

Acorn A3010, A3020 and A4000
Module Level Service Manual

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Published by Acorn Computers Limited
ISBN 1 85250 109 X
Part number 0494,059
Issue 1, Sep 1993

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About this manual

This manual is a module level service manual for the Acorn A3010/A3020 and A4000 series computers. It is intended as a guide for suppliers at Acorn Service Centres to enable them to trace and repair faults at a module level. Suppliers are not expected to undertake repairs at a component level, as surface mount technology is used on the printed circuit boards of the A3010/A3020 and A4000 computers. Any modules which require component level repairs should be sent to an Acorn Authorised Central Service Workshop.

This manual supplements the basic information given on system hardware in the *Welcome Guide* and *Technical Reference Manual* (available for separate purchase).

The operating system is covered at the user level in the *RISC OS User Guide*, supplied with certain models (also available for separate purchase). Programmers and users requiring a greater depth of information about RISC OS will also need the following manual:

RISC OS Programmer's Reference Manual
(a boxed set)

This manual is available from Acorn authorised suppliers. Full details on the Acorn ARM chip set used in the workstation are given in the *Acorn RISC Machine (ARM) Family Data Manual*, ISBN 0-13-781618-9, available from: VLSI Technology, Inc.

Application Specific Logic Products Division
8375 South River Parkway
Tempe, AZ 85284
USA
602-752-8574

or from the VLSI national distributor.

Part 1- Fault diagnosis and repair

Introduction

This chapter is a guide to the diagnosis and repair at a modular level of basic faults in the Acorn A3010, A3020 and A4000 series computer systems.

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

Note: Throughout this chapter the acronym UUT is used to mean Unit Under Test and the acronym CSW to mean Central Service Workshop.

SAFETY CONSIDERATIONS

WHENEVER ANY SERVICE OR UPGRADE IS PERFORMED, ENSURE THAT ALL THE FUNCTIONAL TESTS AND SAFETY TESTS AS DESCRIBED IN THIS SECTION ARE CARRIED OUT.

FULL FUNCTIONAL AND SAFETY TESTS SHOULD BE APPLIED IRRESPECTIVE OF THE ORIGINAL FAULT OR WORK PERFORMED. FOR DETAILS REFER TO *Appendix C - Earth continuity testing* AND *Appendix D - DC insulation testing - class 1*.

FAILURE TO CARRY OUT THE TESTS IN FULL MAY RESULT IN AN UNSTABLE OR UNRELIABLE UNIT BEING RETURNED TO THE CUSTOMER.

DANGER

BEFORE ATTEMPTING TO OPEN THE COMPUTER OR EXCHANGE EITHER THE PSU (POWER SUPPLY UNIT) OR PCB (PRINTED CIRCUIT BOARD), ENSURE THAT YOU HAVE READ AND FULLY UNDERSTOOD ALL THE INSTRUCTIONS IN *Part 2 - Disassembly and assembly*. IN PARTICULAR, ENSURE THAT YOU DISCONNECT THE COMPUTER, MONITOR AND PERIPHERALS FROM THE POWER OUTLET.

UNDER NO CIRCUMSTANCES SHOULD ANY ATTEMPT BE MADE TO REPAIR OR MODIFY THE PSU. ANY ATTEMPT TO DO SO WILL INVALIDATE THE ORIGINAL SAFETY TESTS APPLIED AT MANUFACTURE AND MAY CREATE A SAFETY HAZARD.

IF THE METAL SAFETY CAGE OF THE A3010/A3020 IS REMOVED EXTRA CARE MUST BE TAKEN DUE TO THE HAZARDOUS VOLTAGES EXPOSED ON THE PCB.

IF THE PCB IS REMOVED FROM THE METALWORK OF THE A3010/A3020, AND THEN CONNECTED TO THE MAINS, EXTRA CARE MUST BE TAKEN DUE TO THE HAZARDOUS VOLTAGES PRESENT ON THE BOTTOM OF THE PCB

Test equipment required

- DC Voltmeter
- ARM 250 Dealer Test Disc (Acorn part number 0294,825)
- a blank 1.6 MB ADFS F format write-enabled, 3.5 inch floppy disc (used as a scratch disc in the disc interface test)
- test IDE hard disc (see the section entitled *Creating a test IDE hard disc* on page F-1)
- serial port loopback plug (see *Appendix B - Serial port loopback plug*)
- headphones (32 ohm impedance)
- analogue multisync colour monitor (suitable for super VGA)
- Epson FX80 compatible printer
- blank 800K ADFS E format write-enabled, 3.5 inch floppy disc:
 - *data disc*– to store the customer's CMOS RAM configuration data
- working keyboard (0391,100) – A4000 only
- mouse (0914,000 or 0914,001)
- mouse test jig template (see *Appendix A - Mouse test jig template*)
- standard hand tools, such as screwdrivers and pliers
- earth testers (see *Appendix C - Earth continuity testing*)
- insulation tester (see *Appendix D - DC insulation testing - class 1*)
- 2 x joysticks – A3010 only
- T.V. – A3010 only.

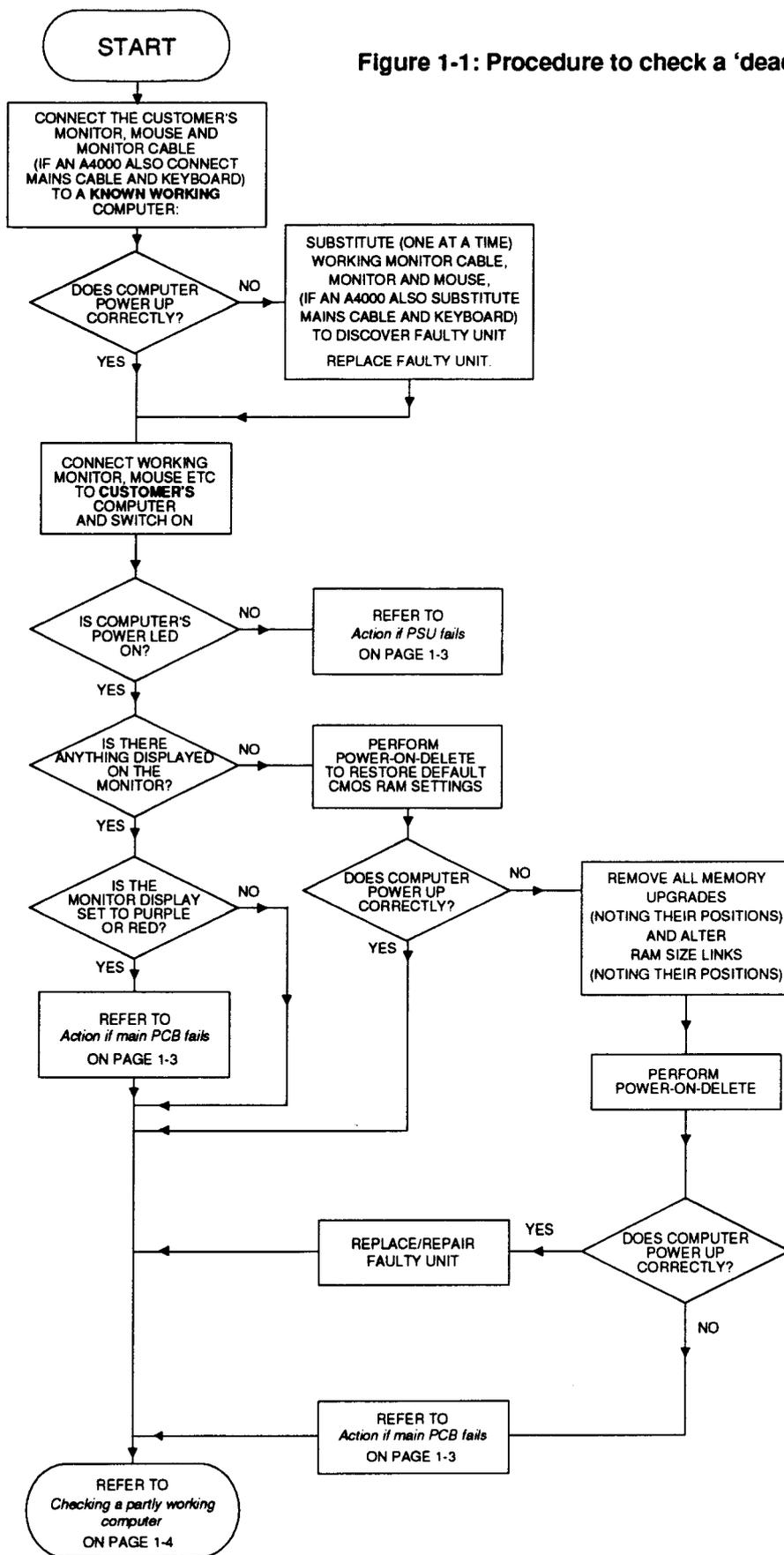
Checking a 'dead' computer

This section describes the initial tests that you should perform on an apparently 'dead' computer to discover which module or upgrade is faulty. If the computer is partially working (i.e. any faults occur after a successful power-up) go straight to the section entitled *Checking a partly working computer* on page 1-4.

To diagnose the faults in a 'dead' computer, refer to the procedure given in the flowchart, *Figure 1-1: Procedure to check a 'dead' computer* on page 1-2. The sections following describe the actions to be taken when you have isolated the fault on the computer.

Note: You may need to reconfigure the CMOS RAM to its original (factory) default setting. Make sure that the customer is made aware of this.

Figure 1-1: Procedure to check a 'dead' computer



Action if PSU fails

There are three ways in which the power supply unit (PSU) may fail:

- complete failure
- individual rail failure
- thermal shutdown.

Complete failure

The **complete failure** of the PSU is indicated by the following symptoms:

- no green LED on the front panel
- no caps lock LED response when caps lock key depressed.

A3010/A3020

To check complete failure in the PSU, switch off, unplug, and refer to the procedure given in the flowchart, *Figure 1-2: Procedure to check complete failure in the PSU on an A3010/A3020* on page 1-6.

A4000

First check that the fuse in the mains plug has not blown. To do this, remove the fuse from the plug and check with a continuity tester. If it has blown then replace only **with a fuse of the same rating** (this will be 5 Amp). If the new fuse is blown when you switch the unit on, then return the PSU to an Acorn Authorised CSW (Central Service

Workshop).

Individual rail failure

If there is an individual rail failure within the PSU, various functions of the computer will fail as follows:

- 5V feeds the main PCB, floppy disc and hard disc (if fitted).
- +12V feeds the video connector (SK1) on pin 12 (when driving a SCART TV) and hard disc (A4000).

A3010/A3020

Ensure that LK1 and LK2 are in place on the main PCB and that the flying connectors are firmly attached to the drives.

If this does not correct the fault, return the PCB to an Acorn Authorised CSW for repair.

A4000

Ensure that the PSU to PCB connector is securely attached to the main PCB and that the flying connectors are firmly attached to the drives.

If this does not correct the fault, return the PSU to an Acorn Authorised CSW for repair.

Thermal shutdown

A3010/A3020

If a thermal shutdown is suspected then the thermal fuse of the transformer can be tested as follows:-

- 1 Unplug machine from the mains.
- 2 Strip down the machine (see *Part 2 - Disassembly and assembly*).

3 Unplug the mains lead from PL1

4 Check Internal Fuse FS1 is ok.

5 Ensure On/Off switch is ON.

Using a ohm meter check the continuity of the primary circuits, a very low resistance should be *seen* (4 Ohms). If the primary reads open circuit then it is likely that the internal transformer thermal fuse has blown.

