding mouse button. The button displayed on the screen should disappear and the next button appear.
Note: If you accidentally press two buttons together, you will see both buttons displayed on the screen. You should press the BREAK key to continue.

If the button cannot be made to disappear then it will be IMPOSSIBLE to continue the test. You should repeat the test with the known good mouse to isolate the fault to either the keyboard or the mouse. Replace faulty components, then retest.

If everything is normal, the program moves on automatically to the next test.

Keys

The screen clears to show a representation of keys in the main keyboard area. You need to test each key in turn in the correct order ie work from the bottom line of the keyboard and from left of the keyboard to the right:

1 Press CapsLock.

2 Check that the picture of theCaps Lock key disappears from the screen. Leave a small delay before pressing the next key.

3 Press Shift and check that the picture of the Shift key disappears from the screen.

If the screen stops clearing the characters as you press the keys, go back to the lowest, leftmost key remaining on the screen and start again from there.
Note: If you accidentally press two keys together, you will see both keys displayed on the screen. You should press the BREAK key to continue.

If the same fault occurs repeatedly or the picture of the depressed key refuses to disappear, then it will be IMPOSSIBLE to continue the test. You should replace the keyboard PCB and start the whole test again.

4 Continue working along the bottom line. Then, start working from left to right along the next line up.

5 When all keys in the main keyboard area have been pressed successfully the screen clears and displays a diagram of the rest of the keyboard area. Again, press each key in turn, following the guidelines above.

6 When all the keys have been successfully pressed, the screen dears and displays the following message:

```
MOUSE TEST - PASSED

MAIN KEYBOARD TEST - PASSED

NUMERIC KEYPAD TEST - PASSED

NOW PRESS RESET BUTTON
```

Press the Reset button on the back of the keyboard. The display will now show:

```
MOUSE TEST              - PASSED

MAIN KEYBOARD TEST      - PASSED

NUMERIC KEYPAD TEST     - PASSED

RESET BUTTON TEST       - PASSED

NOW PRESS SPACE BAR TO RETURN
```

You have now finished the keyboard functional test.

Press the space bar to return to the A300/A400 Test Menu.

Completing the tests

1 if no further tests are to be carried out, select option 5, 'Hard Disc Park', to park the hard disc heads (if fitted). Then press the space bar to return to the A300/A400 test menu.

2 select option 7 to return to the main Dealer Test Menu, then select option 3, 'Load/Save CMOS RAM' to re-load the contents of the CMOS RAM.:
When prompted, replace the test disc with the data disc on which the CMOS RAM contents were saved. Type 'L' to load the data into RAM.
Type the filename to use, followed by <RETURN>.

3 Select 0 to return to the Dealer Test menu and select the 'Quit to desktop' option 5.

4 Switch OFF the power to the computer (at the mains switch on the rear of the machine).

5 Switch OFF the power to the rest of the equipment.

Action if test fails: Make sure that the configuration items "DELAY" and "REPEAT are set to sensible values — see the User Guide.

If the keyboard PCB is replaced, re-run the keyboard functional test.

Expansion tests

Introduction

Run the relevant expansion test detailed below; if it fails, substitute a known good expansion card. If the test still fails, substitute a known good backplane. If the test still fails, either replace the main PCB, or repair it. For expansion card details, see the relevant user guide supplied with the card.

Running the expansion tests.

These tests alter the contents of the battery backed RAM that holds the computer's configuration data. These must be saved before any of the tests are run, and restored when the last test is over.

1 Insert the test disc into the floppy disc drive.

2 If your screen is showing the desktop environment, press function key f12 for the RISC OS supervisor * prompt.

3 At the RISC OS supervisor prompt, type the following;
   DRIVE 0 <RETURN>
   CMOSLS
   <RETURN>

4 Type 'S' to save the contents of the RAM.

5 When prompted, replace the test disc with an ADFS ' D' formatted 800k write enabled disc (the data disc).

6 Type the filename to use, followed by <RETURN>.

7 When prompted, remove the data disc and put it in a safe place. Do NOT use this disc for the later floppy disc test.

8 Type 'Q' to quit this option.

9 Switch off the computer ONLY (leave the monitor ON).

10 Press and hold down the DELETE key (NOT the BACKSPACE key) and switch on the computer. Keep holding down the DELETE key until a a momentary red border around the screen confirms that a 'DELETE power-up' is taking place. (This action clears the CMOS RAM and resets the configuration defaults to the manufacturer's original specification).

11 The Desktop environment will now appear. Insert the test disc into the floppy drive (drive 0). Press and hold down the CTRL, SHIFT and T keys, then press and release the BREAK key. Release the remaining keys.

12 The first test is the computer type/model test. This test is extremely fast and the type and model number of the computer is displayed immediately:

```
        This computer is an

          ARCHIMEDES nnn

        CHECK FRONT LABELS

   THEN PRESS <SPACE> TO CONTINUE
```

You should:
- Check that the number displayed on the screen is the same as on the label on the front of the computer.
- If the number is NOT the same, (or correct for the upgrades fitted), check inside the machine for the amount of RAM fitted. If the test is giving the wrong result there is a fault in the memory areas.

The next display is the first menu of the test disc:

```
Dealer Test Menu

1    A300/A400 Tests

2    Podules and Upgrades

3    Load/Save CMOS RAM

4    Keyboard Test

SELECT OPTION:
```

Select option 2, 'Podules and Upgrades', then proceed to the relevant card information below.

Completing the tests

1 If no further tests are to be carried out, select option 5, 'Hard Disc Park', to park the hard disc heads (if fitted). Then press the space bar to return to the A300/A400 test menu.

2 select option 7 to return to the main Dealer Test Menu, then select option 3, 'Load/Save CMOS RAM' to re-load the contents of the CMOS RAM.:

When prompted, replace the test disc with the data disc on which the CMOS RAM contents were saved.

Type 'L' to load the data into RAM:
Type the filename to use, followed by <RETURN>.

3 Select Q to return to the Dealer Test menu and select the 'Quit to desktop' option 5.

4 Switch OFF the power to the computer (at the mains switch on the rear of the machine).

5 Switch OFF the, power to the rest of the equipment.

Dual floppy disc test

Introduction

The Dual floppy disc test should be carried out whenever you install: repair or replace a second floppy disc.

Note: These instructions assume that the second floppy disc drive upgrade has already been correctly installed. Please refer to the section 'Upgrading' in the appendices, if you need instructions for installation or removal.

Equipment required

In order to carry out the tests, you will require the following equipment:
- Second floppy disc drive upgrade to be tested, which should be fitted already
- Computer
- Keyboard
- 3.5 inch test disc which is write protected (test disc 1)
- ADFS 800k formatted, write enabled, 3.5 inch disc (test disc 2)
- monochrome monitor OR
- analogue RGB monitor.

Connecting up the equipment

It is important to connect the equipment to the computer in the correct order. Connect the:
- keyboard to the front panel connector
- monochrome monitor to the 'Mono Video' socket OR
- analogue RGB monitor to the 'Analogue RGB' socket
- monitor to the mains supply
- computer to the mains supply.

Running the test

if you have not already done so, follow 'Running the tests' in the introduction to the Expansion tests above.

1 Select option 5, 'Dual floppy disc test'. The program loads and displays the following:

```
DUAL FLOPPY DISC DRIVE TEST

Insert Test Disc 1 in Drive 0

Insert Test Disc 2 in Drive 1

Then Press SPACE
```

2 Leave the test disc in drive 0. Insert in drive 1 an ADFS 800k write enabled disc, the scratch disc. Any data already on this disc may be destroyed, so it is best to use a blank disc.

3 The first part of the test checks the write protect mechanism. The test disc (test disc 1) must be write protected for this test to work.

4 The test continues with disc Read, Write and Erase tests (on test disc 2). Each test gives a PASSED/FAILED message.

5 When prompted, swap the discs in the drives, then press the space bar. The tests in 3 and 4 above are then repeated, using the opposite drives.

6 When prompted, replace test disc 1 in drive 0.

You have now completed the Dual floppy disc test. Return to the main menu and select the 'Quit' option to finish.

Completing the tests

1 If no further tests are to be carried out, select option 5, 'Hard Disc Park', to park the hard disc heads (if fitted). Then press the space bar to return to the A300/A400 test menu.

2 Select option 7 to return to the main Dealer Test Menu, then select option 3, 'Load/Save CMOS RAM' to re-load the contents of the CMOS RAM.: When prompted, replace the test disc with the data disc on which the CMOS RAM contents were saved. Type 'L' to load the data into RAM.
  Type the filename to use, followed by <RETURN>.

3 Select Q to return to the Dealer Test menu and select the 'Quit to desktop ' option 5.

4 Switch OFF the power to the computer (at the mains switch on the rear of the machine).

5 Switch OFF the power to the rest of the equipment.

ROM expansion card test

The ROM expansion card test should be carried out whenever you install, repair or replace a ROM expansion card.
Note: These instructions assume that both the expansion card and the backplane have already been correctly installed. See Upgrading, in the Appendices if you need instructions for installation or removal.

Equipment required

In order to carry out the tests, you will require the following equipment:
• ROM expansion card to be tested, which should be already fitted.
• Computer
• Keyboard
• 3.5 inch test disc which is write protected
• monochrome monitor

OR
• analogue RGB monitor.
• ROM Expansion card test ROM , Acorn Part No. 0276, 230-01, fitted to socket IC6. In addition, the position of links LK1-6 and LK2-6 should be changed from between the middle pin and pin A to between the middle pin and pin C.

Connecting up the equipment

It is important to connect the equipment to the computer in the correct order. Connect the:
• keyboard to the front panel connector

• monochrome monitor to the 'Mono Video' socket, or analogue RGB monitor to the 'Analogue RGB' socket
• monitor to the mains supply
• computer to the mains supply.

Running the test

If you have not already done so, follow 'Running the tests' in the introduction to the Expansion tests above.

At the 'Archimedes Podule Tests' menu, select option 4, 'ROM Podule'. The test program is then loaded and automatically runs. When the test is finished a message is displayed to tell you whether the ROM expansion card has passed or failed.

You have now completed the ROM expansion card tests. See 'On completing the tests' in the introduction to the Expansion card tests.
 Remove the test ROM and reset links LK1-6 and LK2-6.

I/O expansion card test & Midi upgrade test

Introduction

The I/O expansion card test should be carried out whenever you install, repair or replace an I/O expansion card.

The MIDI Upgrade test should be carried out whenever you install, repair or replace the MIDI Upgrade for the I/O expansion card.
Note: These instructions assume that the I/O expansion card, the MIDI upgrade to the expansion card (if fitted), and the backplane have already been correctly installed. See Upgrading, in the Appendices, if you need instructions for installation or removal of the I/O card. Installation details for the MIDI upgrade to the I/O card are given in the Archimedes 300 and 440 Service Manuals.

Equipment required

In order to carry out the tests, you will require the following equipment:
• I/O expansion card to be tested, which should already be fitted
• Computer
• Archimedes keyboard
• 3.5 inch test disc which is write protected
• Monochrome monitor

OR
• Analogue RGB monitor.

To test the I/O expansion card you will require the following additional equipment:
- Port Tester assembly
  from which only the following parts are needed:
  - Port Tester main PCB
  - 34way IDC skt to 34way IDC skt cable assembly
  - 20way IDC skt to 20way IDC skt cable assembly
  - 15way IDC D type plug to 15way IDC D type plug assembly.

To test a MIDI upgrade you will require the following additional equipment:
- MIDI upgrade which should be fitted already
- Acorn Econet cable.

Connecting up the equipment

ft is important to connect the equipment to the computer in the correct order. Connect the:
- keyboard to the front panel connector
- hi-res monochrome monitor to the 'Mono' and 'Sync' sockets, or analogue RGB monitor to the 'Analogue RGB' socket
- Port Tester '1MHz Bus' socket to the computer's '1MHz Bus' socket, using the 34way IDC cable
- Port Tester 'User Port' socket to the 'User Port' socket, using the 20way IDC cable
- Port Tester 'A/D Port' socket to the 'Analogue Port' socket, using the 15way IDC D type cable
- MIDI IN socket to the MIDI OUT socket, using the Econet cable
- monitor to the mains supply
- computer to the mains supply.

Running the test

If you have not already done so, follow 'Running the tests' in the introduction to the Expansion tests above.

Select option 1,'I/O Podule & MIDI Upgrade'. A further menu is displayed:

```
Archimedes I/O Podule Test Menu

(c) Acorn Computers Ltd. Version 4.1D

1) I/O Podule Test

2) I/O Podule Soak

3) MIDI Upgrade Test

4) MIDI Upgrade Soak

5) I/O Podule and MIDI Upgrade Test

6) 6). I/O Podule and MIDI Upgrade

Soak 7) Return to Main Menu
```

Select the appropriate test from the menu, then follow it with the corresponding soak test. All the tests load and run automatically, giving a PASSED or FAILED message at the end.

Note: The MIDI upgrade can be tested regardless of whether the I/0 expansion card passed its test or not.

You have now completed the I/O expansion card and MIDI upgrade tests. See 'On completing the tests' in the introduction to the Expansion card tests.

MIDI expansion card test

Introduction

The MIDI expansion card test should be carried out whenever you install, repair or replace a MIDI expansion card.

Equipment required

In order to carry out the tests, you will require the following equipment:
- computer
- keyboard
- 3.5 inch test disc which is write protected
- MIDI expansion card under test
- a second, known good, MIDI expansion card
- 2 Acorn Econet cables (which have been labelled IN and O/P)
- monochrome monitor OR
- analogue RGB monitor

Setting up the MIDI Expansion Cards

For this test to function correctly, the MIDI expansion cards MUST be installed in these positions:
- The MIDI expansion card under test must be in the upper socket of the backplane, labelled Podule '0'.
- The known good MIDI expansion card must be in the lower socket of the backplane, labelled Podule '2'.

It will therefore be necessary to rearrange the expansion cards in the computer. Note the following:
- A record should be made of the positions of any expansion cards already fitted, so they can be replaced in their correct sockets after the test has been run.
- Full instructions for the installation or removal of expansion cards are given in Upgrading in the Appendix. Please refer to it.

Proceed as follows:
1 Remove the top cover of the computer.
2 Ensure that the backplane and its support bar are fitted correctly.
3 Remove any expansion card already in the backplane socket labelled Podule '0'.

4 Remove any expansion card already in the backplane socket labelled Podule '2'.

5 Install the known good MIDI expansion card in the backplane socket labelled Podule '2'.

6 Install the MIDI expansion card under test in the backplane socket labelled Podule '0'.

Connecting up the equipment

It is important to connect the equipment to the computer in the correct order. Connect the:

*   keyboard to the front panel connector
*   hi-res monochrome monitor to the 'Mono' and 'Sync' sockets

OR

*   analogue RGB monitor to the 'Analogue RGB' socket
*   one end of the Econet cable marked 'IN' to the 'IN' socket of the (uppermost) MIDI expansion card under test

AND

*   the other end of this cable to the 'OUT1' socket of the (lower) known good MIDI expansion card
*   one end of the Econet cable marked 'O/P' to the 'IN' socket of the (lower) known good MIDI expansion card
*   monitor to the mains supply
*   computer to the mains supply.
    Note: At this stage the cable marked 'O/P' is only connected at one end. You will be prompted to connect the other end as necessary.

Running the test

If you have not already done so, follow 'Running the tests' in the introduction to the Expansion card tests above.

Select option 3, 'MIDI Podule'.

1 Once the test program is loaded and the first part of the test has been run, the screen displays the following:

```
ARCHIMEDES MIDI PODULE TEST

(c) Acorn Computers Ltd. Version 1.00

Podule ROM test.............        Passed

IN socket test..............        Passed

Connect 0/P lead to THRU then press SPACE
```

2 Plug the free end of the cable marked 'O/P' into the THRU socket of the (uppermost) MIDI expansion card under test. Press the space bar to start the test. A PASSED or FAILED message appears.

3 When prompted, move the cable from the THRU socket to the OUT1 socket, then press the space bar. A PASSED or FAILED message again appears.

4 When prompted, move the cable from the OUT1 socket to the OUT2 socket, then press the space bar. A PASSED or FAILED message again appears.

5 A final message appears telling you whether the MIDI expansion card has passed or failed.

You have now completed the MIDI expansion card test. See 'Completing the tests' in the introduction to the Expansion tests.

Backplane tests

Introduction
The backplane should be tested if you suspect it is faulty. Likely symptoms of this are:

- All installed expansion cards fail their tests
- Expansion cards fail their test only if installed in a specific slot
- A known good expansion card fails a test, but then passes the same test on another computer.

Equipment required
In order to carry out the tests, you will require the following equipment:

- 4-way backplane
- Continuity/isolation tester.

Removing the backplane
The backplane must be removed for testing. Note the following:

- A record should be made of the positions of any expansion cards already fitted, so they can be replaced in their correct sockets after the test has been run.

- Full instructions for the installation or removal of expansion cards and of the backplane are given in Upgrading in the Appendices.

Proceed as follows:
1 Remove the top cover of the computer.
2 Ensure that the backplane and its support bar are fitted correctly.
3 Ensure that all expansion cards are fitted correctly.
4 If no fault was visible, remove all expansion cards from the backplane.
5 Remove the backplane from the computer.

Testing the backplane
The backplane PCB should be electrically tested using a suitable continuity/isolation analyser and wire harness to suit.

Note: Due to the presence of an active device no pin on any connector may be subjected to a voltage greater than 300mV with respect to any other pin on any other connector.

Replacing the backpiane
1 Replace the backplane in the computer.
2 Replace the expansion cards removed at the start of the test in their original sockets.

3 Replace the top cover of the computer by sliding the top cover on from the back of the computer, then doing up the five retaining screws.

Main PCB fault diagnosis and repair

This section deals with fault diagnosis and repair of the main PCB at component level.

See the chapter entitled 'Fault-finding information' for basic fault diagnosis before proceeding to this chapter.

Tools required

The suggested tools for servicing Archimedes 400/1 series machines is as follows:
- 100 MHz oscilloscope
- DC voltmeter
- Earth continuity tester
- Acorn test disc, part no. 0283,090
- Serial Port Loopback
- Headphones (32 Ohm impedance)
- Chip extraction tools (68/84 pin)
- Standard items such as soldering/desoldering workstation, screwdrivers, pliers, etc.

It is a recommended requirement that anti-static precautions should be utilised at all levels of servicing, ie antistatic matting and wrist-straps.

Repairing a 'dead' computer

See Checking a 'dead' computer under 'Fault-finding Information' for initial tests.

These notes are a guide to diagnosing and repairing faults on the main PCB, resulting-from the initial tests.

Video failure

1 Check for +5 V on both ends of L9; if open circuit then check C1 for short circuit. Also check for 3.5 Volts (approx.) on IC 8 pin 43. Should this not be present then check R73, D13 and C27.
2 Check for a 24 MHz clock on IC 8 pin 19. If missing then check continuity to and through P14a and its shunt.
3 Check for video data on IC 8 pins 39, 40 and 41. If not present, check power supply to IC 8; f present, before finally changing IC 8.
4 Check for short circuits on signals VIDRO and VIDAK. Check connection of all data lines to VIDC.

System Failure

In order to eliminate the major devices first, change in turn the ARM IC 32, MEMC IC 34, IOC IC 22 and VIDC IC 8. Re-try the system after each device

change. If the system still appears to be dead, proceed as follows:

1 Check for main system clock of 24 MHz on LK3 centre position. If absent, check again on IC 2 pin 6; if still absent, check for Z 96 MHz (this will look like a sine wave of small amplitude if a high quality oscilloscope is not used), on IC2 Pin 3. Change IC2 if 96 MHz is present. If not, try changing IC1 and X1.

2 Check for clocks on MEMC IC 34 pin 67 and VIDC IC 8 pin 19.

3 Check that the signal RST driving MEMC IC 34 pin 44 and IOC IC 32 pin 9 is not stuck high.

4 Check for the presence and validity of the processor addresses and PHI 1 clock. This can be done by examining the signals on IC 31 pins 12 to 19, IC 30 pins 12 to 19 and IC 24 pins 16 to 19, whilst holding down the RESET button on the keyboard. In this situation the processor continuously
increments its address bus. Should any of the signals not toggle, suspect either a short or open circuit on that line. Should none of the signals toggle, check for the PHI 1 clock on the appropriate IC and on MEMCIC 34 pin 66. Also check to see that addresses are being presented to the inputs of the above devices. Change ICs 30, 31 or 24 as appropriate, or if no addresses are present, change the ARM IC32.

5 The data bus can be inspected by probing on resistors R161 to 192. By their nature, it is difficult to interpret the signals seen, so just check for the ability of the signals to move between logic states. None of these lines should be stuck permanently high, low or in a midrail state. Any of these resistors may be removed in order to isolate the DRAM bank from the CPU, thus easing the tracing of shorts, etc. Also check for short or open circuits on the BDATA bus, IC 14 pins 12 to 19 and IC 22 pins 12 to 19. A fault here may well cause a false interrupt.