Return the PCB to an Acorn Authorised CSW for repair. A4000

If the PSU functions for a while before failing, it is likely that a controlled thermal shutdown has taken place. This is caused by a failure of a component that is internal to the PSU.

Should the PSU continue to shutdown then return the PSU to an Acorn Authorised CSW for repair.

Action if main PCB fails

Although the main PCB is a replacement only item, there are some checks that you can make before sending a faulty PCB to an Acorn Authorised CSW.

Remove the PCB from the main unit, using the procedure given in *Part 2 - Disassembly and assembly* and inspect the board for any of the following:

- ROMs or ROMs not in correct sockets or pins lifted from sockets
 - ROM size and type links incorrectly set. See the *Acorn A3010/A3020/A4000 Technical Reference Manual* for links LK10, LK11, LK12 and LK14
 - incorrect location and orientation of any other socketed devices
 - DRAM size links incorrectly set. See the *Acorn A3010/A3020/A4000 Technical Reference Manual* for links LK23 and LK24
 - Any loose debris lying on the PCB.
- If these checks do not disclose the fault, return the PCB to an Acorn Authorised CSW for repair.

Power-on self-test (POST)

The integral test software is invoked through the ARM reset vector, and will automatically select a test mode defined by the type of reset conditions and the presence or absence of external diagnostic equipment.

When no external equipment is connected, a standard user start up is performed. The test software will examine a status register in IOC to determine whether the reset was a soft reset or a power-on reset:

- If a soft reset occurred (Reset key operated or re-execution of the reset vector) then no further test operations take place and RISC OS is immediately started. This ensures that the most common type of reset operation is not delayed by operation of the POST.
- If the reset appeared to have been caused by a power-on operation, a short test sequence (the POST) is started. This is accompanied by changes of the screen

colour to indicate test progress. If faults are detected, these are indicated by a blinking LED on the floppy disc drive (if fitted). If no faults are found, this test sequence will last between 2 and 12 seconds (dependant on memory configuration).

Note 1: During the POST, the screen mode is set to suit a simple 15kHz monitor (Monitor 0, Sync 0). This will produce a signal unsuitable for VGA or High Resolution monitors, resulting in an unsynchronised screen display. If a stable display is not shown on a type 0 monitor, this may indicate either a video system fault, or some more fundamental fault which stops the test software itself from running.

Note 2: The various power-on key combinations should be held until the message in stage 5 (or the red screen border resulting from a power-on delete operation) appear — the keys will be ignored if released before the self-test sequence has completed.

The following is a normal POST sequence:

1 The screen colour is first set to purple to indicate testing has started. The first part of the test:

- performs a brief ROM and RAM test
- initialises the 10 controller
- initialises the Video controller.

This part of the test lasts less than a second and is not easily visible. However, certain system failures may cause the machine to crash or halt during this phase: no further activity will occur and this may be read as a major failure, probably of the 10 system.

2 The screen colour changes to blue if the simple memory test above is passed, indicating that a more extensive test has started. This phase can take up to 12 seconds on a 16MB machine.

3 Tests are now performed on the video and sound controller, VIDC. These are again very brief.

4 The screen colour reverts to purple and a test is performed for an ARM 3 processor. This test relies on good RAM, and will not be performed if a failure has already been detected.

5 The screen now turns black, with a memory size message displayed, indicating that the self-test is now complete. The system will normally start RISC OS. However, an unexpected failure could leave a purple screen displayed, indicating a major system fault.

If a fault has been detected, RISC OS will not start immediately. Instead, the entire screen will change to red, and the LED on the disc drive will flash. The flashing sequence indicates the fault detected in accordance with the following fault codes (an 8 digit hexadecimal number is displayed as 8 groups of 4 flashes, where a long flash indicates binary 1 and a short flash indicates binary 0).

Status bits

```
00000001 Self-test due to power-on
00000002 Self-test due to interface hardware
00000009 Self-test due to test link
00000008 Long memory test performed
00000010 ARM 3 fitted
00000020 Long memory test disabled by SRAM
           flag [V1.43]
00000040 Integrated I/O controller fitted [V1.43]
00000100 CMOS RAM checksum error [V1.47]
```

Fault bits

```
00000200 ROM failed checksum test
00000400 MEMO CAM mapping failed
00000800 MEMO protection failed
00001000 10C register test failed
00004000 VIDC (Virq interrupt) timing failed
00008000 Sound (Sirq interrupt) timing failed
00010000 CMOS RAM (clock/calendar chip)
unreadable
00020000 Ram control line failure
00040000 Long RAM test failure
```

Thus a ROM failure (fault code 00000219 on an ARM 3 machine) will be displayed as:

```
short short short short      0
short short long short       2
short short short long       1
long short short long        9
```

What to do next

Once you have repaired a fault and the computer is functioning, we recommend that you check for and correct any other faults. This is described in the next section — *Checking a partly working computer*.

Checking a partly working computer

The flowchart in *Figure 1-3: Procedure to check a partly working computer* on page 1-7 shows you how to diagnose and repair a partly working computer.

The following section gives details of how to isolate faults to individual modules, using the test disc (0294, 825) on machines which are running, but exhibiting faults. The test software can be used in two ways:

- As a test suite, including all the tests that you need for a standard configuration machine. The tests run automatically and in sequence.
- As individual tests to test an individual module.

We suggest that if the description of a fault is specific to a module then you only need to run the appropriate individual test. Once you have determined the area of the fault and repaired it, make sure that you run the full test suite on the working computer before returning it to the customer.

Before the tests

Before you run the test software suite, you need to perform the following tasks:

- back up the test disc
- validate the test equipment
- create an appropriate test IDE hard disc (A4000, and A3020 if fitted)
- replace the customer's hard disc (A4000, and A3020 if fitted)
- connect the customer's equipment
- save the customer's CMOS RAM settings.

These tasks are all described in *Appendix F - Tools for software testing*.

Safety considerations

A4000

Some of the tasks described in this section require that you remove the top cover of the Acorn computer. Although the PSU is designed to comply with BS7002/EN60950 Class 1, you must still take care to ensure that no metal objects fall (or are put) into the PSU through the ventilation holes.

A3010/A3020

If the top cover and the top half of the safety case of the A3010/A3020 is removed extra care must be taken due to the hazardous voltages exposed on the PCB.

If the PCB is removed from the metalwork of the A3010/A3020 extra care must be taken due to the hazardous voltages present on the bottom of the PCB.

Notes:

- 1 You must only connect the power after you have made all the other connections.
- 2 You must switch off the equipment and disconnect from the mains supply **before** removing any other connections.

You will find instructions for removing the top cover in *Part 2 - Disassembly and assembly*.

Figure 1-2: Procedure to check complete failure in the PSU on an A3010/A3020

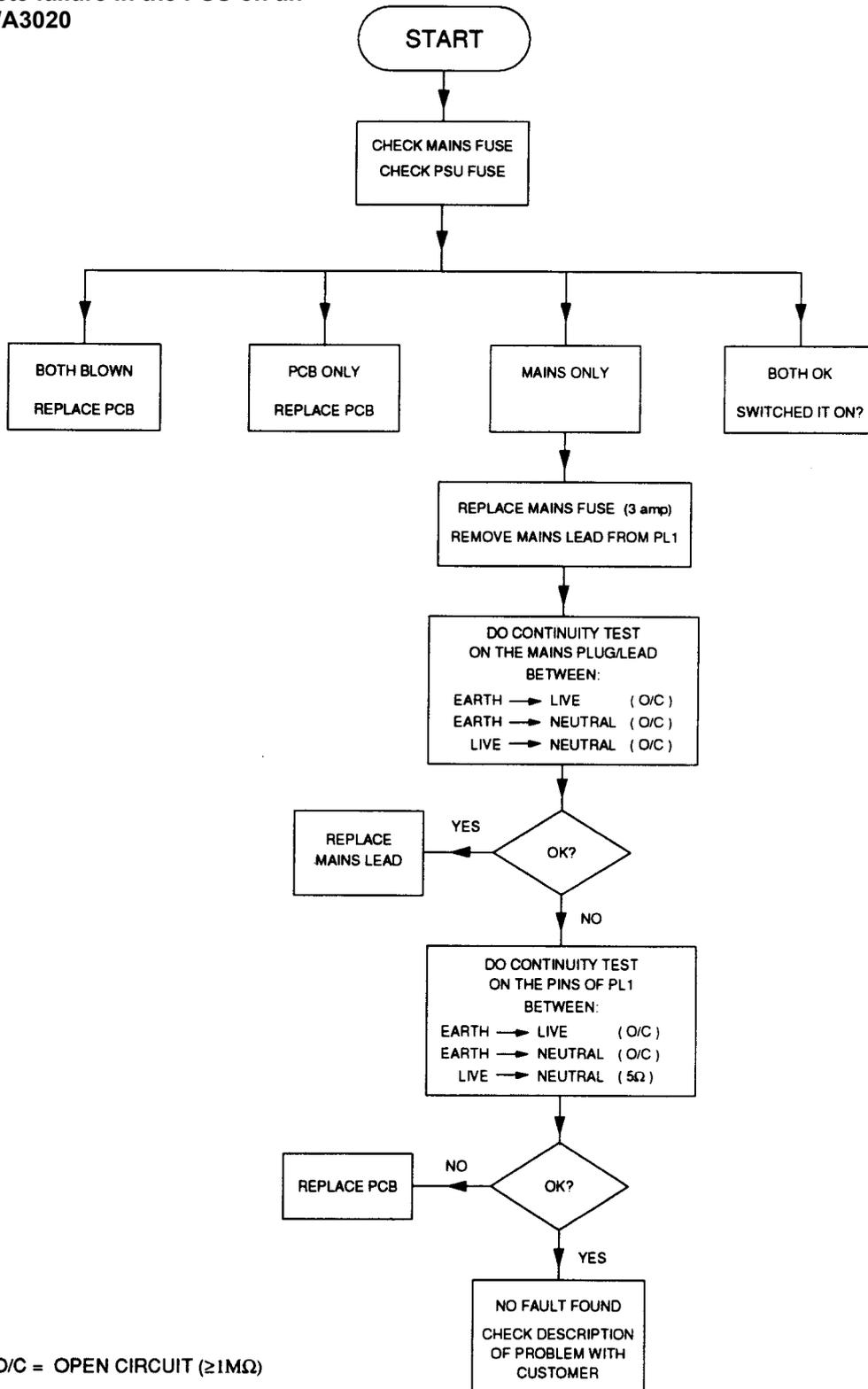
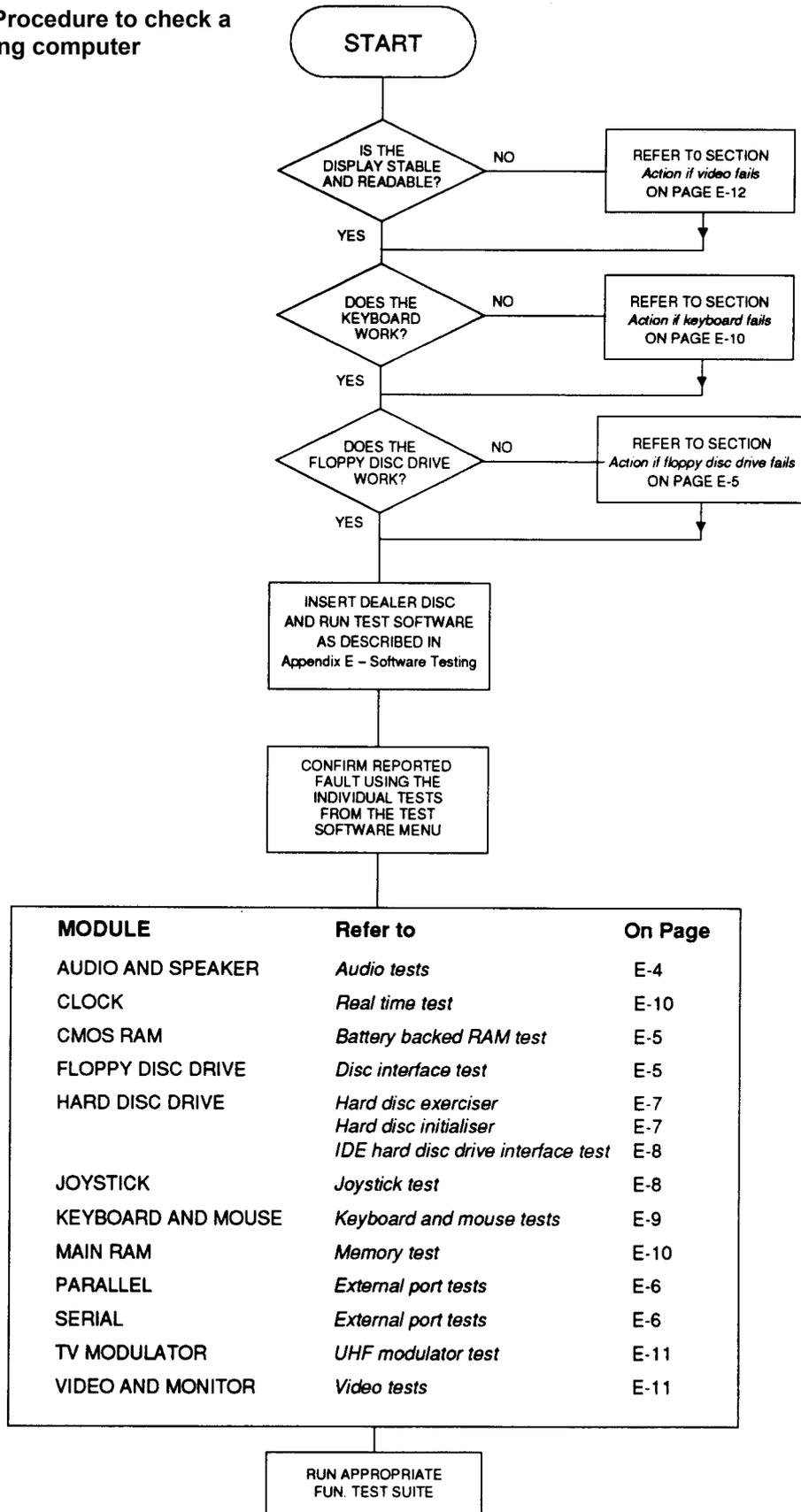


Figure 1-3: Procedure to check a partly working computer



Part 2 - Disassembly and assembly

Introduction

This chapter tells you how to break down a standard A3010, A3020 or A4000 computer into its serviceable modules, in order to carry out basic checks and replace modules found to be faulty.

It is recommended that you remove modules in the order given in this chapter, to ensure, for instance, that no cables are left connected to the particular item you wish to remove.

A3010/A3020

The main unit houses the following:

- Keyboard
- Main PCB
- 3.5" floppy disc drive
- Hard disc drive (if fitted)
- Speaker.

The PSU is part of the PCB and cannot be removed. The mouse and monitor are separate units.

See the appropriate third-party service information for the monitor. The mouse is a service replacement only item.

A4000

The main unit houses the following:

- Main PCB
- 3.5" floppy disc drive
- Hard disc drive
- Speaker
- PSU.

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.

A3010/3020

Removing the top cover

Note: The only screws you need to unscrew to remove the top cover of the A3010 or A3020 are those marked with the symbol shown here.



A3010

To remove the top cover of the A3010, follow the instructions in *Appendix E: Inside the computer in the Acorn A3010 Welcome Guide*.

A3020

To remove the top cover of the A3020, follow the instructions in *Appendix E: Inside the computer in the Acorn A3020 Welcome Guide*.

Removing the keyboard

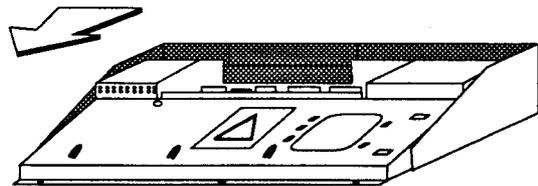
- 1 Pull out the two flexi strips to the PCB.
- 2 Lift the keyboard away and put it somewhere safe.

Removing the metal safety case

The metal safety case is made up of two parts; an upper metal envelope and a lower metal envelope.

Remove the metal safety case

- 1 Remove the two button-headed hexagon screws located underneath the PSU transformer – you will need metric hexagon keys to do this.
- 2 Remove the two screws at the front of the metal safety case.
- 3 Slide the metal safety case forward by about 5 or 6 mms (keep the floppy drive button depressed whilst easing the case evenly forward).



front of the metal safety case

- 4 Lift the metal safety case away from the plastic case, taking care not to damage the floppy drive button.

Separate the two parts of the metal safety case

- 1 Carefully but firmly remove the two ribbon cables to the rear of the floppy drive.
- 2 Remove the hexagon cap screw (3mm) at the front of the metal safety case.

3 The upper metal envelope is attached to the lower metal envelope by a series of small catches along the left and right hand bottom edges. Hold the back of the metal safety case and slide the upper metal envelope forward from the base until these catches disengage. Note: It might be necessary to use a screwdriver blade at the back of the case to help move the upper metal envelope forward. When you slide it forwards keep it parallel to the lower metal envelope.

When you have moved it forward, lift the upper metal envelope up a few inches into the air.

4 Still holding the upper metal envelope above the base disconnect the speaker from the PCB.

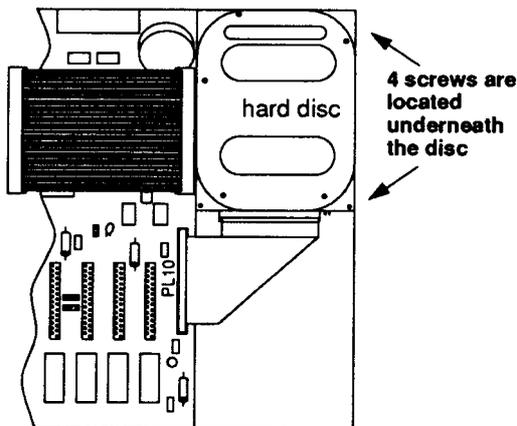
5 You can now separate the two metal envelopes.

Removing the floppy drive

The floppy drive is secured to the upper metal envelope by four screws. To remove the drive simply unscrew these four screws.

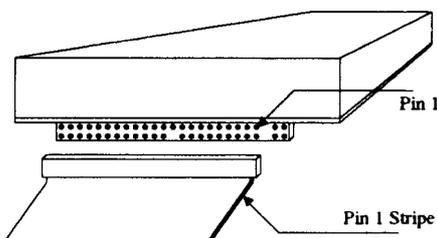
Removing the hard disc

The hard disc drive is secured to the lower metal envelope by four screws. To remove the drive disconnect the cable and unscrew these four screws:



WARNING:

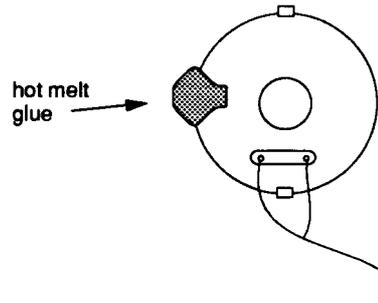
Incorrect connection of the Hard Disc to the computer can result in permanent and unreparable damage to the Hard Disc. Always ensure that the cable is connected to the left hand set of pins, with the 'Pin 1' stripe to the right (looking at the rear of the drive).



Removing the speaker

The speaker is located on the top right hand side of the upper metal envelope.

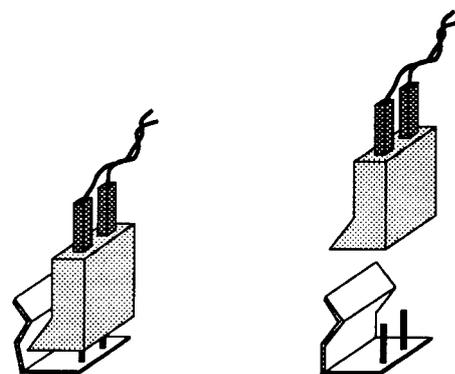
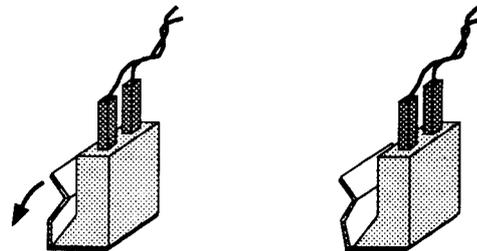
- 1 Cut off the hot melt glue.
- 2 Slide the speaker away from the two clips.



Removing the PCB

The PCB is part of the lower metal envelope.

- 1 Disconnect the mains cable in the top left corner of the envelope by gently pulling back the restraining tab and pulling out the cable:



- 2 At the back of the machine:
 - remove all the screw locks securing the connectors to the lower metal envelope
 - remove the ring lock (marked SK4) using an appropriate screwdriver.
- 3 On some machines you may have to remove the earth lead (by pulling the connector out).
- 4 Carefully lift the board away.

A4000

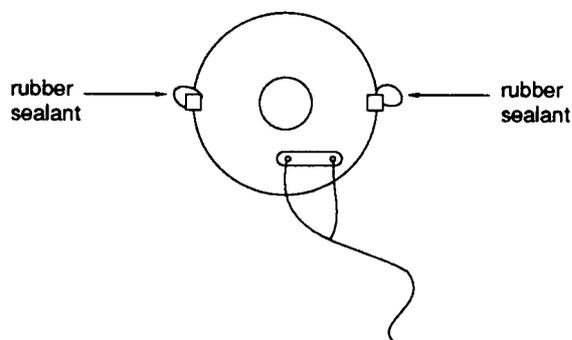
Removing the top cover

To remove the top cover of the A4000, follow the instructions in *Appendix E: Inside the computer* in the *Acorn A4000 Welcome Guide*.

Removing the speaker

Looking from the rear of the main unit, the speaker is located on the right hand side of the unit.

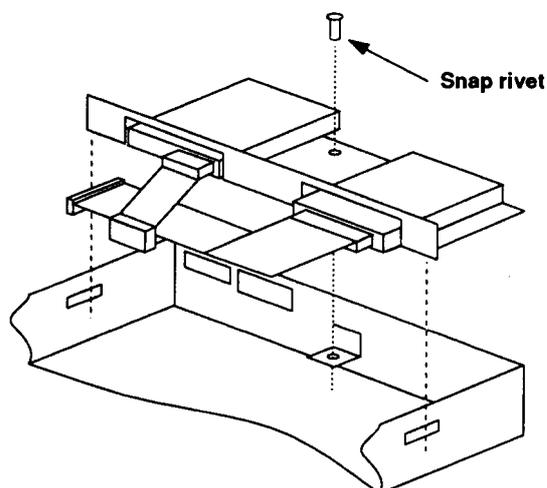
- 1 Disconnect the speaker cable from the PCB (LK19).
- 2 Remove the rubber sealant from each side of the speaker.
- 3 Pull the speaker directly upwards and out of the main unit.



Removing the Drive Tray

- 1 Remove the black snap rivet situated between the floppy and hard drives.

Note: This rivet can be removed and inserted by hand and is in two parts.