6 Check for shorts on DRAM address bus, either on the DRAMs themselves or on IC 34 pins 28 to 37.

7 Check for Data and Address signals on all four of the ROMs. This is especially important if the ROMs have been disturbed, as mis-use of a screwdriver during ROM removal may have damaged or broken PCB tracks or pins on the socket.

8 Check for all address lines on MC, again with RESET held down.

9 Check the processor interrupt lines Fla and IRO pins 8 and 7 on ARM IC 32. Neither of these should be stuck low. IRO can be expected to pulse low, FIQ should be high. These interrupts should also be checked at their source on IOC IC 22 pins 50 and 51. Should these also be low, the interrupt source can be traced by examining all interrupt inputs to

IOC IC 22 on pins 30 to 42 (note that pins 30, 31 and 42 are active high logic).

10 Check corner pins of IOC IC22 for short circuits.

11 Check for a RAS signal on pin 9 of all the DRAMS, check positions of RAM size select links LK14 and LK15.
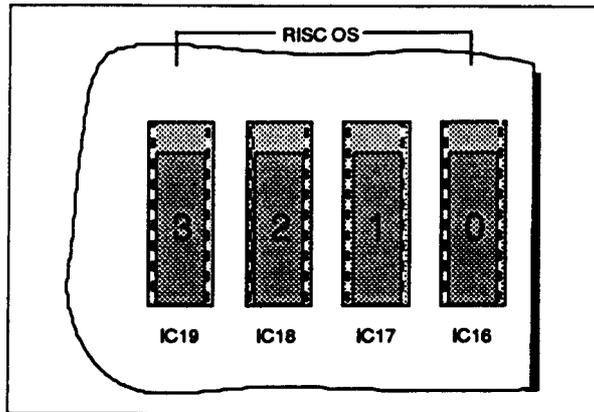
Test ROMs

The test ROMs are designed to assist in the repair of all Archimedes systems where 'Failure to Initialise' faults are present - ie the machine appears to be 'dead' on power-up.

The ROMs contain software which can be categorised in two sections:

1. Main memory test routines.

2. Test routines for use under repetitive reset.

To install the test ROMs, carefully remove the RISC OS ROM set, ICs 16, 17, 18 and 19 and replace them with the test ROMs, 0, 1, 2 and 3 respectively - see diagram below. Note the correct position of the ROMs in their sockets;

ROM pin 1 is three rows down from the lop' of the socket.

Fitting the test ROMs In place of the RISC OS ROMs

Providing that the ARM, memory controller and video controller are functioning, the test ROMs will auto-boot into the menu-driven display below. At any point in the operation of the test ROMs, pressing the BREAK key or re-powering the machine will re-start the program and re-display the menu.

```
0123456789012345678901234567890123456789012345678901234567890123456789012 3


    A1    DIAGNOSTIC TEST ROMS          MEMORY SIZE =&0XX00000 BYTES


          1.  CYCLIC MEMORY TEST WITH PRINTOUT

          2.  CYCLIC MEMORY TEST


     SELECT :
```

Main memory test

The memory test checks memory according to memory size selected.

It is possible that faulty memory may lie in the region designated as 'screen memory'. If this occurs, the video display may become unreadable. For this reason, the sequence 0123456789 is repeated across the top line of the display. Every 4 digits represents a 32 bit word. Watch for missing or corrupted display.

As the start of the screen memory is known to be at physical address &2000000, it should be possible to determine the exact device that is faulty by examining the corruption pattern on the display.

The default 'memory size' is &100000 bytes (1Mb), however this may be cycled through 0.5, 1, 2 and 4Mb memory sizes by pressing the 'M' key.

When using the ROMs on a machine having memory content other than 1 Mb, the video display may at first appear out of line or incorrect. In this instance press the 'M' key repeatedly until the required memory size has been selected.

The memory test is cyclic and on completion of each full memory test a full stop ('.') will be displayed. The 4Mb test takes about 29 seconds.

If for some reason the video display is completely blank or unreadable (eg because of a video fault), a printed output may be obtained by selecting option 1, the output being produced at the printer port as well as on the VDU.

  if an error is found in the memory, the display will show:

```
AT ADDRESS &nnnnnnnn WROTE &pppppppp READ
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

where 'nnnn' is the faulty address, 'pppp' is the data written to that address and 'xxxxxxxx' is the data read back from that address in binary form.

The memory tests do not terminate unless an error is found, in which case after reporting 8 or 9 errors, the test will terminate.

An additional check is now made on the state of CMOS RAM control lines CO and C1. If either of these lines are short-circuit to 0 Volts, the test ROMs will indicate this on power-up.

Repetitive reset test

This section of test code is intended for use when the main memory test menu fails to initialise.

To make use of this section of the ROMs the following test equipment is required:
- Oscilloscope
- Signal or pulse generator

The purpose of the code is to produce certain signals around specific areas of the PCB. These signals may then be monitored using the oscilloscope to assess the operation of that area of the circuit.

The code is written in a loop which should execute three times before proceeding to the main memory test. For this reason the machine must be reset repeatedly.

A suitable square wave or, preferably, a negative-going pulse generator output at 10 kHz should be connected to the reset line via a component connected to IOC IC22 pin 29.

After setting the border colour to white, the signals should be observable in the following order.

```
SVPMD  low
SVPMD  low
SVPMD  low
IOC CS
IOC CS  & S1   hi
IOC CS & S2   hi
IOC CS & S3   hi
IOC CS & S4   hi
IOC CS & S5   hi
IOC CS & S6   hi
IOC CS & S7   i
nB/W   low
nB/W   low
nB/W   low
IOC CS 6 COhi
IOC CS & C1hi
IOC CS 6 C2hi
IOC CS 6 C3hi
IOC CS 6 C4hi
IOC CS 6 C5hi
IOC CS hi
```

Return to start for three executions.

After execution of this code, the border colour is
reset to black. The assembler listing for this section of the
code is given below:

```
Start1LDRTr0,    [r5]            ;SVPMD pin low    )
  LDRT  r0,      [r5]            ;                 )continual toggle of:
  LDRT  r0,      [r5]            ;                 )
  LDR   r1,      iocmof          ;re-load icc base addr. -offset
  LDR   r0,      [r1,r6]!        ;SVPMD pin high
  LDR   r0,      [r1, r6]!       ;IOC CS pin high ;S1 ioc hi
  LDR   r0,      [r1, r6]!       ;IOC CS pin high ;S2 ioc hi
  LDR   r0,      [r1, r6]!       ;IOC CS pin high ;S3 ioc hi
  LDR   r0,      [r1, r6]!       ;IOC CS pin high ;S4 ioc hi
  LDR   r0,      [r1, r6]!       ;IOC CS pin high ;S5 ioc hi
  LDR   r0,      [r1, r6]!       :1OC CS pin high ;S6 ioc hi
  LDR   r0,      [r1, r6]!       :IOC CS pin high :S7 ioc hi

  LDRB  r0,      [r5]            ;nB/W pin hign    )
  LDRB  r0,      [r5]            ;nB/W pin hign    )
  LDRB  r0,      [r5]            ;nB/W pin high    )
  MOV   r1       #&FE0000        ;
  STR   r1,      [r7]            ;   set C0        )
  MOV   r1       #&FD0000        ;                 )
  STR   r1,      [r7]            ;   set CI        ]
  MOV   r1       #&FB0000                          )
  STR   r1,      [r7]            ;   set C2        )
  MOV   r1       #&F70000        ;                 ) I.O.C.
  STR   r1.      [r7]            ;   set C3        ]
  MOV   r1       #&EF0000        ;                 )
  STR   r1,      [r7]            ;   set C4        )
  MOV   r1       #&DF0000        ;                 ]
  STR   r1,      [r7]            ;   set C5        )
  MOV   r1       #&FF0000        ;
  STR   r1,      [r7]            ;   reset all

  LDR   r1,      555555555       ;   write to printer port
  STR   r1,[r8]   ;