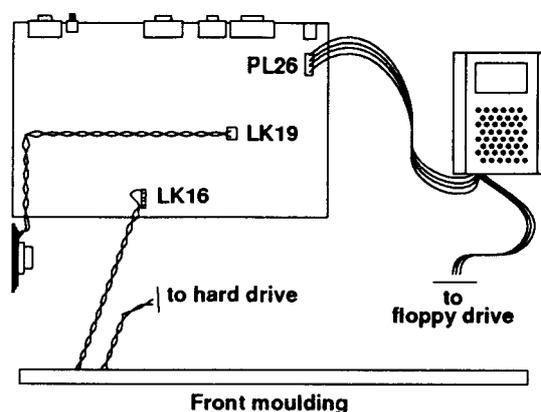


- 2 Disconnect the power leads from the PSU to the floppy and hard drives.

- 3 Disconnect the ribbon cables from the floppy and hard drives to the PCB.
- 4 Carefully lift the drives tray enough to disengage the ears from the metal base, and withdraw it from the front of the machine taking care not to force the floppy drive out of the front moulding.
- 5 Disconnect the hard drive LED lead.

Removing the PCB

- 1 Having removed the drive tray disconnect the power cable from the PSU to the PCB (PL26).
- 2 Disconnect the LED cable from the PCB (LK16).



- 3 Remove the 3mm screw securing the PSU to the lower metal case and slide the PSU forward a few millimetres.
- 4 Carefully lift the rear panel a few millimetres, this will disengage the rear panel from the three castellations on the lower metal case.
- 5 Unclip the three clips that secure the front of the PCB to the lower metal case. The rear panel and PCB assembly can now be (carefully) removed.

Removing the front plastic moulding

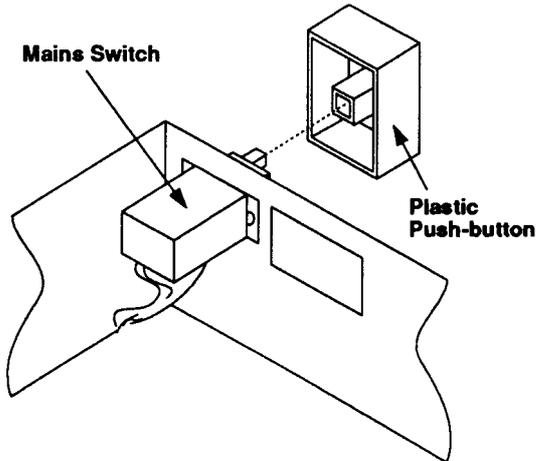
- 1 There are six spring plastic clips on the front moulding, three each on the top and bottom, attaching it to the main unit. Release these clips from the inside of the main unit.

- 2 Remove the plastic moulding.

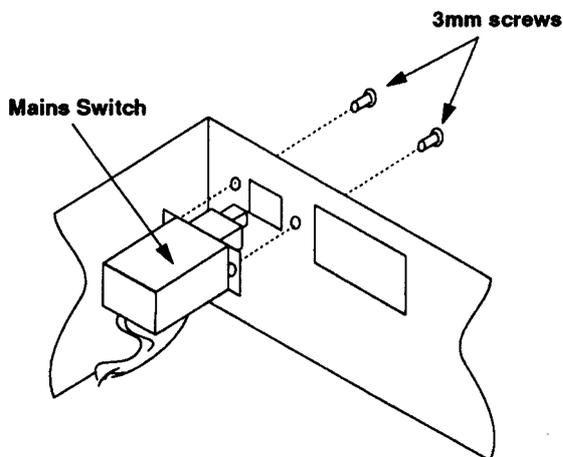
Note: There are two LEDs in the front moulding, with wires attached. Feed these wires carefully through the metal panel.

Removing the PSU

1 Remove the plastic push-button from the Mains switch. These parts snap together:



2 Remove the Mains switch secured to the lower metal case by two 3mm screws:



3 The PSU can now be removed.

Removing the floppy drive

- 1 Disconnect the power cable.
- 2 Disconnect the data cable.
- 3 Undo the spring clip.
- 4 Lift out the floppy drive from the PCB tray.

Removing the hard disc

- 1 Disconnect the power cable.
- 2 Disconnect the data cable.
- 3 Undo the spring clip.
- 4 Lift out the hard disc from the PCB tray.

Main unit assembly

DANGER:

WHEN REFITTING OR FITTING A REPLACEMENT ASSEMBLY, CHECKS SHOULD BE MADE FOR EARTH CONTINUITY AND FOR DC INSULATION.

FOR DETAILS REFER TO *Appendix C - Earth continuity testing* AND *Appendix D - DC insulation testing - class 1*.

NOTE THAT THE A4000 PSU IS A SERVICE REPLACEMENT ONLY ITEM.

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. The following points are also worth noting when you assemble the computer.

Power supply unit

A4000

When installing the PSU on the A4000, test the system for satisfactory earth continuity and DC insulation.

Also make sure that you connect the power connector to the main PCB correctly.

A3010/A3020

When installing the PCB on the A3010/A3020 check that the power supply insulation sheet is fitted, is in good condition, and has two clips securing it firmly in position. Also check that the second insulation sheet (underneath the power supply insulation sheet) is in place prior to assembly (not clipped to the PCB).

Speaker

When refitting the speaker, ensure that you replace the rubber sealant on each side of the speaker (A4000), or hot melt glue on one side of the speaker (A3010/A3020).

Disc drives

When refitting the drive support tray on the A4000, note that the tray has two tabs which slot into the front of the main unit and two clips, one at each side, holding the tray in place. Ensure that the two tabs on the tray slide fully into the slots at the front of the unit. If they are not completely in place, there is a risk of damage to the disc drives when the unit is moved.

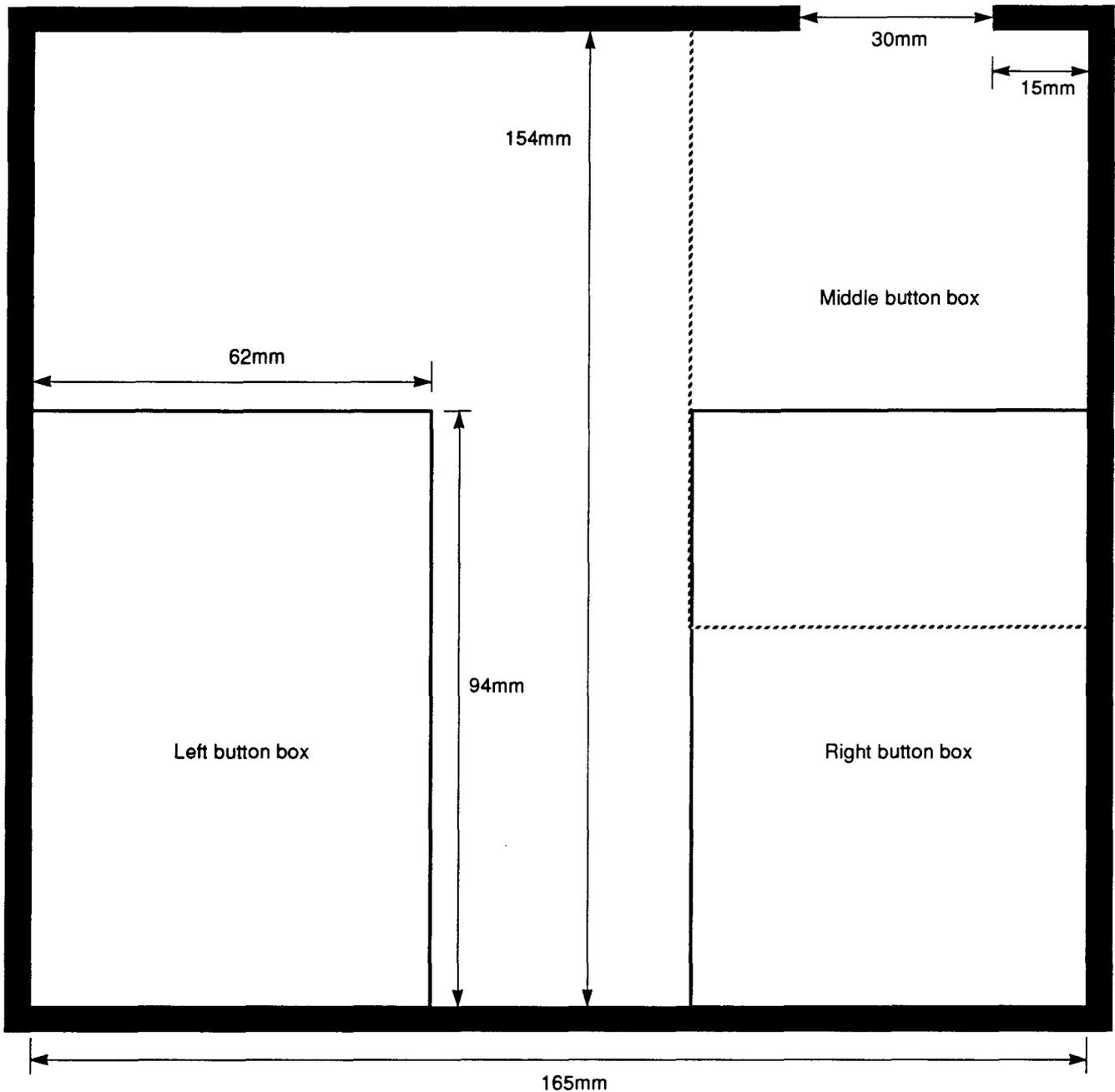
PCB

Where EMC gaskets are fitted, care is needed when assembling to ensure the gaskets are fitted correctly (the edges of the gaskets can be sharp).

Keyboard and Mouse

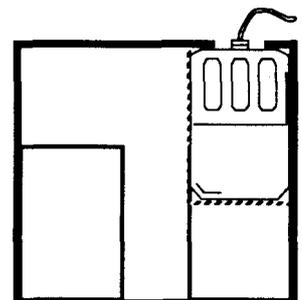
The keyboard and mouse are service replacement only items.

Appendix A - Mouse test jig template

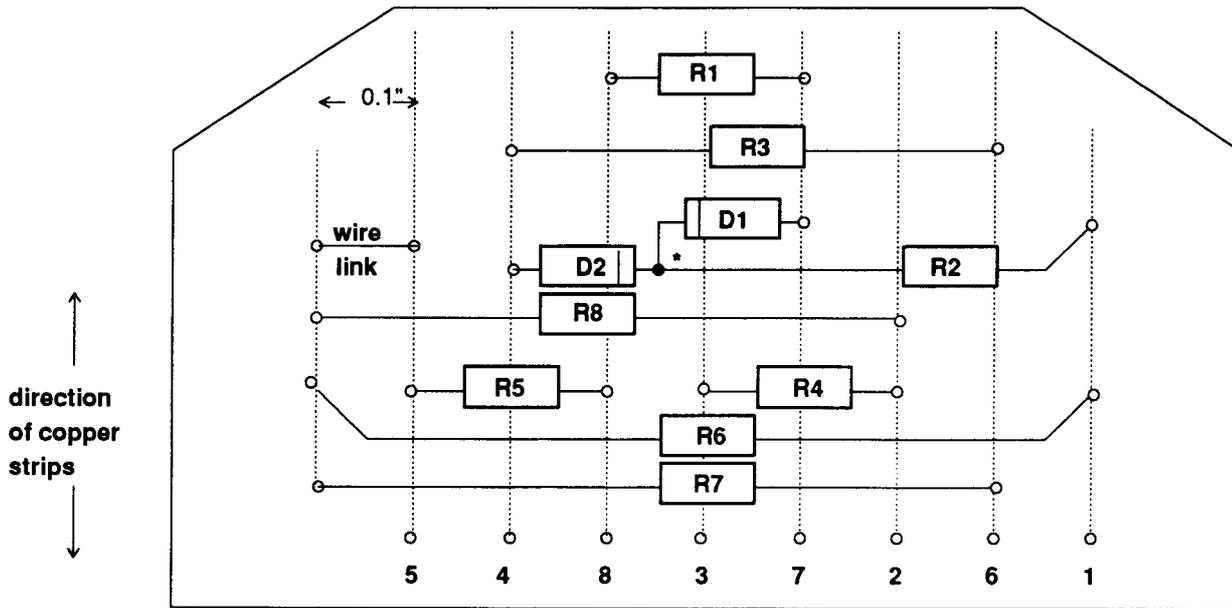


- 1 Using wood or metal strips, construct a test jig with the dimensions shown in the template (plan view) above.
 - 2 Secure the test jig to a firm, flat, horizontal, non-slip surface.
 - 3 Mark out the three button boxes shown on the template.
- Notes:
- The INSIDE dimensions of the jig are important.
 - The sides of the jig should be LESS than 5mm high.
 - The Middle and Right button boxes overlap.

Mouse in middle button box



Appendix B - Serial port loopback plug



○ hole

* components join above the board surface

Item	Part no.	Description	Qty
1	0276,081	CIRCUIT & ASSEMBLY DRAWING	1'
3	0800,288	CONR 9W SCKT 'D' ST MS SB	1
5	0800,991	CONR 9W SHELL 'D' + SCREWS	1
R1	0502,122	RES 1K2 C/MF 5% 0W25	1
R2	0502,122	RES 1K2 C/MF 5% 0W25	1
R3	0502,122	RES 1K2 C/MF 5% 0W25	1
R4	0502,122	RES 1K2 C/MF 5% W25	1
R5	0502,472	RES 4K7 C/MF 5% W25	1
R6			N/F
R7	0502,472	RES 4K7 C/MF 5% W25	1
R8	0502,472	RES 4K7 C/MF 5% W25	1
D1	0790,085	DIODE BAT85 SBL	1
D1	0790,085	DIODE BAT85 SBL	1

• per batch

Assembly notes

Assemble the components onto Veroboard, and fit item 5 (the shell) to protect the assembly

Note: This is the same serial loopback as used for the A3000, A540 and A5000 computers.

Appendix C - Earth continuity testing

Equipment required

An earth continuity tester or appliance tester capable of sourcing 8-25A derived from an AC source with a no-load voltage not exceeding 12V, for example, CLARE A433R-IO.

It is recommended that the calibration and operation of the instrument is checked frequently enough to ensure its accuracy.

DANGER:

THE FOLLOWING TESTS INVOLVE HIGH CURRENTS BUT LOW VOLTAGES. ALL NECESSARY PRECAUTIONS MUST BE TAKEN TO ENSURE OPERATOR SAFETY DURING TESTING.

DANGER:

SWITCH OFF THE COMPUTER, DISCONNECT IT FROM THE MAINS SUPPLY, AND DISCONNECT ANY EXTERNAL PERIPHERALS AND CABLES BEFORE CARRYING OUT THIS TEST.

WARNING:

DO NOT MOVE THE TEST PROBE WHILST APPLYING THE TEST CURRENT.

Before testing

Check the mains lead and plug for any physical damage and replace if necessary.

Consult the instructions supplied with the test equipment.

Test procedure for the A4000

The test should be performed on a fully assembled computer and the equipment must be tested with the mains lead it will be operated with.

Using the Earth continuity tester, check the continuity between the power supply cord plug earth/ground pin and the following points:-

1 the chassis upper wrap

Note: If you need to remove the paint from the upper wrap in order to make a good connection, do this in a place where it will not be visible to the customer. We recommend an area within the cooling slots on the side of the upper wrap.)

2 the lower wrap (metalwork) on the base of the unit

3 the rear panel

4 the expansion slot panel.

The resistance measured between the earth pin and each of the above test points shall not exceed 0.15 Ω . This value includes an allowance for the resistance of the mains cable. The **duration of each test shall not exceed 10 seconds**. No waiting period between tests is necessary.

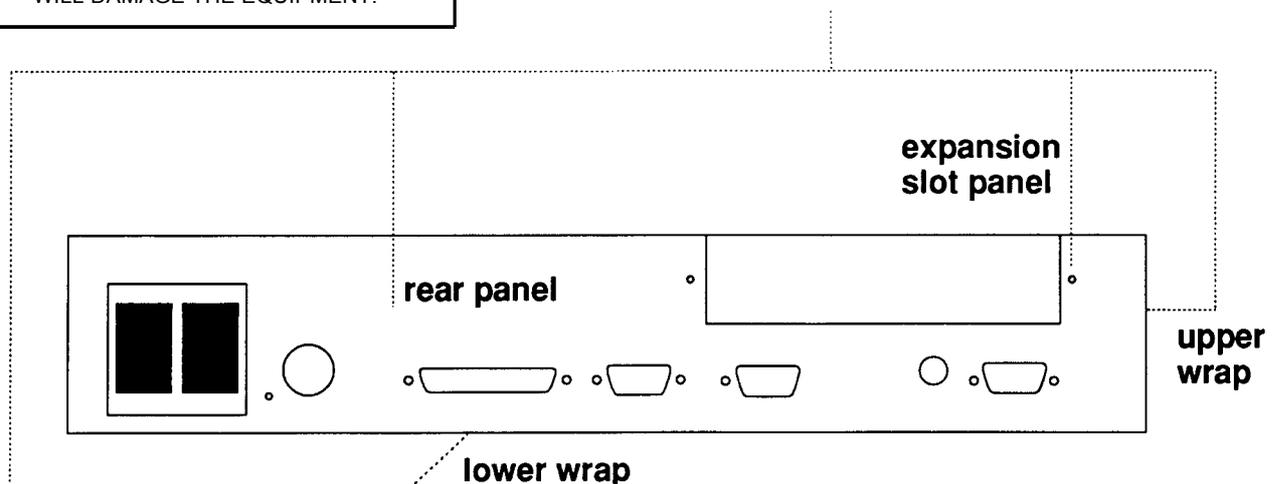
WARNING:

IF AN EXPANSION CARD IS FITTED CONSULT THE MANUFACTURER'S INSTRUCTIONS.

WARNING:

YOU MUST NOT ALLOW THE TEST PROBE TO TOUCH ANY OF THE CONNECTORS' SIGNAL PINS AS THIS WILL DAMAGE THE EQUIPMENT.

A4000 Earth continuity test points



Test procedure for the A3010/A3020

The test should be performed on a fully assembled computer and the equipment must be tested with the mains lead it will be operated with.

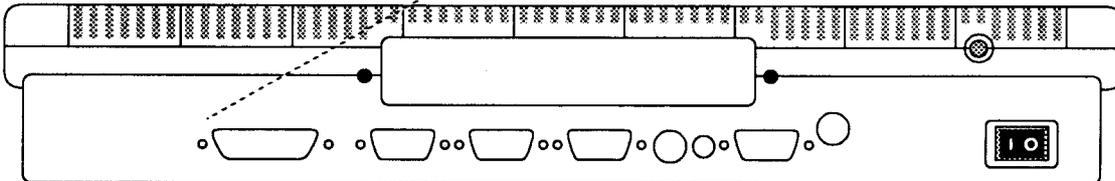
Using the Earth continuity tester, check the continuity between the power supply cord plug earth/ground pin and the rear panel port screws.

The resistance measured between the earth pin and each of the above test points shall not exceed 0.15

This value includes an allowance for the resistance of the mains cable. **The duration of each test shall not exceed 10 seconds.** No waiting period between tests is necessary.

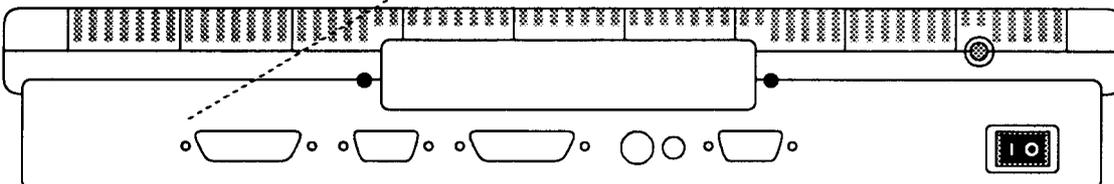
WARNING:
YOU MUST NOT ALLOW THE TEST PROBE TO TOUCH ANY OF THE CONNECTORS' SIGNAL PINS AS THIS WILL DAMAGE THE EQUIPMENT.

**A3010 Earth continuity test point
(rear panel port screws)**



WARNING:
YOU MUST NOT ALLOW THE TEST PROBE TO TOUCH ANY OF THE CONNECTORS' SIGNAL PINS AS THIS WILL DAMAGE THE EQUIPMENT.

**A3020 Earth continuity test point
(rear panel port screws)**



Appendix D - DC insulation testing - class 1

UK information only Equipment required

A portable appliance tester or an insulation tester that provides 500V DC ONLY.

Note: The computer contains RFI capacitors on the PSU input.

It is recommended that the calibration and operation of the instrument is checked frequently enough to ensure its accuracy.

DANGER:

THE FOLLOWING TEST INVOLVES HIGH VOLTAGES. ALL NECESSARY PRECAUTIONS MUST BE TAKEN TO ENSURE OPERATOR SAFETY DURING TESTING. NOTE THAT THE OPERATOR MUST BE TRAINED AND COMPETENT.

DANGER:

SWITCH OFF THE COMPUTER, DISCONNECT IT FROM THE MAINS SUPPLY, AND DISCONNECT ANY EXTERNAL PERIPHERALS AND CABLES BEFORE CARRYING OUT THIS TEST.

Before testing

Check the mains lead and plug for any physical damage and replace if necessary.

Consult the instructions supplied with the test equipment.

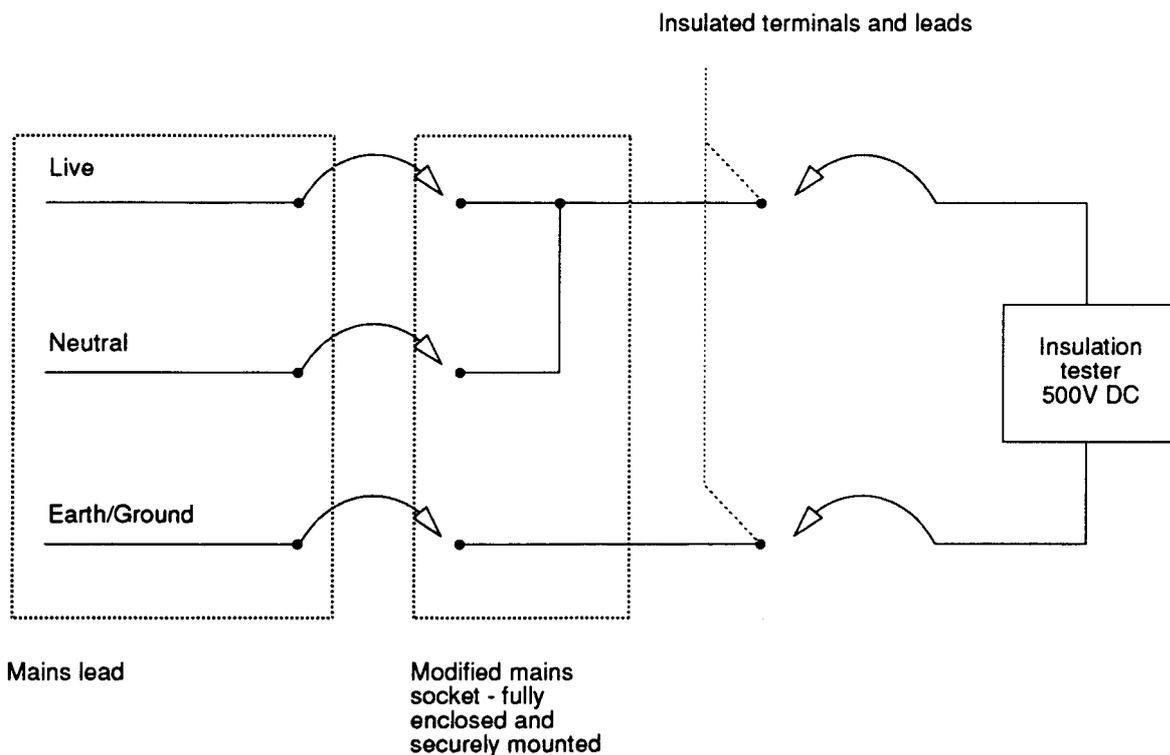
Test procedure

The test should be performed on a fully assembled computer.