  SUBS  r9, r9,  #1
  BNE   start1
  B     main
```

Repairs following functional testing

The following notes refer to the functional test procedures described in the previous chapter, and give component level diagnosis and repair information following a test failure.
Unless otherwise stated, always perform the simple checks given in the chapter entitled 'Fault-finding Information' first, then refer to the relevant component level information below.

Type/Model
Memory area fault - Run the Memory Test (see Test ROMs above) and repair as necessary.

Memory
Repair as above.

Battery-backed RAM

If the NVM suffers data retention problems and the RTC fails, then, with the computer power off, check for about 2.8 V on IC29 pin 8. If this voltage is not present, inspect PL10, D16 and the charge state of the batteries (>1.4 V per cell).
If the NVM IC29 consistently fails on the same data bits, change the device.
If the clock fails to run or runs inaccurately, check and if necessary replace X3. TP2 allows access to the clock signal.

Audio (Loudspeaker test and Headphones test)

Test the audio with both headphones and internal speaker. Do not forget to issue 'SPEAKER ON and " VOLUME 127 commands.

If only the speaker fails, check connections to the main PCB via PL8 and check IC12 pin 5 for a signal of 3 V amplitude. ff no signal is present on pin 5 but can be found on pin 3, change IC12.

If there is no audio at all, first check for +5 V on both ends of L10. If this is open circuit, check the condition of C48 before replacement. Check for -5 V on IC11 pin 11 and R49 and R43. Check for about 3 V on VIDC IC 8 pin 12.
A low amplitude signal should be found on VIDC IC 8 pins 13, 14, 15 and 16. If not, change VIDC. These signals can be traced through the peripheral circuitry and out to 012 and 014. The signal amplitude at these points should be about 1.5 V peak to peak.

Check for short or open circuit on signals "SNDAK" and "SNDRO" on VIDC IC 8 pins 9 and 24.

Monitor Screen

If the display breaks up around its edges and spurious characters appear then investigate the system oscillator. Check IC 1 and X1.

Check DRAM using the test ROMs, — see Test ROMs.

With a full white screen, VIDC IC 8 pins 39, 40 and 41 should all have the same signal on them. If not, change the VIDC IC 8.

Trace each signal through the periphery circuitry and out to SK1 until the fault is found.

Unstable or scrolling display
The computer may have lost its configuration value for SYNC. Type at the keyboard:

*CON. SYNC 1 (RETURN)

press RESET and see if any change occurs. Check for CSYNC signal on SK1 pin 4. If not present, trace back through LK1, R10 and IC 9, finally changing VIDC IC 8.

Floppy disc drive
Make sure that the configuration items "STEP' and " FLOPPIES" are correctly set. Check that the disc drive ID selection switch is in the required position (usually 0). Swap the disc drive for a known good drive and cable. If this also fails, check the power supply connection for +12 V, +5 V and 0 V (see Upgrading).

Serial port

If a fault is reported but the test is passed, see the Serial Port Application Note in the Archimedes 440 Service Manual for possible explanations, noting that the 440/1 serial port is now based on the RS232 standard, and the patch (RS423 Drive version 1.24) is no longer required.
Check for -5 Von IC 6 pin 8 and R 13 to R 16. Check for the clock on IC 23 pins 6 and 7; change X2 if faulty. If OK, change ICs 5 and 6.

Printer

If the printer fails completely, check for a STROBE signal on SK 3 pin 1, trace back through R 42, 0 10 and R 68 to IC 43. Also check for shorts or open circuits on PACK and PBSY.
If the data printed is incorrect, check the continuity of the data lines into and out of IC 7, though R 33 to R 41

and onto SK 3.
If both the printer and the floppy disc drive fail,
change IC 43.

Keyboard and mouse

Check computer interface by swapping to a known good
keyboard and mouse. If failure still present, check
continuity of keyboard connector SK 12 and ensure that
+5 V can be found on pin 4 and 0 V on pin 3.

Check functionality of inverting buffers in IC 15, check
continuity through R 204 and R 208. Replace IOC IC
22.

Expansion cards

Check through System Failure, tracing all signals
through to the expansion card backplane. If
necessary, replace the expansion card backplane.

Appendices

Parts list

Items listed with part numbers are available from Acorn Computers Limited as spare parts.

Main PCB

	Part No.	Description	Qty	Component number
6	0283.022	RISC OS ROM 1 V2.0	1	IC16
7	0283.023	RISC OS ROM 2 V2.0	1	IC17
8	0283.024	RISC OS ROM 3 V2.0	1	IC18
9	0283.025	RISC OS ROM 4 V2.0	1	IC19
10				
11	0283.032	PAL (0760,021 TBP)	1	IC84
12				
13	2201.365	IC ARM (2UM PLSTC)	1	IC32
14	2201.375	IC MEMC 1A (PLSTC)	1	IC34
15	2201.367	IC VIDC 1A (PLSTC)	1	IC8
16	2201.368	IC IOC (PLSTC)	1	IC22
17				
18		RES ZERO R 0W25	4	R114, 115, 116, 117
19		RES 10R　　C/MF 5% 0W25	1	R103
20		RES 100R　　C/MF 5% 0W25	4	R156, 158, 204, 205
21		RES 1K　　C/MF 5% 0W25	5	R68, 128 , 134, 200 ,210
22		RES 10K　　C/MF 5% 0W25	11	R13-19,27,73,206,207
23				
24		RES 100K　　C/MF 5% 0W25	2	8129,193
25		RES 1K2　　C/MF 5% 0W25	5	R132, 135, 148, 149, 157
26				
27		RES 150R　　C/MF 5% 0W25	4	R1, 2, 28, 199
28		RES 1K5　　C/MF 5% 0W25	1	R31
29				
30		RES 180R　　C/MF 5% 0W25	2	R32, 155
31		RES 1K8　　C/MF 5% 0W25	2	542, 133
32				
33		RES 22R　　C/MF 5% 0W25	9	R33, 34, 35, 36, 37, 40, 41, 42
34				
35		RES 220R　　C/MF 5% 0W25	6	R6, 22, 24, 71, 194, 208
36		RES 2K2　　C/MF 5% 0W25	3	R38, 88, 89
37		RES 22K　　C/MF 5% 0W25	3	R12, 152, 209
38		RES 270R　　C/MF 5% 0W25	1	R29
39				
40				
41		RES 33R　　C/MF 5% 0W25	6	R20, 21, 53, 79, 150, 151
42		RES 330R　　C/MF 5% 0W25	2	R52, 154

	Part No.	Description	Qty	Component number
43		RES 3K9 C/MF 5% 0W25	1	R86
44		RES 33K C/MF 5% 0W25	7	R56, 57, 61, 62, 63, 111, 213
45		RES 390R C/MF 5% 0W25	1	R213
46		RES 47R C/MF 5% 0W25	1	R201
47		RES 470R C/MF 5% 0W25	2	R30, 82
48		RES 4K7 C/MF 5% 0W25	28	R4, 5, 23, 25, 64, 65, 66, 67, 118-124, 126, 127, 130, 137, 153, 159, 160. 196, 211, 212, 214, 215, 216
52				
53		RES 56R C/MF 5% 0W25	4	R59, 60, 77, 78
54				
55 94,		RES 68R C/MF 5% 0W25	62	R7 TO 11, 74, 75, 76, 80, 81, 83, 84, 90 TO
				104, 105, 106, 112, 113, 136, 138, 140, 142, 145, 146, 161 TO 192, 195, 203
65		RES 680R C/MF 5% 0W25	2	R48, 72
66				
67		RES 82R C/MF 5% 0W25	1	R47
68		RES 820R C/MF 5% 0W25	4	R85, 87, 197, 198
69				
70				
71		RES 43R2 MF 1% 0W25 E9	3	R26, 46, 51
72		RES 332R MF 1% 0W25 E9	3	R55, 69, 70
73		RES 1K00 MF 1% 0W25 E9	5	R107, 108, 109, 110, 202
74		RES 150K MF 1% 0W25 E9	8	R95 TO 102
75				
76		RES 100R MF 1% 0W25 E9	2	R45, 49
77				
78		RES NET 220/330R SIL 8P	1	RP2
79		RES NET 1K0 TF 10% 9P	1	RP1
80		RES NET 10K SIL 9P	2	RP3, 4
81				
82		CPCTR TANT 10U 10V 20%	15	C1, 3, 25, 48, 70, B1 - 10
83				
84		CPCTR CPLT 10N 30V 80%	1	C71
85		CPCTR CPLT 1N 30V 10%	3	C4, 5, 6
86		CPCTR CPO- 2N2 30V 10%	8	C7 TO 14
87		CPCTR CPLT 2N7 30V 10%	2	C19, 22
88				
89		CPCTR CPLT 12P30V 2%	3	C17, 18, 52
90				
91		CPCTR CPLT 22P 30V 2%	1	C16
92		CPCTR CPLT 33P 30V 2%	1	C50, 55

	Part No.	Description	Qty	Component number
93		CPCTR CPLT 47P 30V 2%	6	C20, 21, 26, 60,61,64
94		CPCTR CPLT 100P 30V 2%	5	C15, 23, 24, 33,34
95		CPCTR CPLT 330P 30V 2%	4	C35, 36, 39, 40
96				
97		CPCTR ALEC 47U 10V AX	5	C65 TO 69
98		CPCTR ALEC 471J 16V RAD	3	C28, 31, 32
99		CPCTR ALEC 220U 16V RAD	5	C47, 72, 73, 76,77
100		CPCTR ALEC 470U 10y RAD	1	C51
101		CPCTR ALEC 10U 16V RAD	2	C27, 49
102		CPCTR ALEC 100U 25V RAD	3	C53, 74, 75
103				
104		CPCTR CER 47N 30V 80%	1	C42
105				
106		CPCTR MPSTR 1 N0 63V 10%	1	C62
107		CPCTR MPSTR 1U0 50V 10%	1	C59
108		CPCTR MPSTR 100N 50V 10%	1	C58
109		CPCTR MPSTR 22N 50V 10%	2	C29, 30
110		CPCTR MPSTR 33N 50V 20%	2	C56, 57
111		CPCTR MPSTR 68N 50V 10%	1	C63
112				
113				
114		CPCTR DCPLR 33/47N AX 12V	53	A1-53
115		CPCTR DCPLR 100N AX 25V	32	K1-32
t21	0701.772	IC 1772 FDC 28/0.6"	1	IC42
122				
123	0704.118	IC 514256 DRAM 256Kx4	8	IC48,.50,52, 54,56,58, 60, 62
125	0706.552	IC 65C51		11C23
126				
127	0708.455	IC 8455 DATA SYNC 20/0.3'	1	IC85
128	0708.583	IC PCF8583		11C29
129				
130	0709.463	I.C. 63463 HDC 48/0.6"	1	IC65
131				
132				
133	0721.198	I.C. DLY 50nS 5T 14/0.3'	1	IC46
135				
136	0732.630	I.C. 26LS30 RS422/423 DRVR	1	IC6
137	0732.631	I.C. 26LS31 RS422/423 DRVR	1	IC28
138	0732.632	I.C. 26LS32 RS422/423 RCVR	2	IC5,44
139				
140	0740.006	I.C. 7406 TTL 14/0.3"	2	IC35,39

	Part No.	Description	Qty	Component number
	0740.016	I.C. 7416 TTL 14/0.3"		OPTION
143	0740.038	I.C. 7438 TTL 14/0.3"	2	IC9,40
144	0741.000	I.C. 74S00 TTL 14/0.3'	1	IC3
145				
146				
147	0742.374	I.C. 74LS374 TTL 20/0.3"	1	IC7
148				
149	0744.138	I.C. 74ALS138 TTL 16/0.3"	1	IC64
150				
151	0745.074	I.C. 74AS74	1	IC2
152				
153	0747.000	I.C. 74HC00 CMOS 14/0.3"	1	IC41
154	0747.004	I.0 74HC04 CMOS 14/0.3"	1	IC66
155	0747.014	I.C. 74HC14 CMOS 14/0.3'	1	IC15
156	0747.051	I.C. 74HC51 CMOS 14/0.3"	1	IC47
157	0747.075	I.C. 74HC75 CMOS 14/0.3"	1	IC83
158	0747.138	I.C. 74HC138 CMOS 16/0.3"	1	IC37
159	0747.573	I.C. 74HC573 CMOS 20/0.3"	5	IC14, 21, 24, 30, 31
160	0747.574	I.C. 74HC574 CMOS	1	IC43
161				
162	0748.166	I.C. 74F166 TTL 16/0 3'	1	IC4
163				
164				
165	0749.014	I.C. 74HCT14 CMOS 14/0.3"	2	IC10, 38
166	0749.153	I.C. 74HCT153 CMOS 16/0.3"	1	IC45
167	0749.543	I.C. 74HCT573 CMOS 20/0.3"	2	IC13,20
168				
169	0750.002	I.C. 74AC02 CMOS 24/0.3"	1	IC33
170	0750.004	I.C. 74AC04 CMOS 14/0.3"	1	ICI
171	0750.011	I.C. 74AC11 CMOS 14/0.3'	1	IC27
172	0750.245	I.C. 74AC245 CMOS 20/0.3"	2	IC25,26
173				
174	0751.574	I.C. 74ACT574 CMOS	1	IC36
175				
176	0770.324	I.C. LM324 QUAD OP AMP	1	IC11
177	0770.386	I.C. LM368 AUDIO AMP	1	IC12
178				
179				
180	0780.241	TRANS BC239 NPN	6	03, 10, 12, 14, 16, 17
181	0783.905	TRANS 2N3904 NPN	1	01
182	0783.907	TRANS 2N3906 NPN	9	02, 4, 5, 6, 8, 9, 11, 13, 15

	Part No.	Description	Qty	Component number
183	0780.496	TRANS BF496 NPN	1	07
184				
185	0794.005	DIODE SI IN4005 600V 1A	2	D15, 16
186	0794.148	DIODE SI IN4148	14	D1 - D14
187				
188	0800.913	CONR 5W SKT DIN RA PCB	1	SK4
189	0800.050	CONR 2W WAFR 0.1' ST PCB	7	PL4 (X2), LK2, 5, 6, 8 (X2)
190	0800.051	CONR 3W WAFR 0.1' ST PCB	7	LK1, 7 (X2), 12, 13, 14, 15
191	0800.052	CONR 5W WAFR 0.1' ST PCB	2	PL2 (X2)
192	0800.070	CONR 2W SHUNT 0.1"	13	PL2 (X2), 4 (X2), LK1, 7 (X2)
				8 (X2), 12, 13, 14, 15
194	0800.120	SKT I.C. 20/0.3" NORM	1	IC84
195	0800.132	SKT I.C. 32/0.6' SUPA	4	IC16, 17, 18, 19
196	0800.148	SKT I.C. 48/0.6" NORM	1	IC65
197	0800.169	SKT I.C. 68P PLCC	3	IC8, 22, 34
198	0800.185	SKT I.C. 84P PLCC	1	IC32
199	0800.195	SKT I.C. 20W ZIP SUPA	24	IC49, 51, 53, 55, 57, 59, 61,
				63, 67 - 82
201	0800.203	FSTN TAB 6.3MM x 0.8MM ST PCB	5	PL5, 6, 7, 11 (POWER), GND
202				
203	0800.408	CONR 96W SKT ST ABC PCB	1	SK7 (EXPANSION)
204	0800.458	CONR 2W WAFR 0.1" ST LK	1	PL10 (BATTERY)
205	0800.469	CONR 6W WAFR 0.1" ST LK	1	(FRONT PANEL)
206	0800.481	CONR 5W SKT HSNG 0.1" PBC	1	SK6 (NET MODULE)
207	0800.484	CONR 17W SKT HSNG 1' PCB	1	SK5 (NET MODULE)
208				
209	0800.642	CONR 3W 3.5MM RA PCB JSKT	1	SK2 (AUDIO)
210	0800.853	CONR 2W WAFR 0.156'''ST LK	1	PL12 (FAN)
211	0800.919	SKT 6W MINDIN RA PCB RFI	1	SK12 (KEYBOARD)
212				
213	0803.100	CONR 20W B03 IDC LP ST	2	SK8, 10 (HARD DISC)
214	0803.102	CONR 34W BOX IDC LP ST	2	SK9, 11 (HARD & FLOPPY)
215				
216	0815.305	FUSE 2A LBC AX PCB	1	FS1
217				
218	0820.019	XTAL 1.8432 MHZ HC 18	1	X2
219	0820.100	XTAL 10.00MHZ HC 18	1	X4
220	0821.327	XTAL 32.768KHZ CC 0.05"	1	X3
221	0820.961	XTAL 96MHZ 5 O/T HC 18	1	X1
222				

	Part No.	Description	Qty	Component number
223	0860.005	COIL RF 33uH AX 0=45	1	L10
224	0860.012	CHOKE RF 2u2H AX 0=45	1	L9
225	0860.014	CHOKE RF OU/8H	1	L8
226	0860.015	CHOKE RF FE BEAD	13	L1 - 7, 12 - 17
236	0800.291	CONR 9W PLG RA PCB LK+LK	1	PL1 (SERIAL)
.241	0800.292	CONR 9W SKT RA PCB LK+LK	1	SK1 (VIDEO)
243	0800.293	CONR 25W SKT RA PCB LK+LK	1	SK3 (PRINTER)

400/1 series Backplane Assembly

	Part No.	Description	Qty	Component number
8	0283.041	IC PAL (0760,003 TBP)	1	
15		CPCTR 220U ALEC 16V 20%	2	
16				
17		CPCTR DCPLR 33/47N 0.?	2	
22		IC 74HC139 CMOS 16/0.3"	1	
27		FSTN TAB 6.3 X 0.8 ST PCB	3	
31		CONR 64W SKT ST AC PCB SH	3	
34		CONR 96W SKT ST ABC PCB	1	
35		CONR 96W PLG RA ABC PCB	1	
38		RES 10K C/MF 5% 0W25	5	

410/1 Lower Case Assembly

	Part No.	Description	Qty	Component number
6	0176.005	DISC DRIVE CABLE ASSY		
7	0176.009'	BATTERY HOLDER ASSY		
8	0176.010	FAN ASSEMBLY	1	
9				
10	0276.004_	REAR MOULDING	1	
11	0276.007*	BOTTOM METALWORK	1	
12	0276.010	L.H.BUSBAR	1	
13	0276.011	R.H.BUSBAR	1	
14	0276.012	BLANKING PANEL	2	
15				
16	0276.026	BACKPLANE SUPPORT BAR	1	
17	0276.033	FAN FILTER CLAMP	1	
18	0276.034	FAN FILTER	1	
19	0276.037	PCB SIDE SLIDE GUIDE	2	
29	0183.002	55W 240V PSU	1	
30	0183.004	3.5 X 1" 1MB FLOPPY DISC DRIVE	1	
31	0183.007	VIDEO BNC CABLE ASSY	1	
32	0183.009	PCB EARTH CABLE ASSY	1	
33	0183.040	SYNC BNC CABLE ASSY	1	
34	0183.040	4-WAY BACKPLANE	1	
39	0283.013	1' FLOPPY DRIVE BRACKET (RH)	1	
40	0283.016'	DRIVE SADDLE	1	
41				
42		CABLE TIE	1	
43		SCREW, M2.5 X 10 PAN HO POSI	6	
44		SCREW M3 X 6 PAN HD POSI	12	
45		SCREW M4 X 35 PAN HD POSI	4	
46				
47		SCREW NO 4 X 1/4" PAN HD POSI	2	
48				
49		SCREW N04 X 3/8" PLS PAN POS	6	
50				
51		NUT M4 STL FULL	7	
52	0882.949	SPIRE CLIP N06	3	
53		WASHER M2.5 PLN STL	6	
54		WASHER M4 SPRF IT STL	1	
55				
56		WASHER M3 SPRF IT STL	6	
57				

	Part No.	Description	Qty	Component number
58				
59		RIVET POP 3.2D DOR D'	4	
60		RIVET POP 3.2D X 4.4T MAT	2	
61	0884.065	SPACER NYLON 8MM PCB	1	
65		SCREW NO 6 X 3/8" PAN POSI	3	
71	0887.012	SPACER PLASTIC HEX 19.05MM	3	
77	0890.009	FOOT, POP-FIT 4MMH	4	

420/1 & 440/1 Lower Case Assembly

	Part No.	Description	Qty	Component number
6	0176.005	DISC DRIVE CABLE ASSY		
7	0176.009*	BATTERY HOLDER ASSY		
8	0176.010	FAN ASSEMBLY	1	
9				
10	0276.004_	REAR MOULDING	1	
11	0276.007*	BOTTOM METALWORK	1	
12	0276.010	L.H.BUSBAR	1	
13	0276.011	R.H. BUSBAR	1	
14	0276.012	BLANKING PANEL	2	
15				
16	0276.026	BACKPLANE SUPPORT BAR	1	
17	0276.033	FAN FILTER CLAMP	1	
18	0276.034	FAN FILTER	1	
19	0276.037	PCB SIDE SLIDE GUIDE	2	
24	0177.002	HDISC CABLE ASSY 34W	1	
25	0177.003	HDISC CABLE ASSY 20W	1	
29	0183.002	55W 240V PSU	1	
30	0183.004	3.5 X 1' 1MB FLOPPY DISC DRIVE	1	
31	0183.007	VIDEO BNC CABLE ASSY	1	
32	0183.009	PCB EARTH CABLE ASSY	1	
33	0183.040	SYNC BNC CABLE ASSY	1	
34	0183.040	4-WAY BACKPLANE	1	
38	0283.012	HARD DISC BRACKET	1	
39	0283.013	1" FLOPPY DRIVE BRACKET (RH)	1	
40	0283.016'	DRIVE SADDLE	1	
41				
43		SCREW, M2.5 X 10 PAN HD POSI	6	
44		SCREW M3 X6 PAN HD POSI	12	
45		SCREW M4 X 35 PAN HD POSI	4	
46				
47		SCREW NO 4 X ¼" PAN HD POSI	2	
48				

	Part No.	Description	Qty	Component number
49		SCREW NO4 X 3/8" PLS PAN POS	6	
50				
51		NUT M4 STL FULL	7	
52	0882.949	SPIRE CLIP NO 6	3	
53		WASHER M2.5 PLN STL	6	
54		WASHER M4 SPRF IT STL	1	
55		WASHER M3.5 SPRF IT STL	4	
56		WASHER M3 SPRF IT STL	6	
57				
58				
59		RIVET POP 3.2D DOR 'D'	4	
60		RIVET POP 3.2D X 4.4T MAT	2	
61	0884.065	SPACER NYLON 8MM PCB	1	
63		SCREW 6 -32UNC X 1/4" PAN POSI	4	
65		SCREW NO 6 X 3M" PAN POSI	3	
71	0887.012	SPACER PLASTIC HEX 19.05 MM	3	
77	0890.009	FOOT, POP-FIT 4MMH	4	
80	0177.001	20 MB H DISC DRIVE 420/1	1	
	0912.012	50 MB H DISC DRIVE 440/1 8 R140	1	

Final Assembly Items

	Part No.	Description	Qty	Component number
5	0276.002_	FRONT MOULDING	1	
6	0276.006*	TOP METALWORK	1	
7				
8	0276.017	BASE LABEL	1	
9				
10	0276.038	'NO ECONET' LABEL	1	
14		SPEAKER/LED ASSEMBLY	1	
15				
16	0283.015	410/1 FRONT LANEL	1	
	0283.215	420/1 FRONT LABEL	1	
	0283.315	440/1 FRONT LABEL	1	
22	0283.003	1" FRONT SUB-MOULDING	1	
26		BATT. ALKALINE 1V5 2AH 'AA'	2	
31		SCREW M3 X 6 PAN HD POSI	5	
32				
33		SCREW NO 6 X 3/8' PAN POSI	5	
34		SCREW NO 6 X 1/2" PAN POSI	2	
35				
36	0882.949	SPIRE CLIP NO 6	5	
		• Supplied as a set only, comprising:		
	0276.006	TOP METALWORK	1	
	0276.007	BOTTOM METALWORK	1	
	0176.009	BATTERY HOLDER ASSY	1	
	0283.016	DRIVE SADDLE	1	
		_ Supplied as a set only, comprising:		
	0276.004	REAR MOULDING	1	
	0276.002	FRONT MOULDING	1	

Miscellaneous items

	Part No.	Description	Qty	Component number
	0176.003	MOUSE	1	
	0283.109	DISC 1, 410/1	1	
	0283.020	DISC 2, 410/1	1	
	0283.027	UTILS DISC 1	1	
	0277.019	CARTON	1	
	0277.029**	SIDE CHEEK, LH	1	
	0277.030**	SIDE CHEEK, RH	1	
	0277.031	KEYBOARD END CHEEKS	2	
	0277.033	ACCESSORIES TRAY	1	
	0483.000	WELCOME GUIDE	1	
	0483.001	BASIC GUIDE	1	
	0483.002	USER GUIDE	1	
	0870.353	POWER LEAD 13A/IEC	1	
		** Supplied as a set only, comprising		
	0277.029	SIDE CHEEK, LH	1	
	0277.030	SIDE CHEEK, RH	1	

Keyboard Assembly

	Part No.	Description	Qty	Component number
	0276.101	CASE LOWER *		
	0276.102	CASE UPPER **		
	0177.100	KEYBOARD PCB ASSY		
	0276.106	NAME LABEL		
	0277.107	LOGO LABEL		
	0276.103	LEG MOULDING		
	0276.104	WINDOW MOULDING		
	0276.105	FRICTION PAD (FOR ABOVE)		
	0276.108	RESET SWITCH CAP MOULDING		
	0483.029	BASIC KEY CARD		
	0890.011	RUBBER FOOT		
	0999.784	CURLY CABLE		

Upgrading

Introduction

The Archimedes 400/1 series and R140 computers may be upgraded with all the expansion cards already made available by Acorn for the Archimedes 300 and 440 series. Notes on these upgrades are included in the Archimedes 300 and 440 Service Manuals.

New upgrades available for the 400/1 series and R140 computers includes SCSI interface, Ethernet and Floating Point Co-processor expansion cards.

New expansion card installation instructions included in this manual cover the fitment of all expansion cards, while specific installation instructions for the Floating Point Co-processor provides the additional

information required for this card. Also included are new installation instructions for a second floppy disc drive kit specific to the 400/1 series.

Information on MEMCI1A and RAM upgrades are given in Technical Service Bulletins numbers 1/89 and 2/89 respectively, also included.

Expansion card installation instructions

(for use with Archimedes and R140 computers)

To install an expansion card in the computer you will require an adapter called a `backplane'. Backplanes are fitted as standard equipment on Archimedes 400 series and R140 computers, and are are available separately for the Archimedes 300 series. Full instructions for installing backplanes are supplied with them.

In order to fit the expansion card you will have to remove the lid of the computer unit and one of the blanking plates at the rear of the machine. The only tools you will require for this are No. 1 and No. 2 Pozidriv screwdrivers.

If you do not feel confident about carrying out this installation, take the expansion card and your Archimedes computer to your supplier who will fit the card for you. A charge may be levied by the supplier for installing the expansion card; such a charge shall be entirely at the discretion of the supplier concerned.

Disassembly

1 Switch off the computer at the rear and disconnect it from the mains supply by unplugging the power supply cable. Unplug any peripherals that are attached and remove them from the computer completely.

2 Locate the screws holding the top case in place (see Fig. 1 below). Remove the three screws at the top rear of the unit, then remove the single screw located on each side of the unit, towards the front.

TOP COVER
FIX

TOP COVER FIX
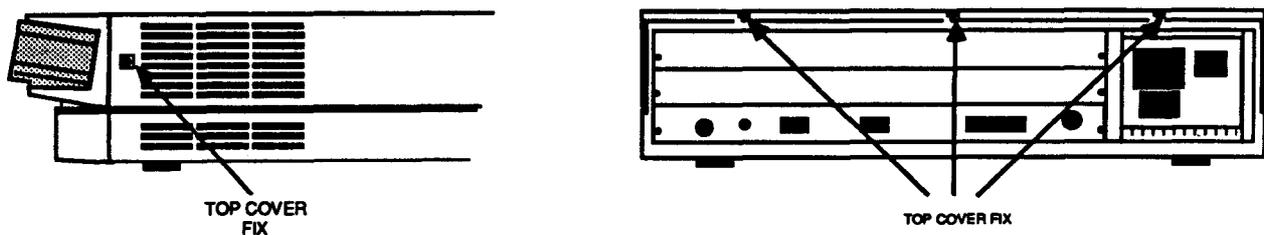
Fig.1: The screws holding the top case.

3 Once you have removed the three rear screws and the two side screws, slide the lid of the unit to the rear of the machine, then remove it completely. Slightly spring the sides of the lid outwards, if necessary, to make it easier to slide.

4 Check that a backplane is fitted to the computer. The backplane consists of a small printed circuit board mounted vertically on the main PCB. If the backplane is not fitted, then you will have to purchase one and install it, according to the instructions which are supplied with the backplane, before you can continue with

the installation of the expansion card.

The standard backplane fitted to the Archimedes 400 series and the R140 can take up to four single-width or two double-width expansion cards The optional backplane fitted to the Archimedes 300 series can take up to two single-width or two double-width expansion cards.

5 If the backplane is fitted, but has no expansion card socket free, you will have to remove one of the expansion cards in order to install a new one.

6 The backplane has upper and lower expansion card slots. These correspond to the two full-width blanking plates fitted to an unexpanded machine. Each blanking plate is held in place by screws, one at each end. Choose the expansion card slot you are going to use, and remove the corresponding blanking plate by unscrewing the two screws holding the plate in position.

You can now fit the expansion card.

Fitting the expansion card

WARNING: Some components on expansion cards can be damaged by static electricity. Avoid touching chips on the card.

Before fitting the expansion card, examine it to see whether it is a full-width or a half-width card.

I A full-width expansion card has a plate at the rear which extends the full width of the machine. If the plate on the rear of your expansion card does not extend the full width of the machine, then you are supplied with a blanking plate along with a T-piece and two screws. Use these to make the expansion card up to the full width of the machine.

Once you have made the expansion card backplate up to the correct width, you can install it into the computer. The diagram below shows an expansion card fitting into one of the positions in the computer unit:
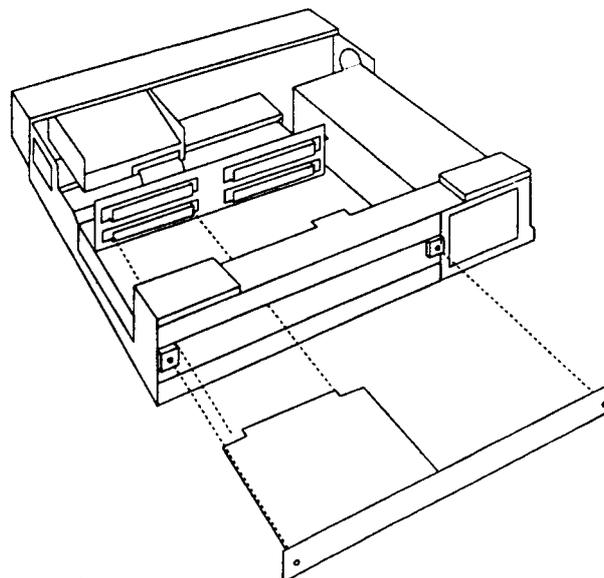
Fig.2 : Fitting an expansion card into the lower slot

2 To fit the expansion card, support the backplane firmly with one hand and push the connector on the card into one of the sockets on the backplane. The connector should be securely seated, i.e. the rear plate of the expansion card should be flush with the rear of the computer case. It is important that you offer the expansion card up to the backplane at right angles to it and that you align the connectors; otherwise, you may bend the pins or break or disconnect the backplane itself. It does not require great force to install the expansion card correctly. If the expansion card will not seat easily, remove the expansion card and try again.

When you have fitted an expansion card to your computer, the backplane should be in a vertical position, assuming that the expansion card is fully inserted and screwed into the rear of the computer.

For some combinations of machines and expansion cards, however, the top of the backplane may appear to 'lean' towards the front of the machine.

If this is the case, you must insert the two spacers found in this package. Each spacer should be inserted between the internal face of the expansion card backplate and the metal clips on the rear plastic moulding of the machine, so that the fixing screws pass through both the backplate and the spacers (see Fig.3). This should result in the external face of the expansion card backplate panel being flush with the rear plastic moulding.
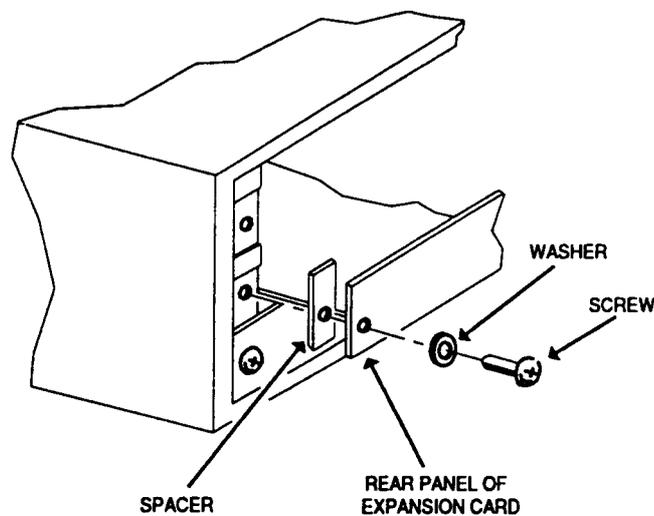
Fig.3 : Fitting spacers to the expansion card backplate

When you have done this, you may need to straighten the backplane, to ensure that the connectors are correctly mated. To do this, take the following steps:

1 Slacken off the two screws fixing the backplane support metalwork to the base metalwork and power supply.

2 Holding the expansion card stationary, ease the backplane towards a vertical position until the faces of the interlocking connectors on the expansion card and backplane are touching.

3   Retighten the two screws slackened earlier.

If you do not require the two spacers, simply secure the expansion card to the rear of the computer case by inserting a screw at each end of the expansion card backplate.

Reassembly

1   Once the expansion card has been correctly installed, slide the top case of the computer unit on from the rear (make sure you slide it on the right way round - the three notches for the fixing screws go at the back of the computer).

2   Replace the three screws at the rear of the unit and tighten them up. See Fig.!

3   Finally, replace the two screws, one on each side of the case. Sec Fig.1

The expansion card is now installed. See the documentation accompanying the particular expansion card you have fitted for information on the use of the card.

WE32206 Floating Point Co-processor Installation and operation guide

(for use with Acorn R140 and Archimedes 440 and 400/1 series computers)

Introduction

The WE32206 floating point co-processor is a high-speed hardware processor for floating point instructions. Compiled programs which currently use the software floating point emulator will be able to use the co-processor once it is installed.

The floating point co-processor gives an execution speed increase of up to eight times that provided by the floating point emulator. The exact speed increase will vary, depending upon the instruction set mix of the code.

The operation of the co-processor complies with IEEE Standard 754-1985, and directly supports single (32 bit), double (64 bit) and double-extended (80 bit) precision ADD, SUBTRACT, MULTIPLY, DIVIDE, REMAINDER, SQUARE ROOT, COMPARE, SIN, COS and ATAN operations. The software floating point emulator (FP Emulator) compounds the remaining operations, and also provides range reduction for trigonometric operations. Refer to the Programmer's Reference Manual for more details.

The RISC OS support software for the co-processor is supplied on the accompanying floppy disc. The latest version of FP Emulator and a simple hardware test program are also provided.

RISC DC support software for the co-processor is included as standard with the RISC DC operating system.

Installing the hardware

Important notes:
- This co-processor card cannot be fitted to Archimedes 305 and 310 computers, as these models do not have a co-processor interface.
- If you have an Archimedes 440, you must return your computer to your supplier for an internal modification before fitting the co-processor card.
- If you have an Acorn R140, Archimedes 410/1, 420/1 or 440/1 computer (or 440 modified as mentioned above), install the co-processor in accordance with the following instructions:

Please take care while fitting this card. Some components on the card can be damaged by static electricity. Avoid touching the chips on the card and the edge connector. Any damage caused while fitting this card is unlikely to be covered by the guarantee.

To fit the co-processor card you will have to remove the cover of the computer unit and one of the blanking plates at the rear of the machine. The tools you will require for this are No. 1 and No. 2 Pozidriv screwdrivers.

Please read through the following instructions carefully before you start. If you do not feel confident about carrying out this installation, take the co-processor card and your computer to your supplier who will fit the card for you. A charge may be levied by the supplier for installing the card; such a charge is entirely at the discretion of the supplier concerned.

Removing the cover of the computer

1   if you are using the RISC iX operating system, you must first follow the RISC iX shutdown procedure to halt the operating system.

2   Switch off the computer at the rear and unplug the power cable from the mains supply. Disconnect the keyboard, monitor and any peripherals and move them out of the way.

3   Locate the screws holding the cover in place (see Figure 1). Remove the three screws at the top rear of the unit, then remove the single screw located on each side of the unit, towards the front.

4   Once you have removed the three rear screws and the two side screws, slide the cover of the unit to the rear of the machine, then remove it completely. Spring the sides of the cover slightly outwards, if necessary, to make it easier to slide.

TOP COVER
FIX

TOP COVER FIX
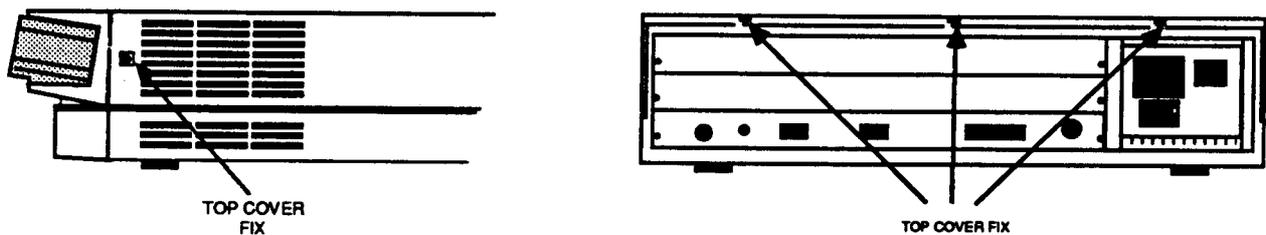
Figure 1: Removing the screws holding the top case.

5   The backplane has two upper and two lower expansion card slots. Co-processor cards can only operate in expansion card slot number two. Looking from the back, this is the lower left-hand slot (labelled 'podule 2'). If there is an expansion card already in this slot, remove the card. When you have fitted the co-processor you can replace the card in an alternative slot. Other expansion card types can be placed in any other available slot.

6   If necessary, remove the blanking plate for slot number two by unscrewing the two screws, one located at each end of the plate.

You can now fit the co-processor card.

Fitting the co-processor card

1   As the backplate on the co-processor card does not extend the full width of the machine, you are supplied with a half-width blanking plate along with a T-piece and two screws. If you do not have another expansion card in the slot next to the coprocessor, make the backplate of the co-processor card up to the full width of the machine using the half-width blanking plate.

Once you have made the backplate up to the correct width, you can install it into the computer.
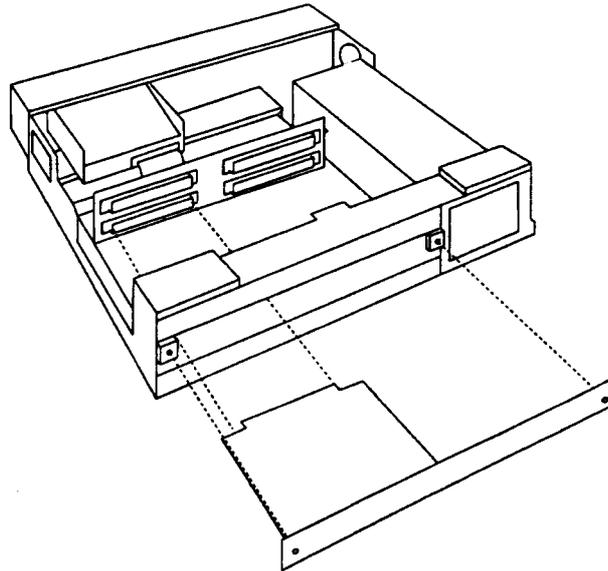
Figure 2: Fitting a co-processor card

2   To fit the co-processor card, support the backplane firmly with one hand and push the connector on the card into the co-processor socket (labelled podule 2) on the backplane (see Figure 2). The connector should be securely seated, i.e. the backplate of the card should be flush with the rear of the computer case. It is important that you offer the card up to the backplane at right angles to it and that you align the connectors; otherwise, you may bend the pins or break or disconnect the backplane itself. It does not require great force to install the co-processor card correctly. If the card does not fit into the socket correctly, remove it and try again.

3   When you have fitted an expansion card to your computer, the backplane should generally be in a vertical position, assuming that the card is fully inserted and screwed into the rear of the computer.

For some combinations of machines and cards, however, the top of the backplane may appear to 'lean' towards the front of the machine. If this is the case, you should insert the two spacers found in this package. Each spacer should be inserted between the internal face of the expansion card backplate and the metal clips on the rear plastic moulding of the machine, so that the fixing screws pass through both the backplate and the spacers (see Figure 3). This should result in the external face of the expansion card backplate panel being flush with the rear plastic moulding.
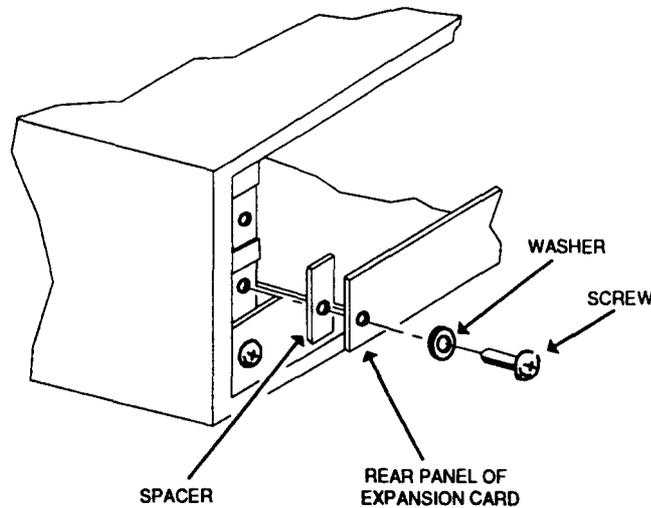
Figure 3: Fitting spacers to the expansion card backplate

Straightening the backplane

When you have fitted the co-processor card, you may need to straighten the backplane to ensure that the connectors are correctly mated. To do this, take the following steps:

1   Slacken off the two screws fixing the backplane support metalwork to the base metalwork and power supply.

2   Supporting the expansion card, ease the backplane towards a vertical position until the faces of the interlocking connectors on the expansion card and backplane are touching.

3   Tighten the two backplane support screws. If you do not require the two spacers, secure the card to the rear of the computer case by inserting a screw at each end of the card backplate.

Reassembling the computer

1   Once the card has been correctly installed, slide the cover of the computer unit on from the rear (make sure you slide it on the right way round – the lip for the three fixing screws should be at the back of the computer).

2   Replace the three screws at the rear of the unit and tighten them up. See Figure 1.

3   Finally, replace the two screws, one on each side of the case. See Figure 1.

The co-processor card is now installed and you are ready to install the software.

Installing the RISC OS software support code

There are two relocatable modules supplied on the support disc, called FPEmulator and FP280. There is also a simple test program called FPTest. The FPEmulator file is a replacement module that supports both hardware-assisted and software-only floating point arithmetic (it replaces the existing FPEmulator file). The FP280 file is the latest version of the original module that provides software-only floating point support; it is included for reference only.

This new version of the FPEmulator module will execute floating point instructions with or without the floating point co-processor being present. There should be no effective difference in operation, other than speed of execution for floating point instructions. However there may be slight variations in accuracy between the hardware co-processor and the software emulator when enumerating certain trigonometric operations to extended precision accuracy. Intermediate calculations may use extended precision when evaluating complicated expressions in compiled languages and this too may produce variations in accuracy, even in calculations where the final product is expressed in single precision.

Loading the floating point module

Before the co-processor board can be used, the combined floating point emulator module and co-processor support code has to be loaded and initialised. From the desktop, you can load and initialise the module by double-clicking on the module filename or file icon. Similarly you can load and initialise the module from the command line by typing, for example:

```
*RMLoad FPEmulator
```

Users should copy the FPEmulator module into the !System.Modules directory, replacing the old FPEmulator. This will enable RISC OS applications automatically to load the correct FPEmulator module on startup.

Modifying a !Boot file

1   To load and initialise the floating point module each time the computer is switched on, a ! Boot file has to be created or modified. The !Boot file is a special file in your root directory that can be configured to run at every power on, reset or Ctrl-Break.

To toad the FPEmulator module you should add the following command line to your !Boot file:

```
*RMEnsure FPEmulator 3.20 RMLoad System:Modules.FPEmulator
```

You can also add this line to any application !Run files of your own. Do not explicitly RMLoad the module, because future versions of RISC OS are likely to incorporate this (or a later) version of the FPEmulator module.

2   If you want to enter the desktop, always make sure that the last command in your !Boot file is

```
*Desktop
```

3   To make the !Boot file run automatically at power on, make its filetype OBEY (refer to the *SetType command in the User Guide), and type:

```
*Configure Boot
*Opt 4,2
```

4   You can now obey the !Boot file by pressing Ctrl-Break.

The FP280 emulator file

The FP280 emulator file is the latest version of the software-only floating point emulator and is provided so that a direct performance comparison between hardware-assisted and software-only floating point operation can be made. It also has the module name FPEmulator (not to be confused with the filename) so that RMLoading it will mean that only one version of the floating point world will exist and be active at any one time. It is not necessary to remove the co-processor card — simply RMLoading the file FP280 will disable the hardware and execute all floating point instructions by software emulation alone, and reloading the FPEmulator file will reactivate the hardware co-processor.

Possible problem areas

Many application programs, originally written to run under the Arthur operating system, have boot sequences and/or earlier copies of the FPEmulator module (which do not support the hardware co-processor) 'built into' their discs.

The RISC OS approach of providing common resources in a !System application directory is by far the tidiest way of resolving this problem, but if you wish to keep such application discs operating exactly as before, then you will have to replace the floating point emulator file (usually called FPEmulator or FPE) with the FPEmulator file from the support disc supplied with the co-processor.

Also be aware that versions of the software-only emulator, prior to version 2.6, do **not** disable the hardware, which could give rise to a most undesirable clash in operation.

Checking the co-processor

Included on the support disc is a program which performs a limited series of tests on the co-processor. To run it, simply type `*FPTest`, or double-click on the FPTest icon from the desktop. Note that the program requires a minimum of 776k of RAM — 1Mb machine owners will need to quit the desktop and reduce configured RAM allocations to small or zero settings, while 420/1, 440 and 440/1 desktop users will need to drag the NEXT RAM allocation beyond 776k, or quit the desktop, before running.

If the co-processor is running correctly, the test program should display:

```
Floating Point tests completed
```

If the test fails, check that enough RAM space has been allocated (a 'stack overflow' error is a symptom of insufficient space). Check also that the installation has been carried out correctly. If problems persist, contact your supplier.

After running the test, hold down Ctrl and press the RESET button to clear the computer.

RISC *i*X software support code installation

There is no separate RISC *i*X software to install. After installing the co-processor card, boot RISC *i*X and you should see a start-up message confirming the existence of the co-processor.

Second floppy disc drive installation instructions

(For use with Archimedes 300 and 400/1 series computers)

These instructions describe how to install a second floppy disc drive in Archimedes 300 and 400/1 computer systems. Note that different drive units are fitted to 300 and 400/1 series machines — check that you have the right kit for your computer before proceeding.

In order to fit the upgrade, you will have to remove the cover of the computer unit. The only tools you will require are a No. 1 Pozidriv screwdriver and a small flat-bladed `electrical' screwdriver.

Please read through the following instructions carefully before you start. If you do not feel confident about carrying out this installation, take this upgrade and your Archimedes computer to your supplier who will fit it for you. A charge may be levied by the supplier for installing the upgrade; such a charge shall be entirely at the discretion of the supplier concerned.

Please take care while fitting this upgrade — the disc drive unit and cable assembly are delicate. Any damage caused while fitting this upgrade is unlikely to be covered by the guarantee.

Parts list

In the upgrade package you should have:

• One 3.5" Disc Drive
• One dual disc drive cable assembly
• One drive bracket
• One dual disc drive sub-moulding assembly
• Model number labels for the front panel
• Six M3 x 6 mm pan head screws and two No.4 x 1/4" pan head screws (or four M3 x 6mm pan head screws and two No.4 x 1/4" pan head screws)
• Serial number label

Disassembly

1   Switch off the computer at the rear and unplug the power supply cable from the mains socket. Disconnect the monitor and any peripherals which may be attached and remove them from the computer completely.

2   Locate the screws holding the top case in place (see Fig. 1 overleaf). Remove the three screws at the top rear of the unit, then remove the single screw located on each side of the unit, towards the front.
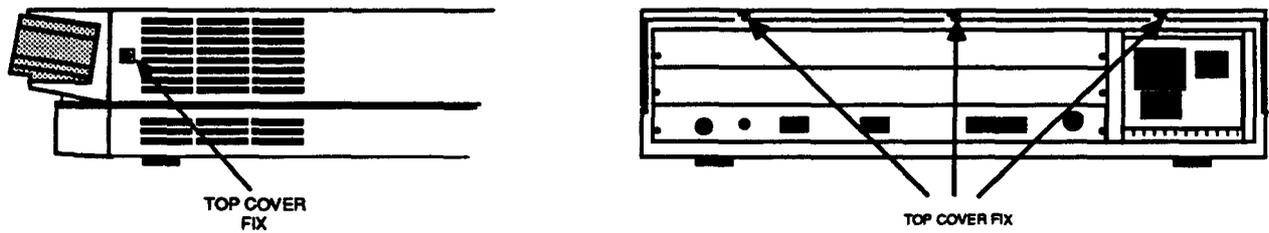
Fig.1: The screws holding the top case.

3   Once you have removed the three rear screws and the two side screws, slide the cover of the unit to the rear of the machine, then remove it completely. Slightly spring the sides of the cover outwards, if necessary, to make it easier to slide.

Fitting the upgrade

Fit the second floppy disc drive (drive 1) alongside the original drive (drive 0) on the disc drive support bracket, as follows:

1   Remove the two screws securing the front moulding assembly at each side. Stand the unit on one side and remove the three screws securing the front moulding assembly underneath the computer (see Fig. 2).

2   Stand the unit back on its feet and unplug the LED/speaker connector PL9 from the main board (see Fig. 5). If a backplane is fitted, remove any expansion cards and lift the backplane out of the way, without removing the wires connected to the backplane. Grasp the front moulding assembly at each end and use a straight, steady pull to withdraw it from the front of the unit.
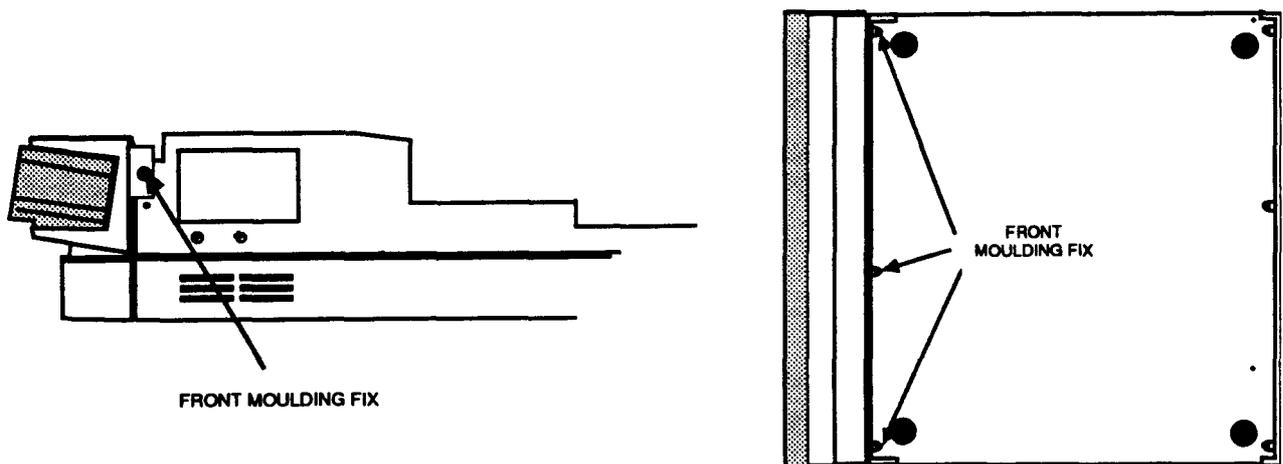
Fig.2: Removing the front moulding assembly

3   Unplug and remove the ribbon-type data cable which connects SK11 on the main printed circuit board to the connector on the rear of the original disc drive 0. Plug the centre connector on the new dual drive cable assembly to drive 0 and the end connector to SK11 (see Fig. 3).
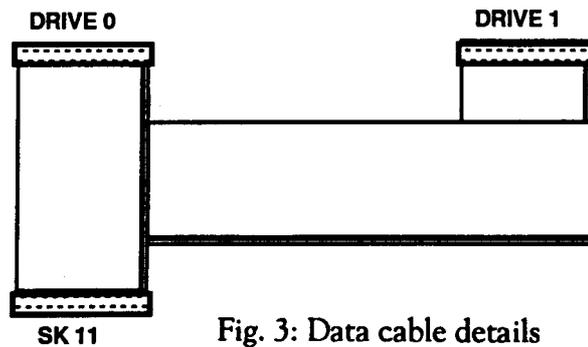
Fig. 3: Data cable details

| 4 (300 series only) | The new disc drive comes with a front fascia panel attached. This fascia is fitted to protect the unit in transit and is not required when the drive is installed in an Archimedes system. The fascia is held in position by two clips, one on each side of the drive. These should be levered carefully out of position using a small screwdriver and the fascia removed. Take care not to dislodge the drive eject button while removing the fascia. |

5   Before fitting the new drive, it must be configured as drive 1. To do this, set the small slide switch on the drive to position 1 (see Fig. 4 below). The location of the slide switch will depend on the type of drive supplied with your particular kit —there are two possibilities:

TYPE A   TYPE B
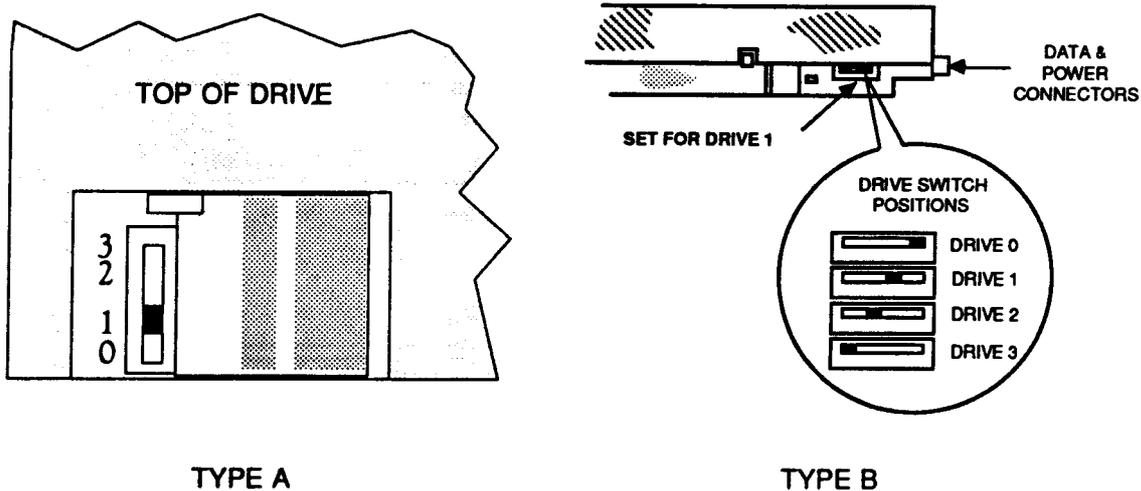
Fig. 4 : Configuring the new drive as drive 1