The equipment must be tested with the mains lead it will be operated with.

- 1 Insert the mains lead either into the portable appliance tester, or into an adaptor, as shown below.
- 2 Move the computer's power switch to the ON position.
- 3 Apply the test voltage for LESS than 10 (TEN) seconds and then note the resistance.
- 4 Pass level: GREATER than 2 (TWO) Ma
- 5 Move the computer's power switch to the OFF position and remove the mains lead from the portable appliance tester.

Testing with an insulation tester



Appendix E - Software testing

About the tests

The Acorn Dealer Test Disc (0294,825) contains various menu-driven tests. The menus are generated from a set of text files. (You can generate new text files if you wish). There are two types of test:

- subjective – you must judge whether the equipment passes or fails these tests. For this reason it is a good idea for you to familiarise yourself with the correct results given by a known good computer (see the section entitled *Validating the test equipment* on page F-1). In this way you will be in a better position to judge faulty results.
- non-subjective – the test program passes or fails the equipment.

General points

The Acorn Dealer Test Disc is designed to test standard Acorn machines, it does not fully support third party upgrades.

How to operate the menu system

When you run the test software the main menu is displayed:

```
MENU VX.XX UN-DEF
(A) Test Suite
(B) Individual Tests
(C) Load / Save CMOS
(D) Quit
Select the test type of your choice
```

To select one of these menu options type the corresponding code (e.g. typing **A** would take you to the Test Suite menu).

The Test Suite

If you selected option **A** from the main menu a list of available suite options will be displayed. These options break down into soak tests, which run themselves without any intervention from you, and functional tests, which run through a series of tests under your control. They are shown in Table 1:

Table 1. Test suite menu

Code	Test
A	A3010 1MB Fun. Test
B	A3010 1MB Soak Test
C	A3010 2MB Fun. Test
D	A3010 2MB Soak Test
E	A3020 2MB Fun. Test
F	A3020 2MB Soak Test
G	A3020 2MB+HD Fun. Test
H	A3020 2MB+HD Soak Test
I	A4000 2MB+HD Fun. Test
J	A4000 2MB+HD Soak Test

Select the appropriate test for the machine you are testing by typing the corresponding code.

Individual Tests

If you selected option **B** from the main menu a list of all the individual tests will be displayed. This list of tests is shown overleaf in *Table 2: Individual test options*. To select one of these tests type in the appropriate code.

(Table 2 also shows which tests are available for particular machine configurations.)

General notes

During a Functional test suite sequence, the software runs through a series of individual tests prompting you to press the space bar after each test:

```
PRESS <SPACE BAR> TO CONTINUE
```

If the computer passes the current test, the test program waits for approximately 1 second and, if you do not press the space bar in this time, continues with the next test. If you do press the space bar within the 1 second period, the program continues immediately.

If the computer fails the current test, the test program beeps and waits for you to press the space bar. This allows you to make a note of the fault and then continue with the tests. You should also note any other failures, but bear in mind the possibility that these failures could be caused by the first recorded failure.

If you are in the Main menu and you want to run a specific test you do not have to go the Individual Tests menu first. Instead you can type in the Main menu code followed immediately by the Individual test code.

For example:

- BR** would take you from the Main menu to the Printer test.
- BJ** would take you from the Main menu to the Sound test.
- AC** would take you from the Main menu to the A3010 2MB Fun. Test (in the Test suite).

Connecting the customer's equipment

Connect the customer's equipment in the following order:

- 1 A4000: keyboard to back panel connector
- 2 serial port loopback plug to the RS232 port
- 3 printer to the printer connector
- 4 headphones to the Headphones 32 Ohm socket
- 5 multi-sync analogue RGB monitor to the video socket
- 6 A3010/A3020: mouse to the mouse connector on the rear panel
A4000: mouse to the mouse connector on the keyboard
- 7 A3010: joysticks to rear panel
- 8 A3010: TV to rear panel
- 9 monitor to the mains supply (do not switch on yet)
- 10 computer to the mains supply (do not switch on yet).

Running the test software

The following is an example of how to test a standard computer.

Note: In order to run the functional tests you must first have saved the customer's and manufacturer's CMOS RAM settings, as described in *Appendix F- Tools for software testing*.

Note: The software is designed to run from a shift power-up/Break. Do not run the software from the desktop.

- 1 Insert the test disc (0294,825) into the floppy disc drive.
- 2 Switch on the computer, whilst holding down the Delete key (not the backspace key) and the Shift key. Keep holding down these keys for several seconds, until the auto-boot file is executed. (This action clears the CMOS RAM and resets the configuration defaults to the manufacturer's original specification).
- 3 A boot file now runs and displays the Main menu.
- 4 To run the entire test suite, select option A from the Main menu. To run an individual test, select option B from the menu and then select the appropriate test. The following instructions refer to the full functional test suite, similar steps apply to individual tests.
 - 1 If you selected option A, the Test suite menu will be displayed. Select the functional test from this menu

Table 2: Individual test options

Code	Test	A3010 1MB	A3010 2MB	A3020 2MB	A3020 2MB+HD	A4000 2MB+HD
A	A3010 1MB Hardware Check	✓				
B	A3010 2MB Hardware Check		✓			
C	A3020 2MB Hardware Check			✓		
D	A3020 2MB+HD Hardware Check				✓	
E	A4000 2MB+HD Hardware Check					✓
F	Memory test	✓	✓	✓	✓	✓
G	Serial Test	✓	✓	✓	✓	✓
H	Printer Test	✓	✓	✓	✓	✓
I	Video Test	✓	✓	✓	✓	✓
J	Sound Test	✓	✓	✓	✓	✓
K	CMOS RAM Test	✓	✓	✓	✓	✓
L	CMOS Time Test	✓	✓	✓	✓	✓
M	103 Key Keyboard Test	✓	✓	✓	✓	✓
N	103 Key Logi Sqr Mouse Test	✓	✓	✓	✓	✓
O	103 Key Logi Rnd Mouse Test	✓	✓	✓	✓	✓
P	Floppy Disc Drive 0 Test	✓	✓	✓	✓	✓
Q	Format 60MB IDE Drive 4				✓	
R	Format 80MB IDE Drive 4					✓
S	IDE Interface Test				✓	✓
T	IDE Hard Disc Exerciser				✓	✓
U	Joystick I/F Test	✓	✓			
V	T.V. Modulator Test	✓	✓			

that is correct for the machine configuration of the UUT (which will then configure the CMOS RAM for that particular machine).

For example, if you want to run a full functional test on an A3020 2MB machine you would type A to go from the Main menu to the Test suite menu, then c to select the A3020 2MB Fun. Test (or just type AC when you are in the Main menu).

2 A list of settings will then appear on the screen. These are the test configuration modules read from the test data file and set up in the CMOS RAM. The tests are detailed in the section entitled *Individual Functional tests* on page E-4.

After the functional tests

At the end of the functional test suite, we recommend that you:

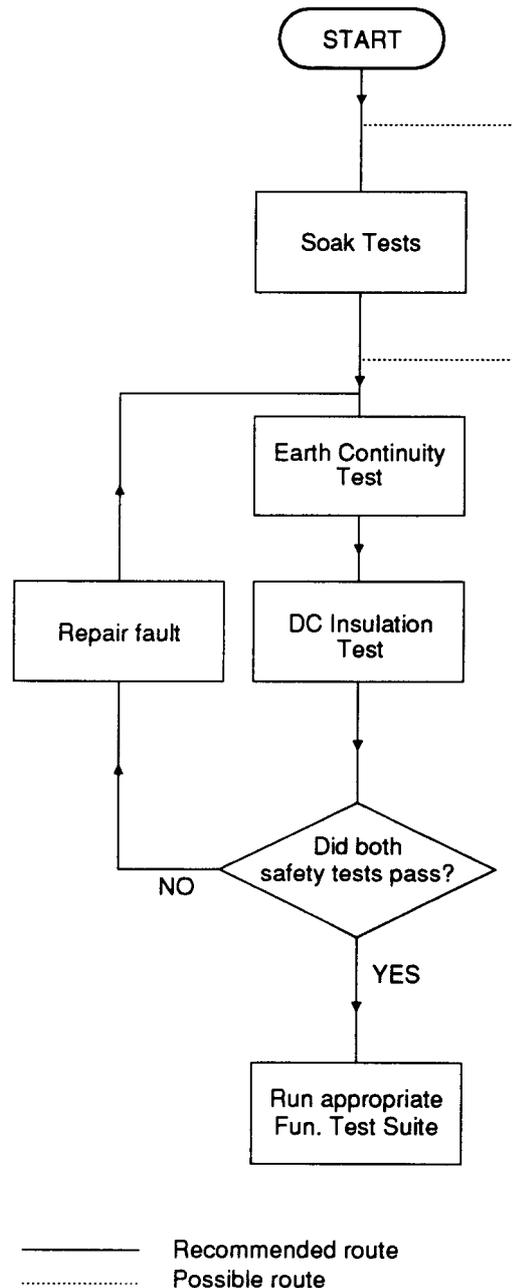
- perform the soak tests
- perform the safety tests
- retest the unit.

See *Figure H-1: Procedure after repair* on page E-3 for an overview of this procedure.

Also, before returning the computer to the customer, you must perform the following tasks using the procedures described in this section:

- restore the CMOS RAM settings
- switch off the equipment
- disconnect the equipment
- replace the customer's hard disc (if necessary).

Figure H-1: Procedure after repair



Performing safety tests

Once you have proved that the UUT functions correctly, you must perform the safety tests described in *Appendix C - Earth continuity testing* and *Appendix D - DC insulation testing - class 1*.

If either the earth continuity test or the DC insulation test fails, take steps to fix the fault. If the problem lies with the PSU, return it to an Acorn Authorised CSW for repair.

Switching off the equipment

If you have completed service or tests on the system and are about to move the computer and/or return it to the customer, you **must** do the following before switching off:

- 1 Shutdown the unit under test.
- 2 Switch off the power to the computer (at the mains switch on the front of the machine).
- 3 Switch off the power to the rest of the equipment.

Disconnecting the equipment

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

- 1 the Acorn computer from the mains supply
- 2 the monitor from the mains supply
- 3 all other equipment from the mains supply
- 4 the monitor from the Acorn computer
- 5 the headphones from the headphones socket
- 6 the printer from the Parallel Printer port
- 7 the serial port loopback plug from the RS423 socket
- 8 the keyboard from the rear panel connector (A4000 only)
- 9 T.V (A3010 only)
- 10 joystick (A3010 only)
- 11 mouse (A3010/A3020 only).

Packing

After servicing, repack the 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.

Individual Functional tests

This section details all the available functional tests.

Test	page
Audio	E-4
Battery backed RAM	E-5
Disc interface	E-5
External port (Printer, RS423)	E-6
Hard disc exerciser	E-7
Hard disc initialiser	E-7
Hardware check	E-7
IDE hard disc drive interface	E-8
Joystick	E-8
Keyboard and mouse	E-9
Memory	E-10
Real time	E-10
UHF modulator	E-11
Video	E-11

Audio tests

Note: The audio tests are subjective tests and that you should be familiar with the correct sounds before running the tests.

Speaker tests

The screen clears and the following menu is displayed:

```
SOUND TEST VX.XX DEALER
```

```
Running Loudspeaker Test Listen  
and check sound quality
```

```
Stereo Output Channel
```

Flashing arrow heads («») will then point alternately left and right depending on the stereo channel being used.

The test consists of a repeating sequence of 8 musical notes.

- 1 Listen to the sequence of notes.
- 2 Check for any deviation from the known good sound, and ensure that a clean sound is being emitted from both channels.

- 3 Listen for any interference or background hissing from the speaker.

Press F5 if correct, or F8 if not correct, to continue. You cannot press a function key until at least one cycle of each sound channel is complete.

Headphone tests

When prompted connect headphones to the Headphones 32 Ohm socket.

The headphone test is similar to the speaker test except that the sound is sent through the headphones. The same checks that are used for the loudspeaker test should be undertaken. The first four notes are played in one

headphone and the next four notes in the other headphone. Press F5 if correct, or F8 if not correct, to continue. You cannot press a function key until at least one cycle of each sound channel is complete.

Remove headphones when prompted.

The screen will then clear and the sound test results will be displayed. If the test fails, refer to the following section entitled *Action if audio tests fail*.

Action if audio tests fail

If it appears that the speaker alone is at fault, check the speaker connections. Ensure that the cable connecting the speaker to the PCB is in place. Also check the solder joints on the speaker tags and the two crimps in the shell. Repair any bad joints and try the tests again. For details of how to remove the speaker, refer to *Part 2 - Disassembly and assembly*.

Disassembly and assembly.

If the headphones alone appear at fault, substitute a known working pair of headphones and retest.

If these actions fail to restore the audio system or the audio system is distorted or corrupted in some way, you must remove the main PCB and return it to an Acorn Authorised CSW.

Battery backed RAM test

The following is displayed on the screen:

```
CMOS TEST VX.XX DEALER
Copied CMOS RAM into main memory.
Passed CMOS RAM Configuration.
Passed Read - Write function.
Copied CMOS RAM from main memory.
Passed CMOS RAM Verification Test
```

```
THIS SUB TEST HAS PASSED
PRESS <SPACE BAR> TO CONTINUE
```

During the Configuration check of the CMOS RAM you will be requested to enter the file name for the CMOS data file that should be used for this test. This file contains the CMOS data, and will change with different configurations of unit (i.e. IDE fitted etc). You should press Return to use the default data file. If you need to use a specific file, not the default, then enter the path and filename of the data file to be used.

Action if the battery backed RAM test fails

Check that the CMOS test data file is correct. If the test still fails, then refer to the section entitled *Action if main PCB fails* on page 1-3.

Note: If this test fails you cannot rely on the results of the remaining tests. This is because the CMOS RAM is used to control the test sequence and store the results.

Disc interface test

The screen will clear and the following will be displayed:

```
FLOPPY DISC TEST VX.XX DEALER
Passed Write Protect Test.
Passed Verification Test.
Running Write Track Test 0, Drive 0
Remove the test disc from drive :0
Insert the BLANK DISC in drive :0
The BLANK DISC needs to be F Map
```

Insert the blank *scratch* disc, and the write track test continues, displaying the following on the screen:

```
Working Track 76 Sector 04 Head 00
Disc Address used &000BF000
```

The read track and erase track tests are now complete. When you are requested, put the test disc back in drive :0. Press the space bar to continue.

If the write protect test fails it will corrupt the test disc. You will then have to replace it with a new copy. A sign of this corruption is that a file called ! DISC_FAIL will appear on the disc, and the disc will not boot.

If errors occur during the read test, a maximum of 12 read errors may occur per sector before the next sector is read. A total of 6 sectors are tested.

Note: During the soak tests only the write protect and verification tests are executed.

Action If floppy disc drive fails

If there is no desktop icon, check the CMOS RAM configuration for "floppies 1" and reset if necessary. Disassemble the machine (see *Part 2 - Disassembly and assembly*) and check that both the 34 way data cable and the 4 way power cable are securely connected at the rear of the drive. Also check that the data cable is connected to the main PCB at PL10 (the A3010/A3020 power cable is connected to the main PCB at PL5).

Using a voltmeter, check that 0V is present on pins 2 and 3. Also check that +5V is present on pin 1 (conductor 1 is marked with white on the cable) of the disc drive power cable. If there is no power, inspect the crimps inside the connector shell and repair or replace if possible. If the

failure is with the PSU itself (A4000 only), return it to an Acorn Authorised CSW for repair.

Check the data cable by substituting a known working cable and retesting. Check the power cable (A3010/A3020) by substituting a known working cable and retesting.

As a final measure, try substituting a known working floppy disc drive. Depending on the outcome of this test, return either the main PCB or the floppy drive to an Acorn Authorised CSW for repair.

If an icon is present but an error occurs during access, disassemble the machine and check that the 34 way data cable is correctly connected both at the rear of the drive and on the main PCB PL10 (the A3010/A3020 power cable is connected to the main PCB at PL5).

Check the data cable by substituting a known working cable and retesting. Check the power cable (A3010/A3020) by substituting a known working cable and retesting.

Also check that the main PCB links are set correctly. See the *Acorn A3010/A3020/A4000 Technical Reference Manual* for LK18, LK19 and LK21.

Try to format a new floppy disc and retest the drive by attempting to read the original disc on another machine.

Note: If this fails the disc may be corrupted.

As a final measure, try substituting a known working floppy disc drive. Depending on the outcome of this test, return either the main PCB or the drive to an Authorised Acorn CSW for repair.

External port tests

You should be familiar with the correct print-out pattern before running this test. It should resemble *Figure H-2: Printer test output* shown overleaf.

While each test is being run the word Running will appear next to the test and then, when the test is complete, the pass/fail message will overwrite it.

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 a missing or corrupted pattern. As this is a subjective test make a note of any faults that you detect.

The **RS423** port test is carried out automatically and gives a passed/failed message.

The screen will clear and the following will be displayed:

EXTERNAL PORTS TESTS VX.XX DEALER

Passed PRINTER,EPSON FX.
 Passed Printer Graphic Test.
 Passed Printer Text Test.
 Passed SERIAL, 82C710 CHIP TEST.
 Passed Control Line Test.
 Passed Data Line Test.
 Passed Communications State Test.
 Passed Baud Rate Test.
 NOT DOING ECONET PORT TEST

THIS SUB-TEST HAS PASSED
 PRESS <SPACE BAR> TO CONTINUE
 Check the printout.

Action if printer test fails

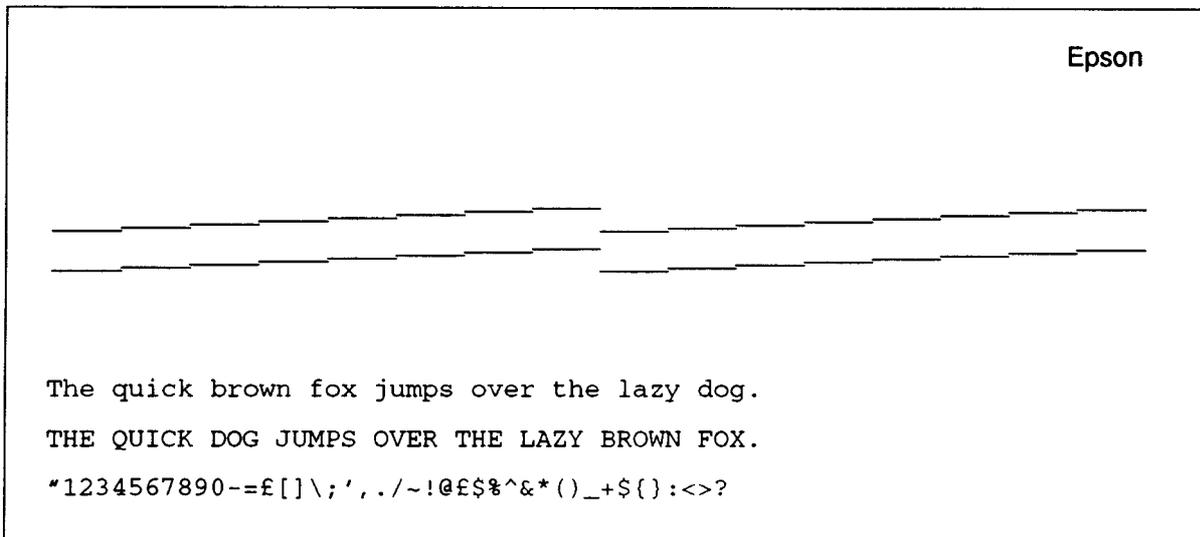
- Check that the configuration settings for PRINTER and IGNORE are correct.
- Check that the type of printer displayed matches the type used.
- Check that the printer is on line and that the printer lead is connected correctly and functions correctly.
- If the fault still persists then refer to the section entitled *Action if main PCB fails* on page 1-3.

Action if the RS423 tests fail

- Ensure that configuration items BAUD and DATA are set to sensible values (see the *RISC OS User Guide*).
- If the test still fails, check that the correct loopback plug is fitted and that it functions correctly (this can be done by trying it on another unit).
- If the unit still fails, then refer to the section entitled *Action if main PCB fails* on page 1-3.

Note: During the soak tests neither the printer nor the RS423 tests are executed.

Figure H-2: Printer test



Hard disc exerciser

This program exercises the hard disc by creating 20 random data files on the disc. It then performs 4000 various operations on these files. A pass completion screen is displayed, similar to that shown below:

```
SCSI WINCHESTER EXERCISER

Operations 4000

      Pass Fail          Pass  Fail
File 1  104          File B   57
File 2   98          File C   70
File 3  166          File D   75
File 4  157          File E   89
File 5   86          File F   77
File 6   48          File 10  98
File 7   98          File 11 181
File 8   80          File 12 103
File 9  112          File 14  93
File A   85          File 15 114

Disc Op.  0 Commands  0
```

The values given to Disc Op. and commands are 8 bit patterns decoded to be the following:

```
Disc Op.
Bit 7,6,5 Not used
Bit 4      Read Failure
Bit 3      Write Failure
Bit 2      Failed trying to close file
Commands
Bit 7      Fail try to load dummy file
Bit 6      Compact Failed
Bit 5      Verify Failed
Bit 4      Free Failed
Bit 3      Map Failed
Bit 2      CAT Failed
Bit 1      not used
Bit 0      not used
```

When complete the test will perform a verify of the hard disc.

Note: This program requires a minimum of 2MB RAM and 5MB HD free space. Although this test is nondestructive, a backup copy of the customers data is recommended.

Hard disc initialiser

WARNING:

THIS TEST WILL WRITE TO THE IDE HARD DISC. YOU SHOULD FIT A TEST HARD DISC (SEE THE SECTION *Creating a test IDE hard disc* ON PAGE F-1) OR ALTERNATIVELY ENSURE THAT THE CUSTOMER IS AWARE THAT THEIR HARD DISC WILL BE OVERWRITTEN, AND HAS GIVEN THEIR CONSENT BEFORE YOU START. THE SOFTWARE WILL AUTOMATICALLY RUN THE INITIALISER, WITHOUT ANY OPERATOR INPUT.