6   Assemble the drive to the drive bracket with four of the M3 x 6mm screws supplied, using the original drive 0 assembly as a guide to orientation. Don't overtighten the screws.

7   Assemble the drive bracket to the disc drive support bracket with two of the M3 x 6mm screws supplied (or No 4 x 1/4" screws if untapped). Leave the screws slightly loose.

DRIVE 0   DRIVE 1

DRIVE BRACKET FIX   PL 9   PSU
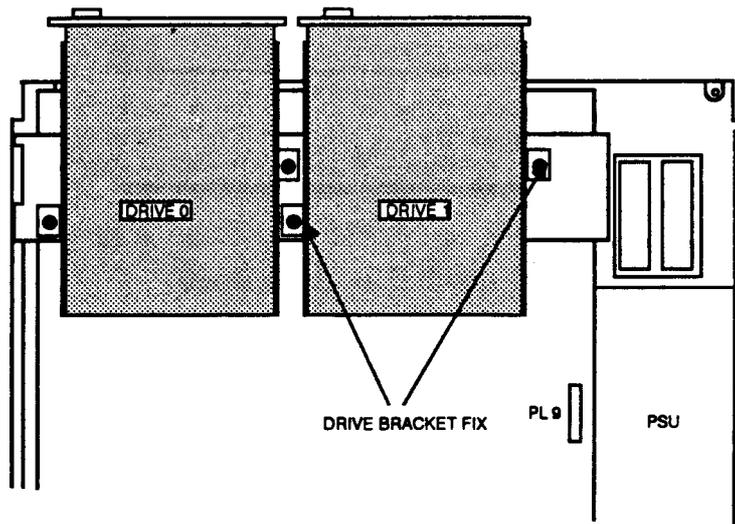
Fig. 5: Installing the new drive

8   Connect the centre connector on the disc drive power cable and the end connector on the disc drive data cable to the new drive.

9   Taking the front moulding assembly, locate and remove the two self-tapping screws at each end inside the main moulding and slide the sub-moulding away from the main moulding (see Fig. 6).

SUB-MOULDING
FIX

INSIDE FRONT MOULDING
(300/400 SERIES)

AFFIX LABEL HERE   NEW DRIVE 1

DUAL DRIVE
SUB-MOULDING
(300/400 SERIES)

ENSURE EJECT BUTTON
CLEARS MOULDING
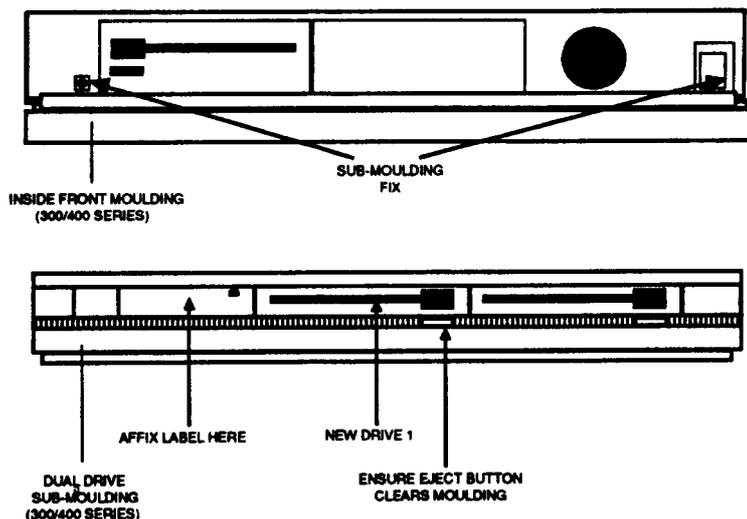
Fig. 6a : Front moulding assembly details (300/400 series)

INSIDE FRONT
MOULDING
(400/1 SERIES)

SUB-MOULDING
FIX

AFFIX LABEL HERE

NEW DRIVE 1

DUAL DRIVE
SUB-MOULDING
(400/1 SERIES)

ENSURE DRIVE FACIA
CLEARS MOULDING
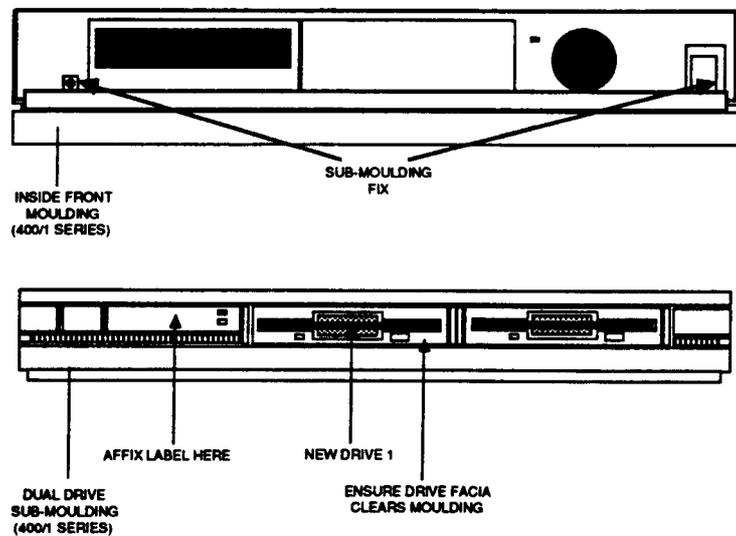
Fig. 6b Front moulding assembly details (400/1 series)

10 The leads from the speaker in the main moulding and the LED in the sub-moulding share the same connector. The new dual-drive sub-moulding has an LED already fitted to it. You will need to remove the existing leads from the connector and replace them with those from the new LED, as follows:

11 Using a small electrical screwdriver or similar, depress the barbs on the LED wire contacts in the LED/speaker connector (red and black wires) and withdraw the contacts from the connector, noting the polarity of the LED wires (see Fig. 7, steps 1 and 2). Place the old front sub-moulding to one side.

1 PRESS TO RELEASE BARB

RED

BLACK

2 WITHDRAW FROM HOUSING

BARB 3 INSERT WITH BARB AT TOP

4 LOCATE LOCKING EARS OVER TAB ON BOARD CONNECTOR
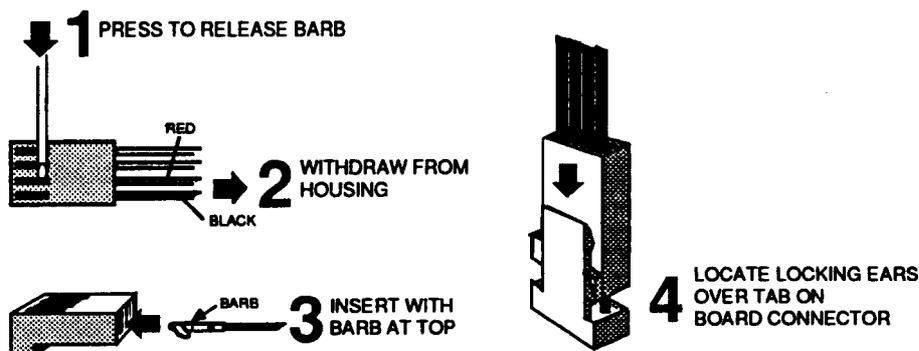
Fig. 7 : Removing/inserting LED wires in the LED/speaker connector

12 Offer up the new dual drive sub-moulding to the main moulding, passing the LED wires through the drive 1 aperture. Ensure that the top edge of the sub-moulding fits into the slot between the rib and the top edge of the main moulding, then secure the sub-moulding using the two self-tapping screws previously removed. Do not overtighten.

13 Insert the LED wire contacts into the LED/speaker connector so that the barbs on the contacts engage in the slots in the connector housing (see Fig. 7, step 3). Observe correct polarity – make sure that the red and black wires are the correct way round, as shown in Fig. 7, step 2.

14 **(300 series only)**   Insert a disc into both drives to aid alignment of the disc eject buttons through the apertures in the front moulding.

15 Offer up the front moulding assembly to the main unit, ensuring that the LED/speaker cables pass around the side of the new drive 1, and that the main circuit board locates in the slots in the front moulding. Do not force the moulding.

16 Insert the front moulding assembly fixing screws and fully tighten them.

17 **(300 series only)**   Check that both drives will accept and reject discs, that the eject buttons do not bind on the moulding, and that an inserted disc clears the front moulding. Adjust the position of the new drive 1 as appropriate.

18 **(400/1 only)**   Check the alignment of the drive fascia panel with the aperture in the front moulding. Adjust the position of the new drive 1 as appropriate.

19 Provided that its position has not been disturbed, the original drive 0 should align correctly. Tighten both disc drive 1 bracket fixing screws.

20 Plug the LED/speaker connector to PL9 on the main board, ensuring that the locking ears on the connector locate either side of the locking tab on the board-mounted connector (see Fig. 7, step 4).

21 Stick the small white serial number label provided onto the top of the new floppy drive's case (not its bracket), alongside the batch code number, if fitted. It is important that this label is fitted in case any warranty claims should arise.

22 Visually check that all is well, then refit the top cover and tighten all fixing screws.

23 Remove the backing paper, and carefully fix the appropriate model label to the new front sub-moulding. Press it down firmly when it is in the correct position.

24 If you have removed any expansion cards, replace these, and refit the backplane.

25 Slide the cover back onto the computer, and refit the five screws securing it.

26 Reconnect the keyboard, monitor and peripherals to the computer unit. Reconnect the system to the mains supply and switch on.

27 Exit from the desktop, and from the Command line, type:

*CONFIGURE FLOPPIES 2

Reset the computer (hold down Ctrl and press RESET), and you should be able to access either floppy drive. Refer to the User Guide for further guidance. If you have problems with the new drive, contact your supplier.

Keep the old front moulding and drive cable assemblies, in case you decide to upgrade further to a hard disc system at a later date.

Main PCB links and test points

Archimedes model 400/1 link options and test points

Link No	Status	Function
LK 1		North selects SK1 pin 4 to be HSYNC. South selects SK 1 pin 4 to be CSYNC (default is link fitted South).
LK 2		No link fitted selects SK 1 pin 5 to be a mode control AMODE. Link fitted selects SK1 pin 5 to be VSYNC. (Default is no link fitted.)
LK 3	NF'	Not applicable
LK 4	NF	Not applicable
LK 5		No link selects Hi-Res Sync. Link fitted for Low-Res Monochrome via 'Sync' BNC socket. (Default is no link.)
LK 6		No link selects Hi-Res Sync. Link fitted Low-Res Monochrome via 'Sync.' BNC socket (Default is no link.)
LK 7a		Selects ROM size for ICs 16
LK 7b		to 19 . Default selection is for 512K/1M devices. See table on circuit diagram for other sizes.
LK 8		Selects type of EPROMs/ROMs. DEFAULT: Links set 1 to 2 and 3 to 4 for EPROMS up to 0.5 Mbit, 1 Mbit ROMs and 1 Mbit ROM-type EPROMS, eg 27C301. Links set 1 to 3 and 2 to 4, JEDEC 1 Mbit EPROMS, eg 27C101. (See table on circuit diagram).
LK 9	NF	Not applicable
LK 10	NF	By cutting track and fitting in a South position, the floppy disc drive may be powered via the ribbon cable.
LK 11	NF	Can be used to ground RDY signal in floppy disc interface for test purposes. .
LK12		Hard disc head select &
LK13		reduced write current select Default is LK12 East, LK13 West.
LK14		RAM size select - see table
LK15		on circuit diagram.
TP 2		Access to real time dock oscillator

*NF = Not Fitted

Main PCB plugs

Plug No	Function
PL 1	Serial line
PL 2	Auxiliary audio connector. 10 way 2 row 0.1" pitch-NF For pin out see silk screen on PCB.

1	Unfiltered left channel output
2	0V
3	Filtered left channel output
4	0 V
5	Auxiliary input (feed to internal amplifier and speaker)
6	0 V
7	Filtered right channel output
8	0V
9	Unfiltered right channel output
10	0 V

Plug No	Function
PL3	Connection to VIDEO BNC sockets.- NF
PL 4a	Internal clock selection. 4 way 2 row 0.1- pitch. For pinout see silk screen on PCB; links fitted 1 to 2, 3 to 4.

1	CKSYS 24 MHz system clock.
2	Feed to VIDC clock
3	Sync signal
4	0 V

Plug No	Function
PL 4b	Internal Video 10 way 2 row 0.1" pitch - NF

5	VED0	(inverse of red data bit 0)
6	VED1	(inverse of red data bit 1)
7	VED2	(inverse of red data bit 2)
8	VED3	(inverse of red data bit 3)
9	SUP	(supremacy output control for external video mixing)
10	HI	(horizontal interlace marker)
11	HS	(horizontal sync)
12	VS	(vertical sync)

Plug No	Function
PL 11	
PL 5	Power supply connector +12 V
PL 6	Power supply connector 0 V
PL 7	Power supply connector +5 V
PL 8	Power supply connector -5 V
	Front panel connector, pins 1 to 4 fitted only

1	Speaker connection
2	0 V
3	Power on LED connection
4	0 V

Plug No	Function
PL 9	Auxiliary I/O connector - NF

1	0V
2	Aux 2
3	Aux 1
4	C4 Bidirectional 10 line
5	NVM alarm signal

Plug No	Function
PL 10	Battery connection
PL 12	Fan connection

Technical Service Bulletins

400/1 RAM Upgrade

> **Note:**
> **This upgrade should only be Installed by an Acorn Approved Service Centre contact your supplier for details. If this instruction is disregarded, the guarantee on either this upgrade or the computer, or both, may be invalidated.**

Applicable models

- Archimedes 410/1
- Archimedes 420/1

Purpose

To install a 1Mb RAM upgrade kit in an Archimedes 400/1 series computer.

One or three kits may be installed in a 410/1, to upgrade the RAM to 2Mb or 4Mb respectively. Two kits may be installed in a 420/1, to give 4Mb of RAM.

Note: There is no 3Mb memory option, and you cannot install more than 4Mb of memory.

Parts required

One or more 400/1 RAM upgrade kits (AKA 52).

Fitting the kit

Disassemble the computer

> **WARNING:**
> **TAKE ALL PRECAUTIONS REGARDING STATIC ELECTRICITY AND EARTHING IN ACCORDANCE WITH BS 5783.**

Remove the main PCB:
- Remove the cover of the computer
- Remove the front moulding assembly
- Unplug the backplane
- Disconnect the main PCB power connectors.

The full disassembly procedure is given in the 400/1 Service Manual.

Insert the ICs

1 Remove the ICs from their packaging.
2 Check that all pins on the ICs are straight. If any appear crooked or splayed, you will need to realign them; use a pin aligning tool.
3 Locate the area of the board where the memory is fitted. A diagram of this area is shown in Figure 1. If you are upgrading from 1Mb to 2Mb, the new ICs will be interleaved with the existing soldered memory chips. If you are upgrading from 2Mb to 4Mb, the new ICs will be fitted into the upper row of empty sockets.
4 Fit the ICs with the bevelled edge facing towards the back of the computer.
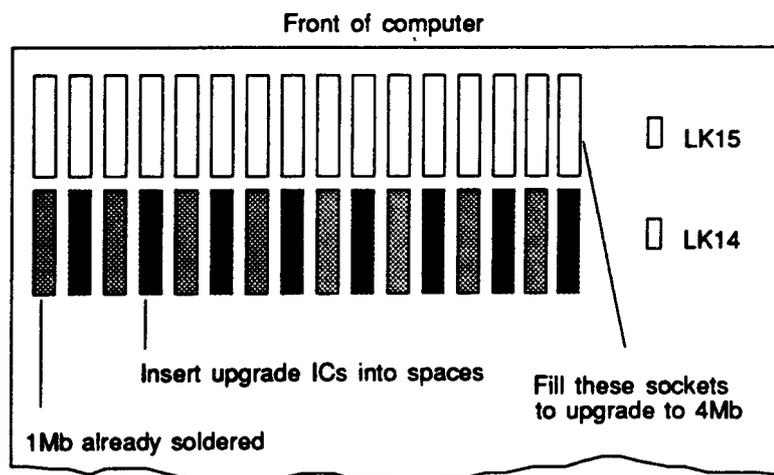
Figure 1: Memory banks and links

Change the link settings

The link settings on LK14 and LK15 (see Figure 1) need to be changed so that the computer can make use of the new memory.

Figure 2 shows the settings of the links.

Figure 2: Link settings
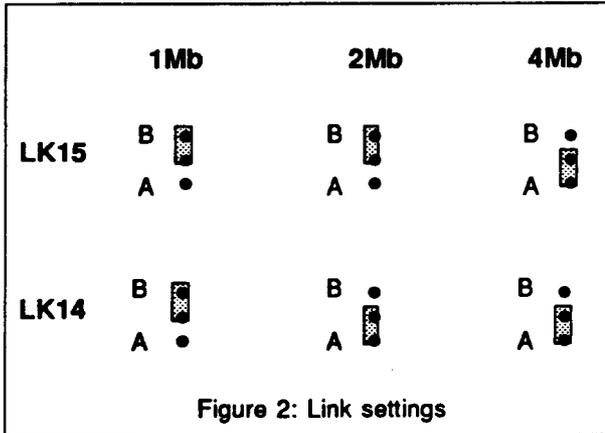
On a computer with 1Mb of memory both links are set to position B.

- If you have upgraded to 2Mb then set link LK15 to position B and LK14 to position A.
- If you have upgraded to 4Mb then set link LK15 to position A and LK14 to position A.

Attach the serial number label

Attach the serial number for the 1 Mb upgrade in position A (see Figure 3) on the underside of the PCB. If upgrading to 4Mb, attach the extra serial numbers in positions B and C.

Reassemble the computer

Reassemble the computer following the procedure given in the 400/1 Service Manual. Remember to replace any expansion cards you may have removed.

Change the front panel model label

Peel off the old model label on the front panel, and fit the appropriate new label from the kit.

Test the computer

Endorse the guarantee form

Complete the 'Installation details' on the Upgrade Guarantee form (part number 0483,051) enclosed with the kit.
The installation is now complete.
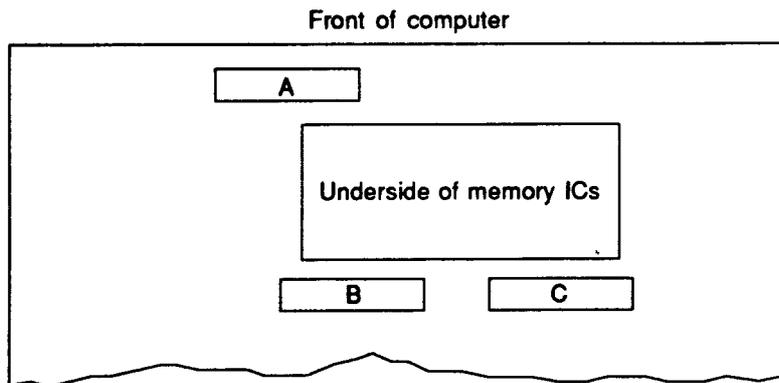
Figure 3: Serial number positions

Drawings

Main PCB plugs and sockets

SK9

SK12 — **SK12**

ARM

MEMC

CASE GND

SK10 — **SK10**

SK11 — **SK11**

L7   SK8   **PL8**   **PL9**   **PL10**   **PL12**

Main PCB links and test points

ARM

MEMC

IC32

IC34
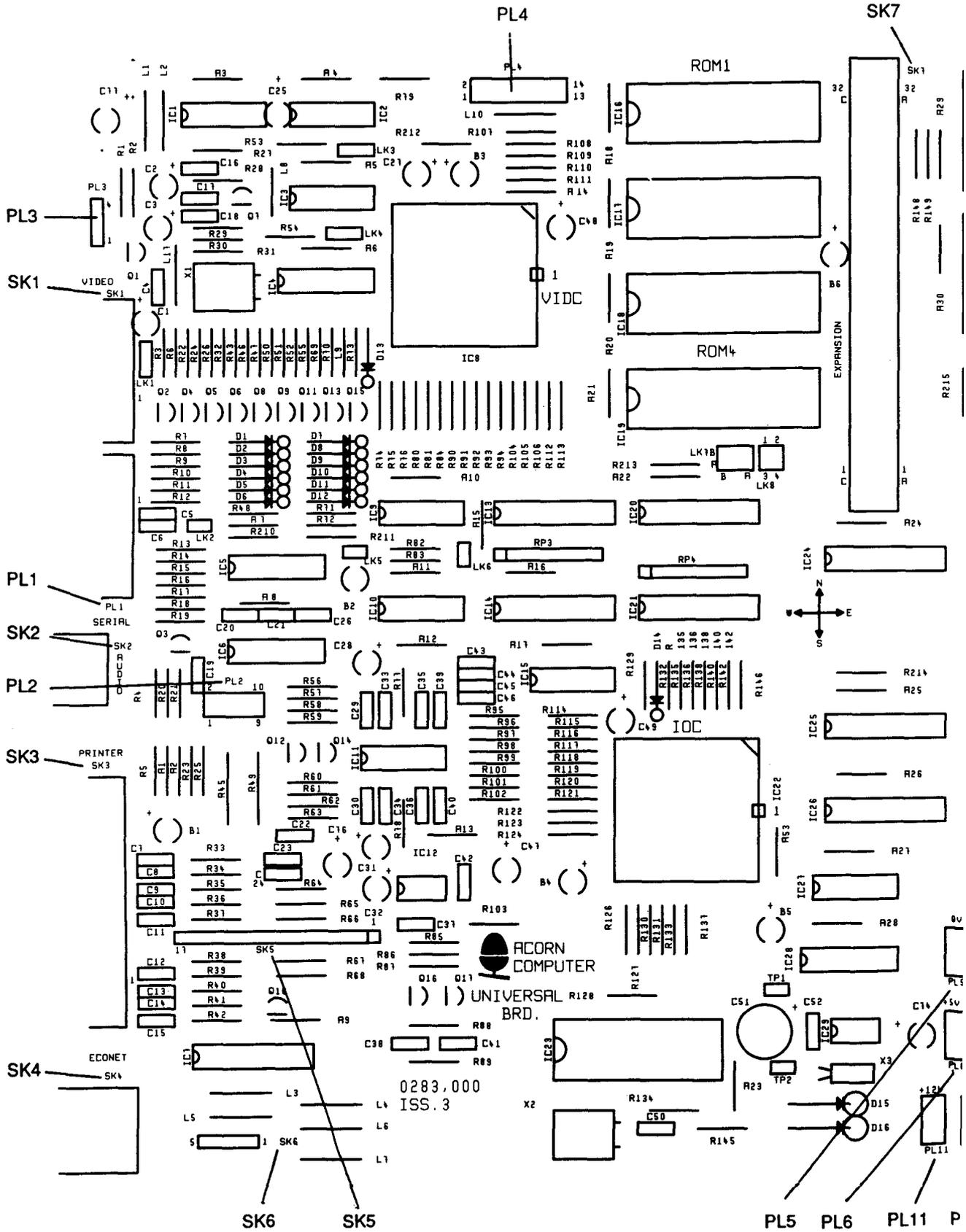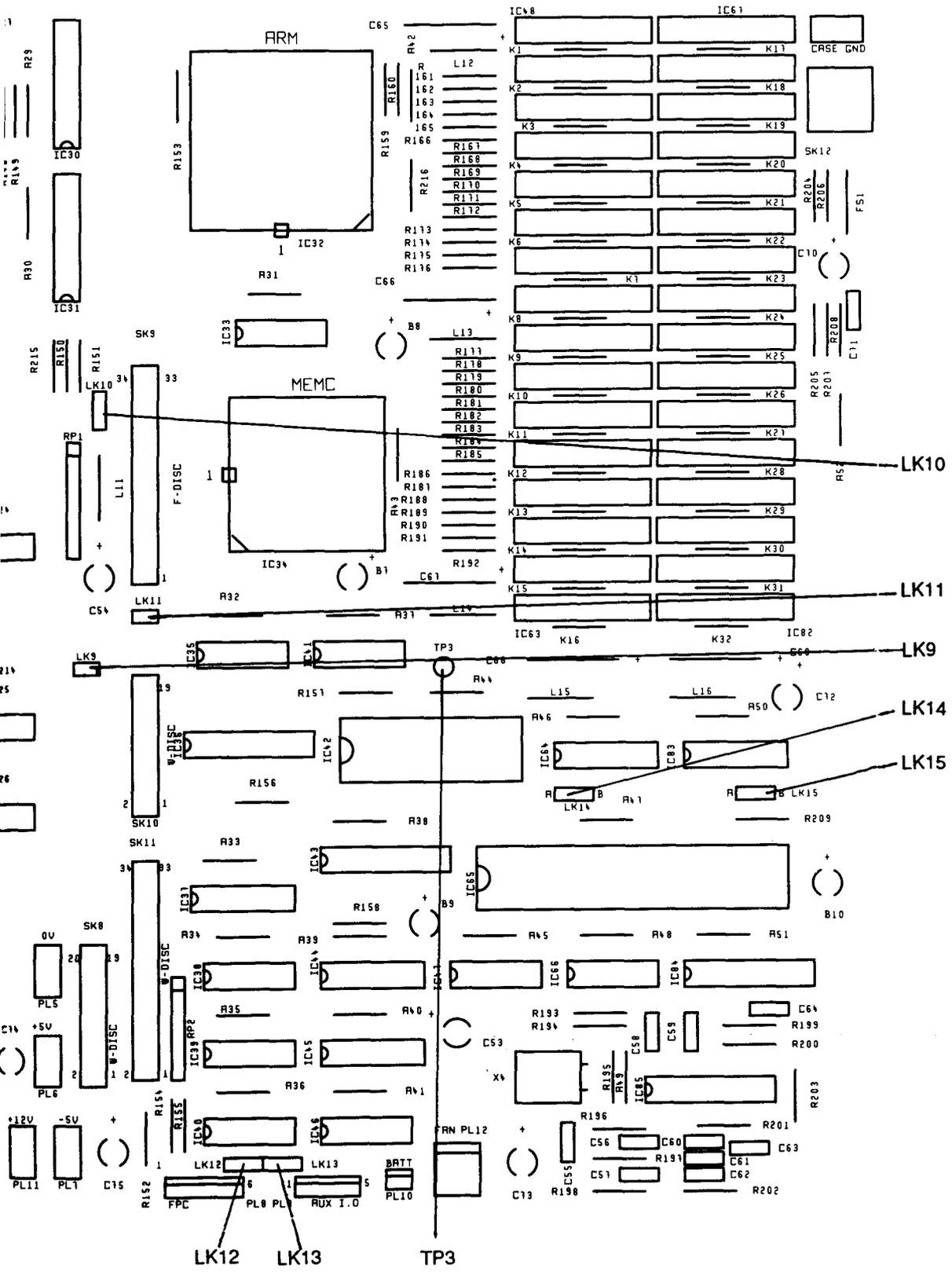
LK10

LK11

LK9

LK14

LK15

LK12   LK13

TP3

CASE GND

Main PCB function map

SYSTEM OSCILLATOR

ROM

ANALOGUE AUDIO AND VIDEO

HI-RES MONO VIDEO

IO DATA LATCHES

SERIAL PRINTER

SPEAKER DRIVER

REAL TIME CLOCK VOLATILE RAM

ROM1

ROM4

VIDC

IOC

ACORN COMPUTER

UNIVERSAL BRD.

0283,000
ISS.3

EXPANSION

ECONET SK4

PRINTER SK3

SERIAL SK2

VIDEO SK1

PL3   PL1   PL2   PL4
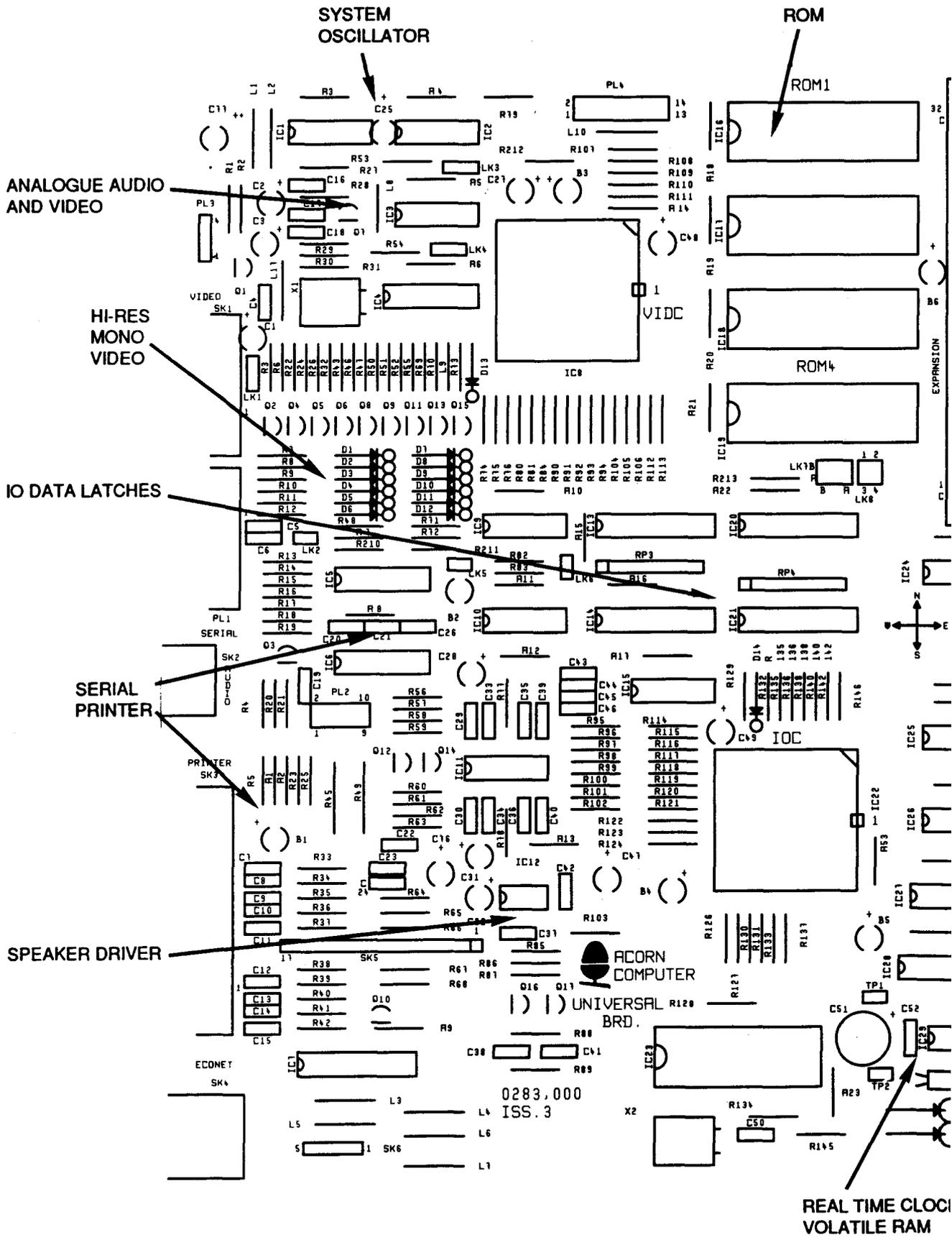
EXPANSION

ADDRESS LATCHES
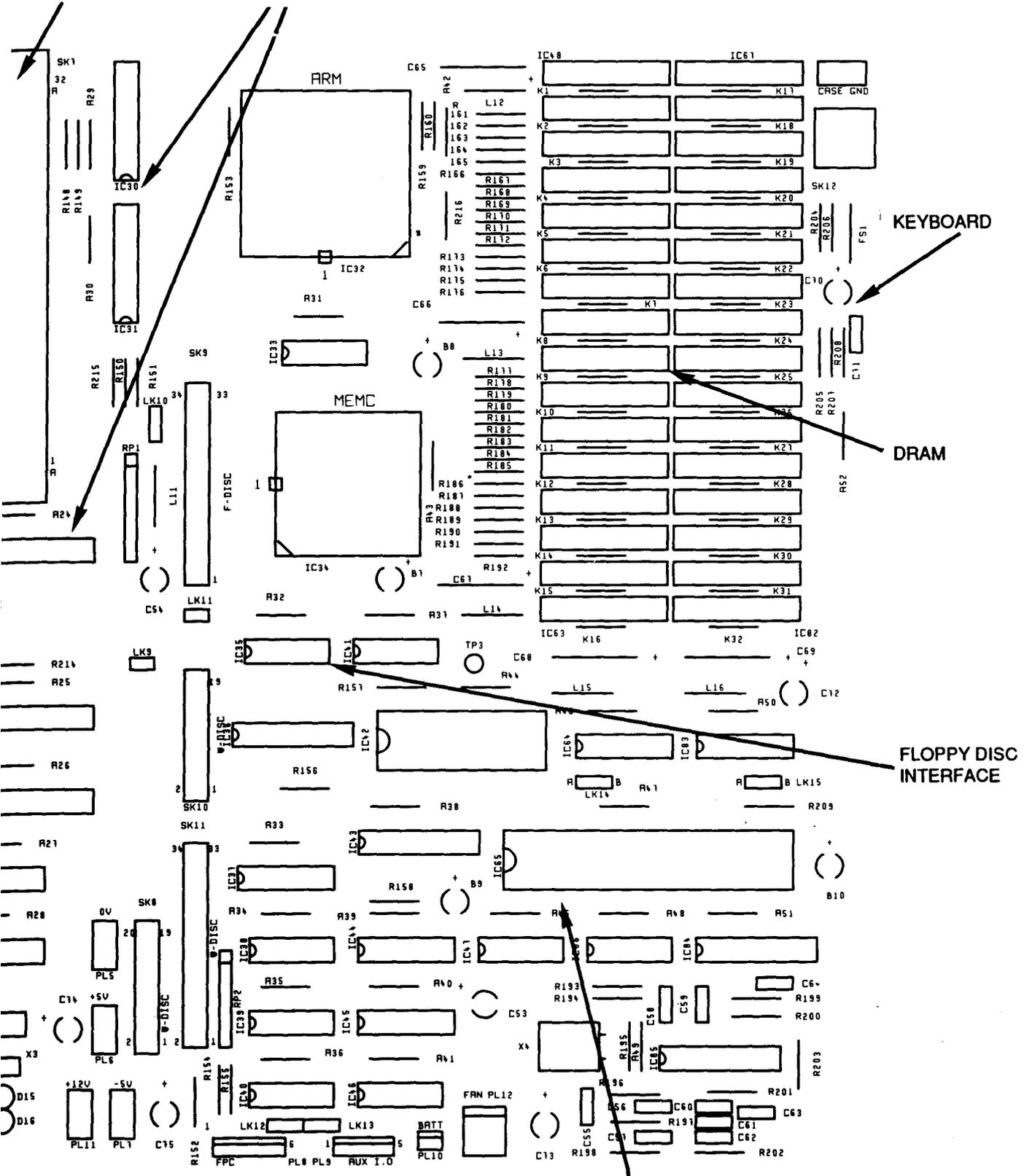
KEYBOARD

DRAM

FLOPPY DISC INTERFACE

HARD DISC INTERFACE

K AND NON

Final assembly — 410/1

6

6

31
2

20

28
2

14

TO MAIN PCB
PL9

SEE NOTES
1 & 2

GREEN

AMBER

16

22

5

33
2

SEE NOTE 4

36
5

SEE NOTE 4
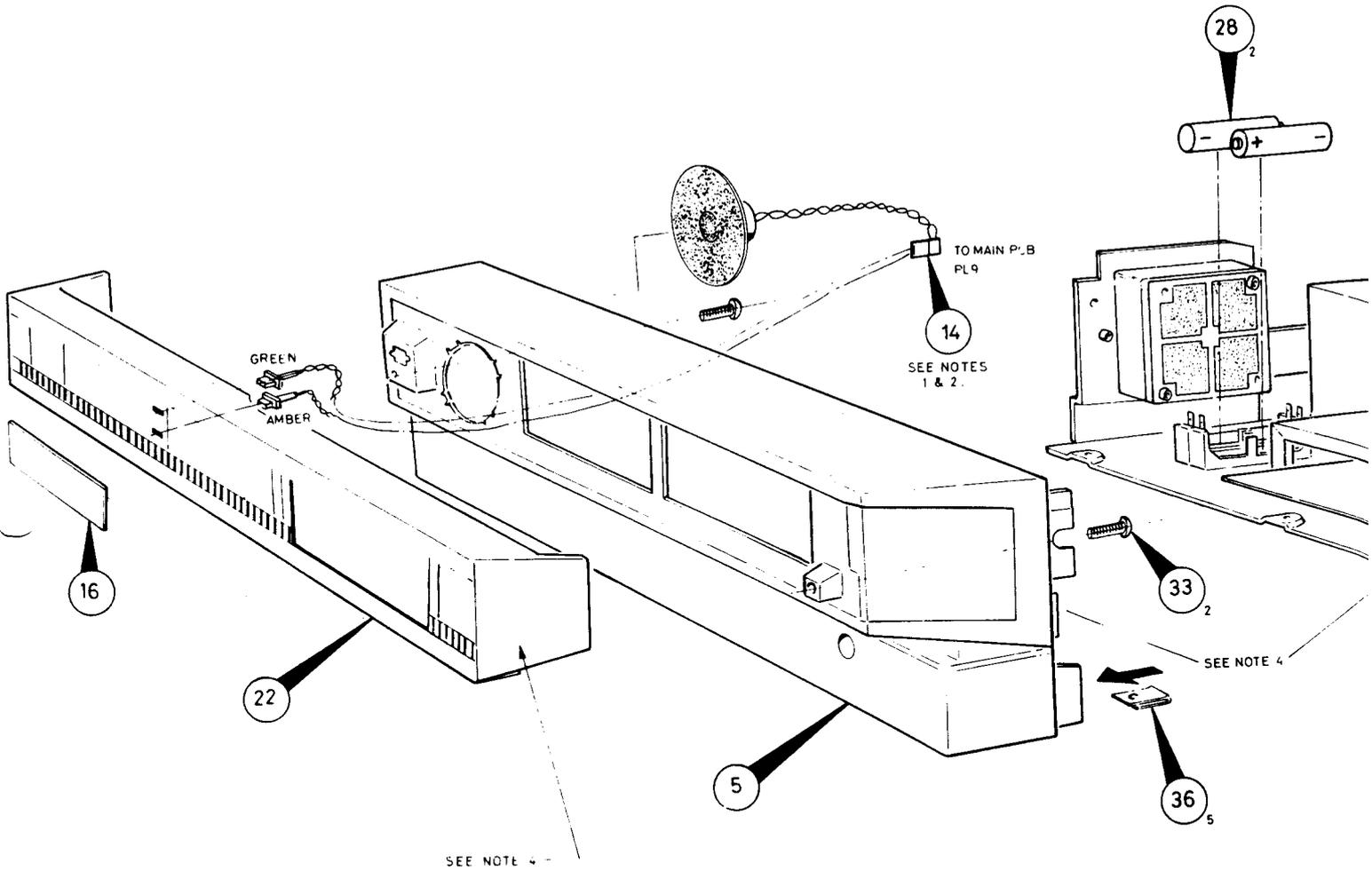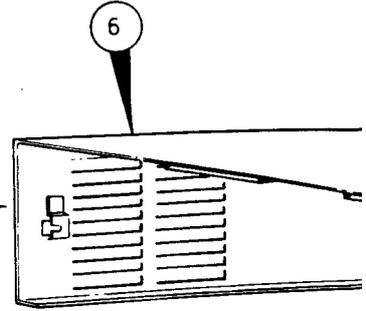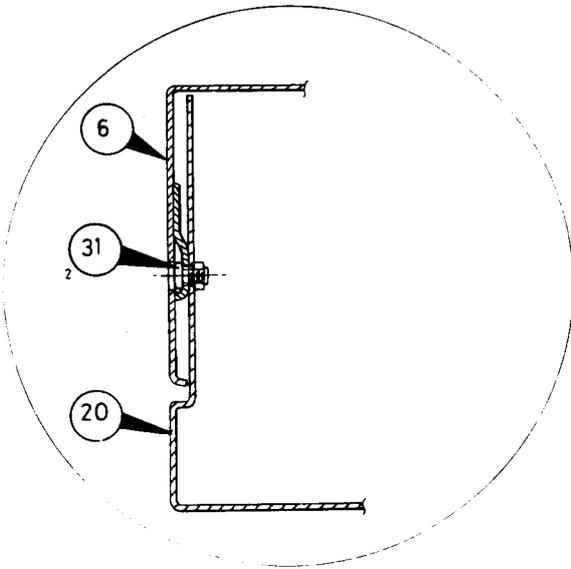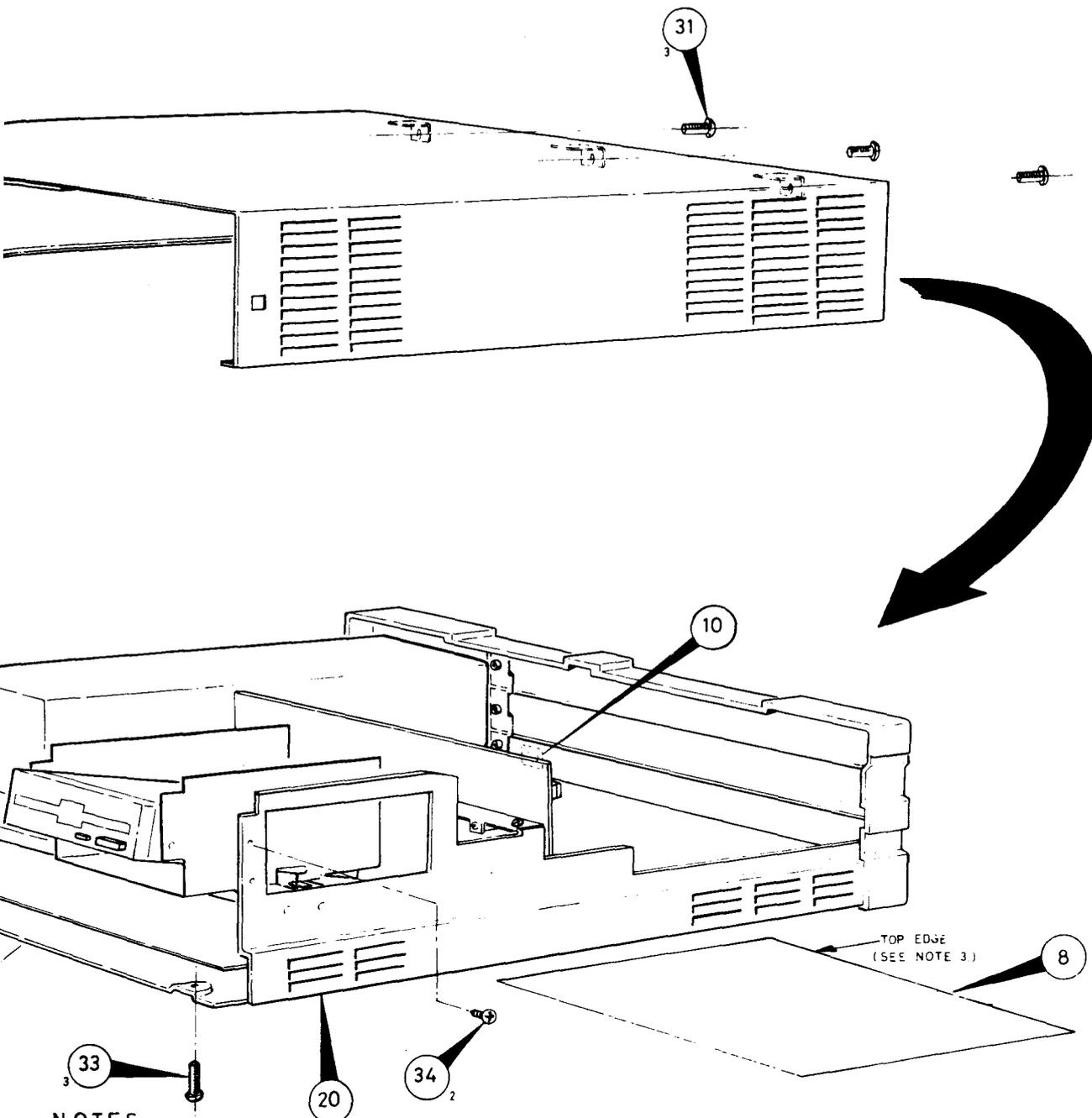
NOTES.

1. FIT LOUD SPEAKER, ITEM 14, UNDER LOWER TWO LOCATION CLIPS ON FRONT MAIN MOULDING, ITEM 5 AND CLIP UNDER TOP TWO LOCATION CLIPS.

2. USE SILICON COMPOUND, ITEM 39, TO SECURE LOUDSPEAKER, ITEM 14 AND L.E.DS, ITEM 14, TO MOULDINGS. ENSURE THAT NO COMPOUND COMES INTO CONTACT WITH ANY PART OF THE LOUDSPEAKER EXCEPT THE METAL CASE.

3. FIT ITEM 8 TO ITEM 20 SUCH THAT THE TOP OF ITEM 8 IS TOWARDS THE BACK OF ITEM 20

4. ASSEMBLE FLOPPY DISC DRIVE SO ITS PLASTIC FACE IS FLUSH WITH THE FRONT MOULDING (ITEM 22). THE DISC DRIVE FACE MUST NOT PROTRUDE, RETRACT OR TWIST ABOUT ITS CENTRE LINE MORE THAN 0,5mm

6

31
2

20

31
2

6

28
2

TO MAIN PCB
PL9

14

SEE NOTES
1 & 2

GREEN

AMBER

16

22

33
2

SEE NOTE 4.

5

36
5

SEE NOTE 4
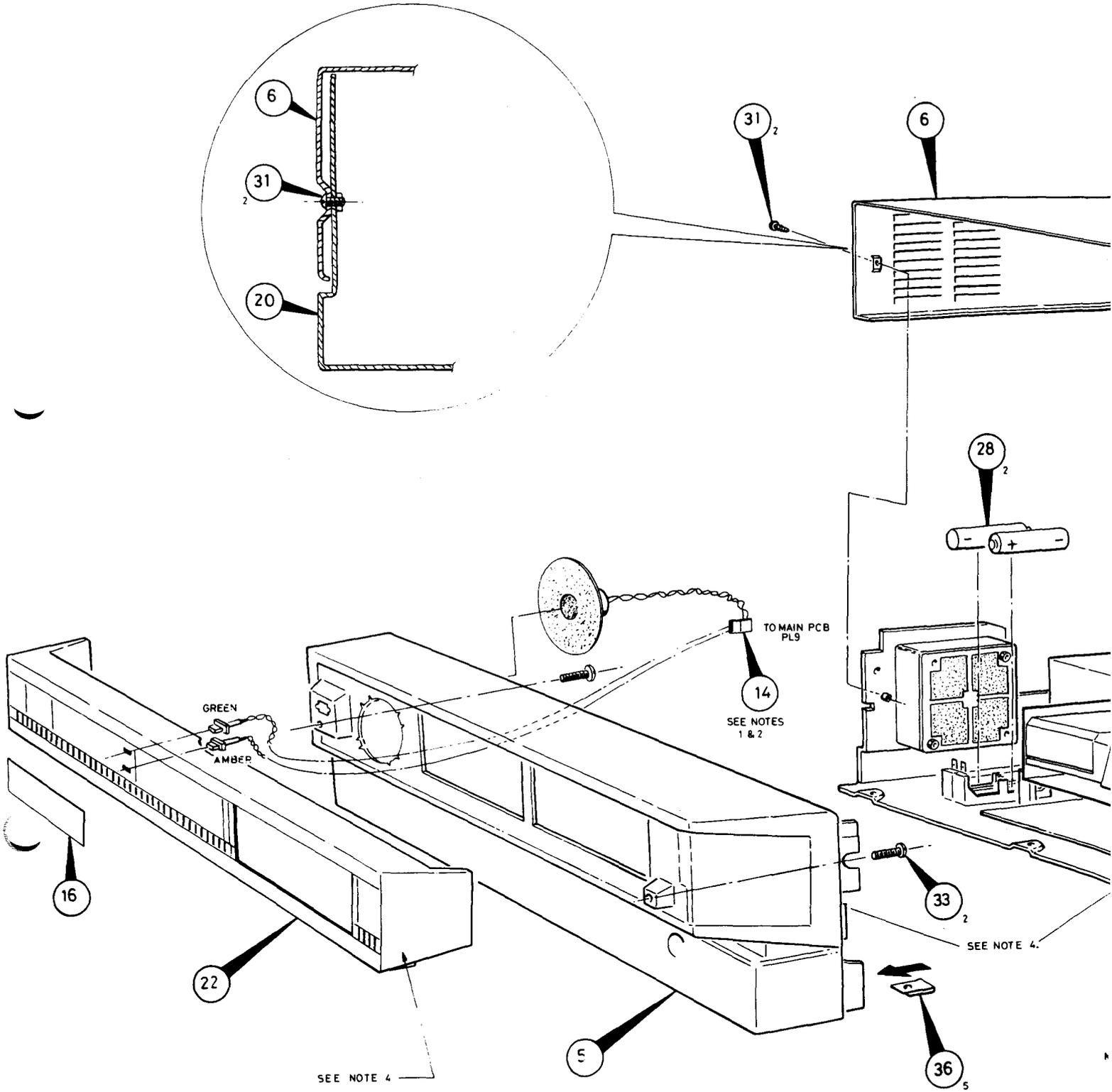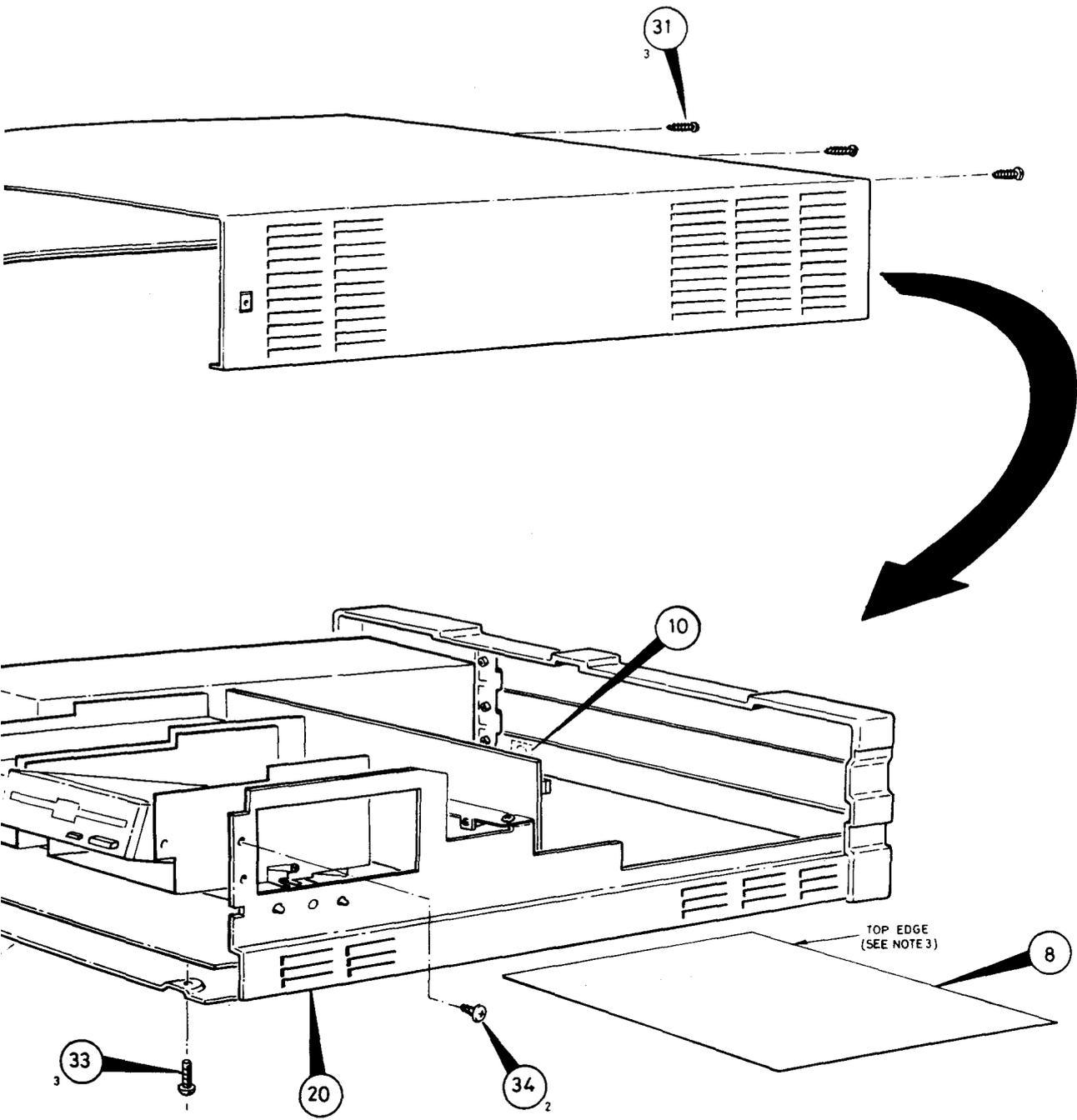
1. FIT LOUDSPEAKER ITEM 14 UNDER LOWER TWO LOCATION CLIPS ON
   FRONT MAIN MOULDING, ITEM 5 AND CLIP UNDER TOP TWO LOCATION CLIPS.

2. USE SILICONE COMPOUND, ITEM 39 TO SECURE LOUDSPEAKER
   ITEM 14 AND L.E.D.S. ITEM 14 TO MOULDINGS. ENSURE THAT NO COMPOUND
   COMES INTO CONTACT WITH ANY PART OF THE LOUDSPEAKER
   EXCEPT THE METAL CASE.

3. FIT ITEM 8 TO ITEM 20 SUCH THAT THE TOP OF ITEM 8 IS TOWARD THE BACK OF ITEM 20

4. ASSEMBLE FLOPPY DISC DRIVE SO ITS PLASTIC FACE IS FLUSH WITH THE FRONT MOULDING (ITEM 22).
   THE DISC DRIVE FACE MUST NOT PROTRUDE, RETRACT OR TWIST ABOUT ITS CENTRE LINE MORE THAN 0,5 mm

Lower case assembly — 410/1
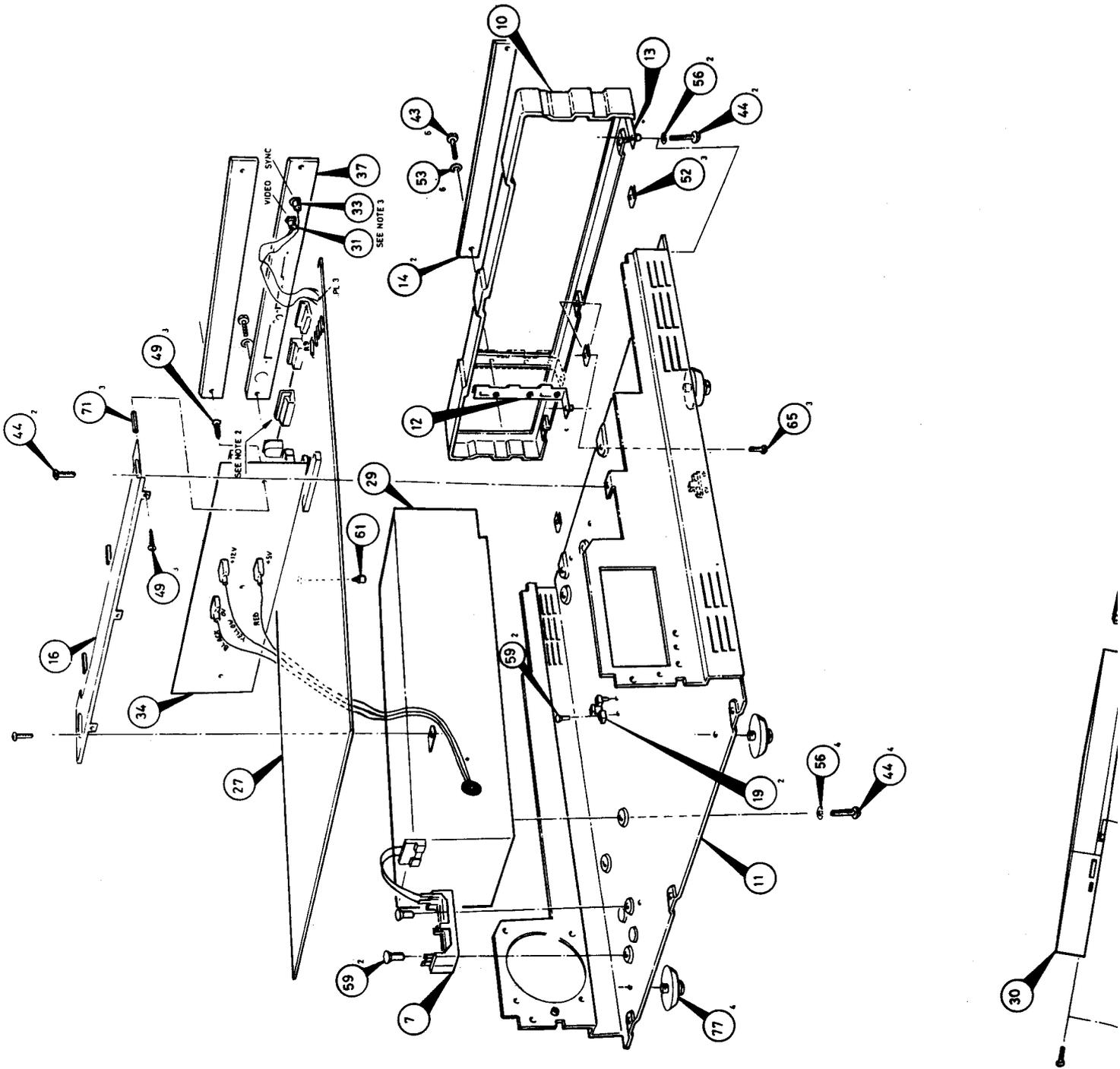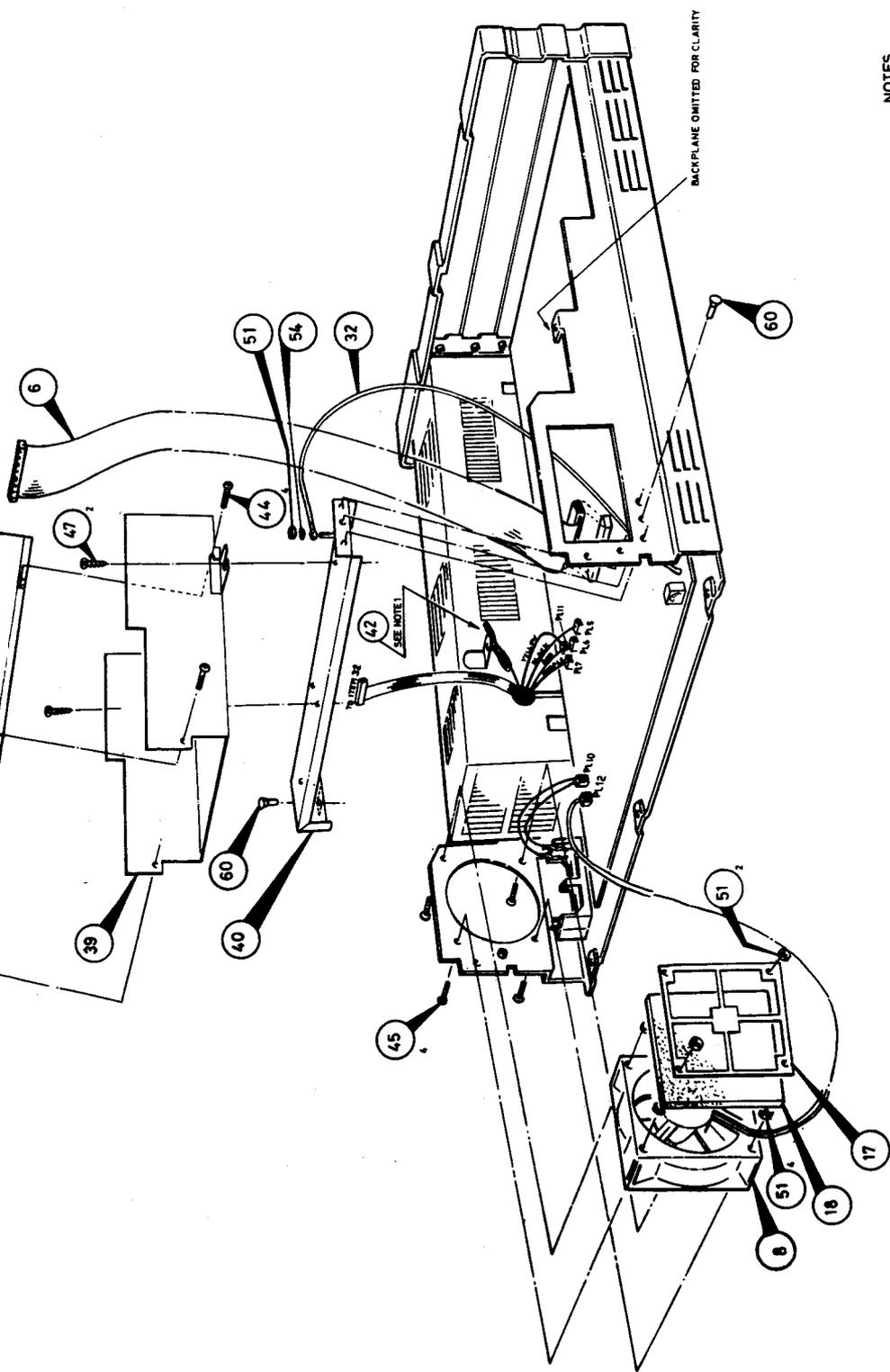
NOTES

1. COIL REMAINING UNCONNECTED CABLES
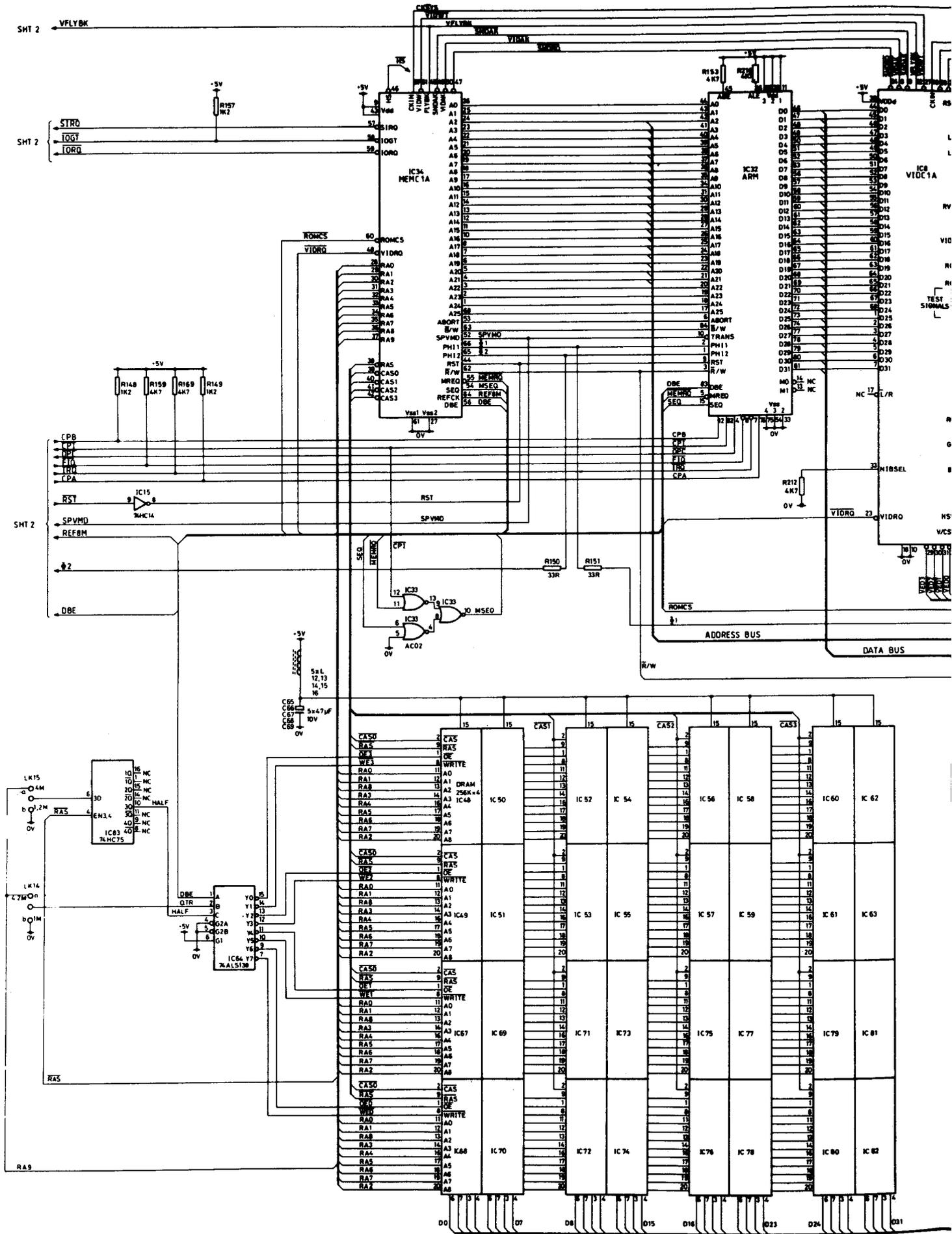   NEATLY & TIE TO B'PLANE SUPPT. BAR (ITEM 16) USING ITM 42

2. PCB TO REAR PANEL FIXINGS. (6 POSITIONS)
   SEE COMPONENT APPROVAL FOR RELEVANT
   D TYPE CONNECTOR USED FOR ARRANGEMENT
   OF JACK SCREWS, WASHERS, ETC. IF THE TYPE
   USED CONTAINS SPACING WASHERS, ENOUGH
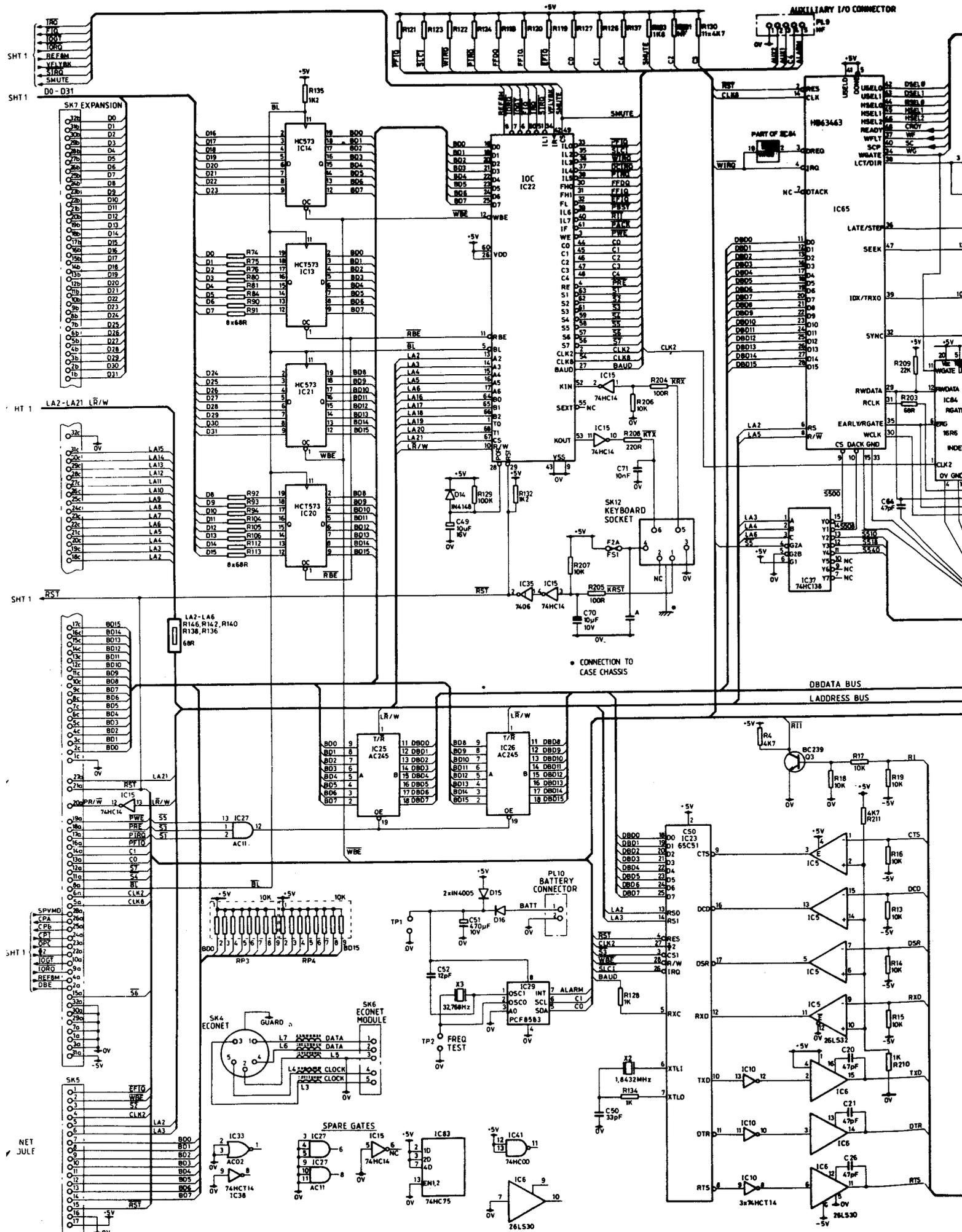   OF THESE MUST BE DELETED TO ACCOUNT
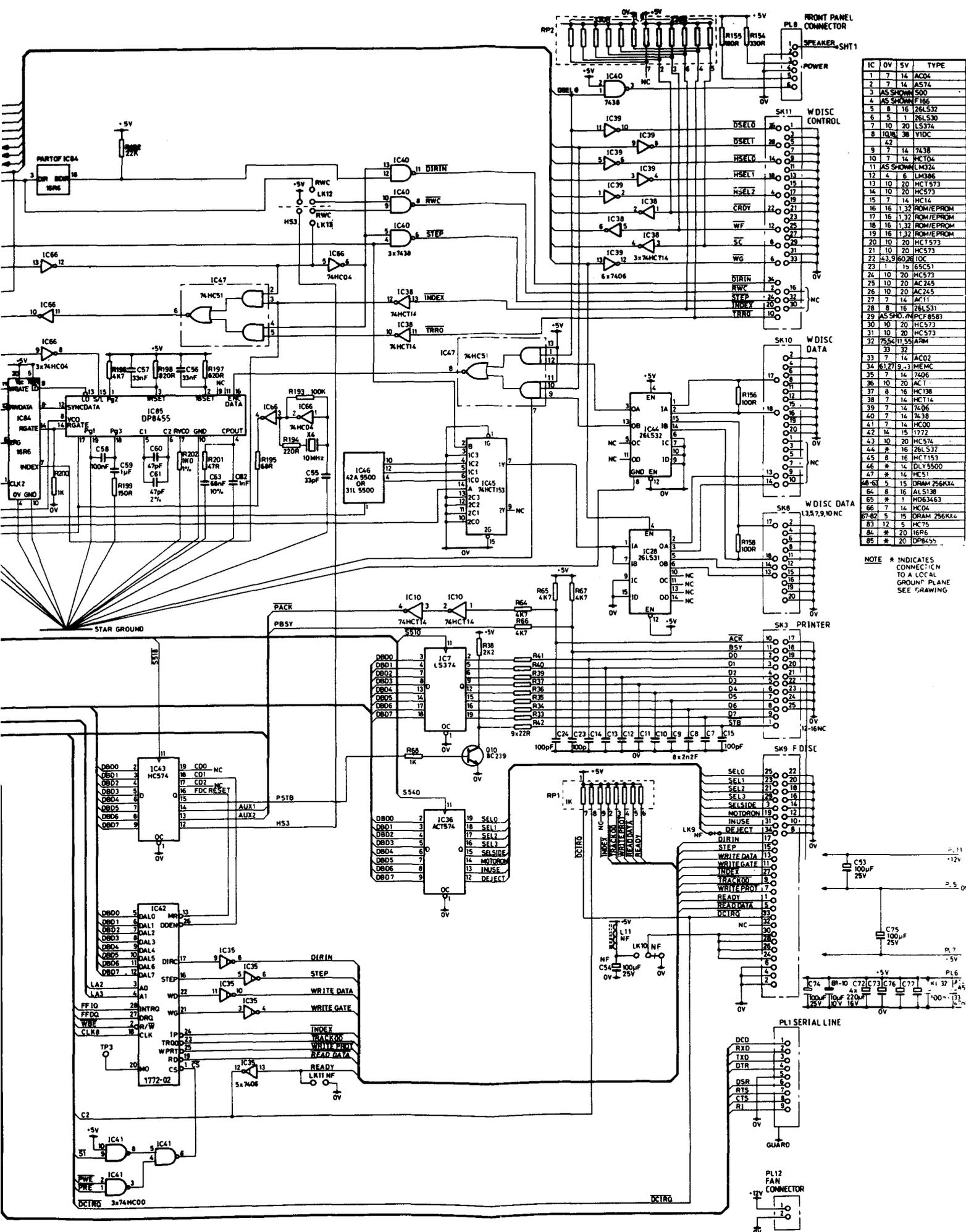   FOR THE REAR PANEL THICKNESS.

3. WIRING GUIDE FOR PL 3/BNC CONNECTORS

PL 3	BNC CONNR.	COLOUR
PIN 1	SYNC. SIGNAL	WHITE
PIN 2	SYNC. 0V	BLACK (WITH WHITE)
PIN 3	VIDEO 0V	BLACK (WITH RED)
PIN 4	VIDEO SIGNAL	RED

Lower case assembly — 420/1 and 440/1

BACKPLANE OMITTED FOR CLARITY
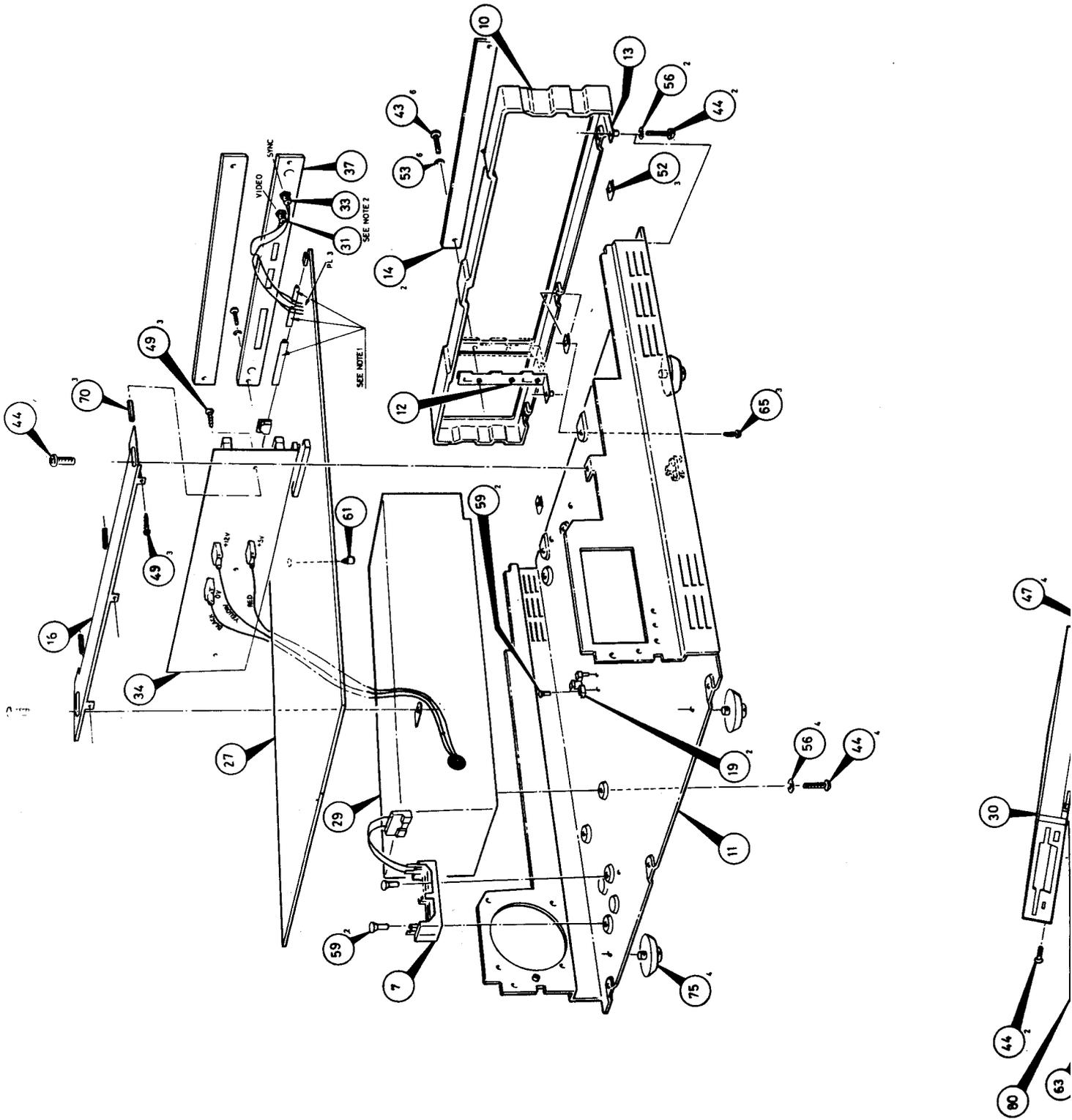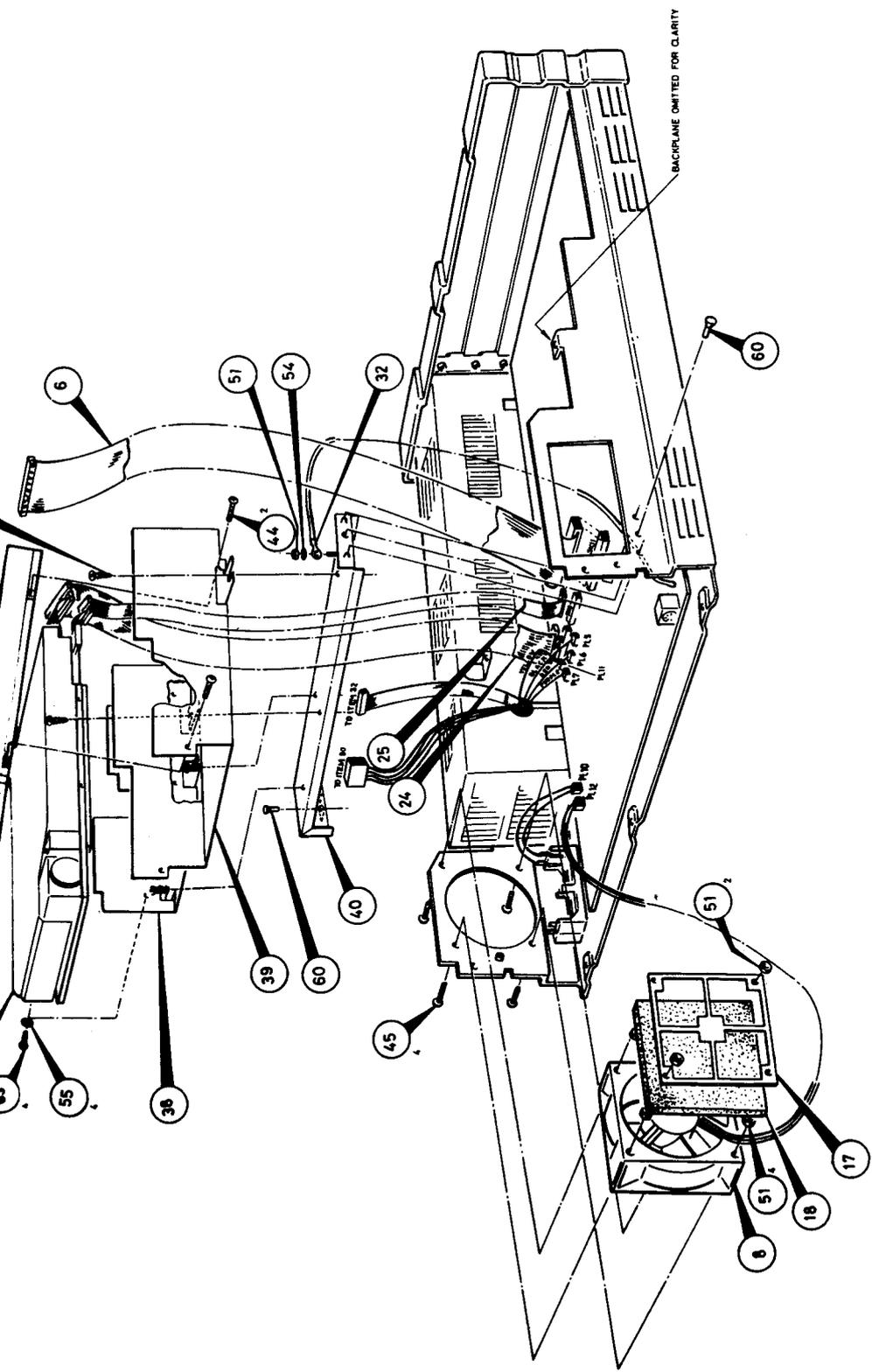
NOTES

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Circuit diagram - Sheet 2