Note: The figures given in the following example are for illustration only and vary according to the model of hard disc drive.

When you run the hard disc initialiser program, the screen clears and the following information is displayed (the figures given are typical for a 40MB hard disc):

```
HARD DISC FORMATTER

Format which drive (4-7)? 4
Drive 4 is an IDE drive
IDE drive ADFS:4 identifies itself as :
Description : <manufacturer's name, model no.>
Firmware Version : <Version no.>
Configuration : < ? cylinders, ?
heads and ? sectors/track>
This disc was last formatted using the
standard shape :
<manufacturer's name, model no.> 526
Cylinders, 4 Heads and 40
Sectors/Track
Parking cylinder 527, Initialisation flag 1
Do you wish to use this shape (Y/N) ? N Do
you wish to use the standard shape for this
drive (Y/N) ? Y

A: no more changes
B: add defect by cylinder, head,
  byte/sector
C: add defect by disc address
D: remove defect
A,B,C, or D ? A

Disc will be formatted as
<manufacturer's name, model no.> 526
Cylinders, 4 Heads and 40
Sectors/Track
Parking cylinder 527, Initialisation flag 1
Format or just initialise the drive (
F/I) ? I

Soak test the hard disc for defects (
Long/Short/None) ? S

Are you SURE you want to do this to
drive ADFS:4 (Y/N) ? Y
Verifying
Large file allocation unit? 512
Writing defect list

Creating map
Writing map
Writing root directory
Bytes free &02910800 = 43059200
Bytes Used &00007800 = 30720
```

PRESS <SPACE BAR> TO CONTINUE

Hardware check

This test performs a comparison check between the test data file and the items it finds fitted to the computer. The screen will clear and the results of the comparison checks will be displayed. For example:

```
COMPUTER TYPE TEST VX.XX DEALER
```

```

PASSED CPU version matches
PASSED MEMC version matches
PASSED OS version matches
PASSED Memory size matches
PASSED ST506 int. correct setup
PASSED ST506 ext. correct setup
PASSED IDE int. correct setup
PASSED Hard disc is correct size
PASSED FDC correct setup
PASSED Serial correct setup
PASSED Ethernet I correct setup
PASSED Ethernet II correct setup
PASSED SCSI Podule correct setup
PASSED ROM Podule correct setup

```

PRESS <SPACE BAR> TO CONTINUE

If the test fails, make a note of the fault and press the space bar.

The following will be displayed:

```

COMPUTER TYPE TEST VX.XX DEALER
PASSED UPM correct setup
PASSED I/O correct setup
PASSED I/O MIDI correct setup
PASSED MIDI correct setup

```

PRESS <SPACE BAR> TO CONTINUE

If all modules are correct then the program will report a pass.

When the program is run under the 'Dealer' test type (shown on the top of each screen) and the program detects a module fitted that does not match the description given for that module in the configuration file, then the program will report that item as having been 'CHECKED' instead of failed. The program will then pause at the bottom of the screen to let you see the difference. Therefore the program will not be able to fail. Under all other test types the program will fail.

Action if hardware check fails

If hardware check finds a module that should have been passed but was reported as checked or failed, then this module is either faulty or the data file used was incorrect.

Check that the system matches the data file that you selected.

If the data file is correct, refer to the section entitled *Action if main PCB fails* on page 1-3.

IDE hard disc drive interface test

The screen will clear and the following will be displayed:

```

IDE INTERFACE TEST VX.XX DEALER
Drive 4 is IDE
ADFS::4 is IDE drive 0
IDE drive : 0
Description : <aaaaa> <bbbbb>
Firmware version : <cccc>
PASSED byte check

```

THIS SUB-TEST HAS PASSED
PRESS <SPACE BAR> to continue.

Note:

<aaaaa> Drive manufactures name (e.g. Conner Peripherals)
<bbbbb> Drive model number (e.g. CP3044)
<cccc> Firmware version number (e.g. 2SA4.53)

Action If the IDE hard disc drive fails

Check that the machine configuration is set for "IDEdiscs 1" and reset if necessary. Disassemble the computer using the procedure given in *Part 2 - Disassembly and assembly* and check the following:

A4000

- the 40 way data cable is securely connected to the drive and to PL9 on the main PCB.
- the 4 way power connector is correctly attached. Using a voltmeter confirm that the following voltages appear on the 4 way power connector:
 - 0V on pins 2 and 3 (black cable)
 - 5V on pin 4 (red cable)
 - +12V on pin 1 (yellow cable)

If a voltage is missing, check the crimps within the connector shell and repair if possible. If the problem is within the PSU then you must return this to an Acorn Authorised CSW.

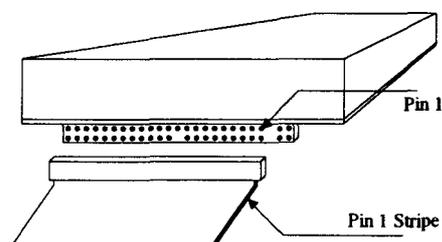
A3020

- the 44 way power/data cable is securely connected to the drive and to PL10 on the main PCB.

Try substituting a known working data cable for the existing cable and retest.

WARNING:

Incorrect connection of the Hard Disc to the computer can result in permanent and unrepairable damage to the Hard Disc. Always ensure that the cable is connected to the left hand set of pins, with the 'Pin 1' stripe to the right (looking at the rear of the drive).



Joystick test

The screen will clear and display two crosses on the screen. You are then required to move the joysticks to the limits on each of the four axes.

When you have done this press the fire button.

The program checks that each input is exclusive, i.e. only one switch pressed at one time will be accepted. The program shows a correct input by putting a green bar at the end of each axis and the fire button box.

The program will test both joysticks at the same time. Once all the inputs have been tested then the program will automatically continue.

If you cannot get an input to operate then you can fail that joystick by pressing F8, then inputting either L or R to indicate the Left or Right joystick.

If a failure occurred you should press the space bar when prompted at the end of the test.

Keyboard and mouse tests

Note: For the mouse test you will need a mouse jig template to perform the test (see *Appendix A - Mouse test jig template*).

Reset button sub-test

During this test you are asked to press the Reset button to test the operation of the switch. If this button works, the program moves onto the next sub-test automatically.

If the test fails, refer to the section entitled *Action if A4000 keyboard fails* on page E-10.

Stuck key sub-test

This sub-test tests for stuck keys or mouse buttons. If no items are found to be stuck, the test software moves onto the next test automatically without displaying any information.

If any keys or mouse buttons are stuck down, you will see the following screen display:

```
SOME KEYS ARE STUCK
```

```
Note the keys that are stuck, reject the
keyboard or the mouse.
```

```
Press the Break key to continue and wait.
```

Press the Break key and the program moves to the Keyboard/Mouse report screen. Refer to the section entitled *Action if A4000 keyboard fails* on page E-10.

Throughout the following tests if you press the wrong key nothing will happen. If you press two keys (the correct key and one other) the screen is shown in inverse video and the depressed keys are shown on the screen. If a key fails to disappear after three attempts, the program displays a failure message at the top of the screen and then prompts you to press the Break key. The program then exits to the Keyboard/ Mouse report screen. Refer to the section

entitled *Action if A4000 keyboard fails* on page E-10 or *Action if A3010/A3020 keyboard fails* on page E-10.

Mouse sub-test

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 (i.e. left, middle, right) are

displayed on the screen in turn, together with a pointer. You need a mouse test jig template to perform this test. See *Appendix A - Mouse test jig template*.

During this test the mouse is viewed with the cable coming out of the top of the mouse. Take care to ensure that the mouse does not 'skid' on the template when you move it.

Follow the instructions on the screen, moving the mouse from the left box to the right, then to the middle. You should eventually return to the left box.

- If the pointer does not finish in the displayed box when the mouse is in the relevant test jig box, the test has failed.
- If you cannot make a button disappear then it will be impossible to continue the test.

If the test fails, refer to the following section *Action if mouse fails*.

If the mouse is functioning correctly, the program moves on to the next test.

Action if mouse fails

Check that you are testing the correct mouse type. If, when you pressed the requested mouse button, nothing happens or the program repeatedly claims that two keys were pressed or the pointer will not move, then substitute a known working mouse of the same type and retest. This determines if the fault is within the mouse itself or the keyboard's mouse interface (A4000 only). If the fault is within the keyboard, refer to the section entitled *Action if A4000 keyboard fails* on page E-10 or *Action if A3010/A3020 keyboard fails* on page E-10.

Check that roller ball is not sticking, in which case you can remove and clean it. If the mouse still fails then return it to an Acorn Authorised CSW for repair.

Main keyboard sub-test

For this sub-test, the display clears and the main keyboard matrix is displayed with the following title at the top of the screen:

```
Main Keyboard Test
```

Press each key in turn, starting at the bottom left (Caps lock) moving across to the bottom right (Ctrl) key, then up a line to the left hand Shift key. An arrow indicates the key to press.

As you move across the keyboard pressing the keys in the correct order, the key that is pressed should disappear from the display. The test continues in this way until all the keys up to the function key F12 have been tested.

If the keyboard functions correctly, the program moves onto the next test.

Numeric keypad sub-test

For the numeric keypad sub-test, the display clears and the cursor and numeric key matrixes are displayed on the screen. Press each key as indicated by the arrow.

If the keyboard functions correctly, the program moves onto the next test.

Keyboard LED sub-test

This test checks that the LEDs on Caps Lock, Scroll Lock and Num Lock are working.

The screen clears and the following is displayed:

```
Running Keyboard LED Tests
CHECK <CAPS LOCK> LED IS ON
```

- 1 Check that the caps lock keyboard LED is the only LED on, the other two are extinguished.
- 2 Press F5 to PASS or F8 to FAIL the test (do this for each subsequent LED test). Check the caps lock is extinguished, hence all keyboard LEDs are off.
- 3 This test is repeated for the remaining two keyboard LEDs, the display giving you suitable prompts. Note any LED failures before continuing with the next test.

This is a subjective test. If the test fails, refer to *Action if A4000 keyboard fails* on page E-10 or *Action if A3010/A3020 keyboard fails* on page E-10.

Keyboard/mouse report screen

At the end of a successful test the following screen is displayed:

```
KEYBOARD & MOUSE TEST VX.XX DEALER
```

```
PASSED Logitech Mouse Test
PASSED Reset Button      Test
PASSED Stuck Keys        Test
PASSED Keyboard LED      Test
PASSED Main keyboard     Test
PASSED Numeric Keypad    Test
```

```
PASSED MOUSE TEST
```

```
PASSED KEYBOARD TEST
```

```
THIS SUB TEST HAS PASSED
PRESS <SPACE BAR> TO CONTINUE
```

The message that the keyboard has passed the sub-test refers only to the non-subjective test elements and should not be interpreted as an overall **pass**, since you may wish to fail the UUT on a subjective test element.

Note: During the soak test neither the keyboard nor the mouse tests are executed.

Action if A4000 keyboard fails

Substitute the existing keyboard for a known working keyboard and retest.

If the fault lies with the original keyboard, return the keyboard to an Acorn Authorised CSW for repair.

If the working keyboard fails, remove the main system PCB and return it to an Acorn Authorised CSW for repair.

Action if A3010/A3020 keyboard fails

Remove the lid.

Check that Link 14 is made from Pin 1 to Pin 2. Substitute the existing keyboard matrix for a known working keyboard and retest.

if the mutt lies with the original Keyboard matrix, return the keyboard to an Acorn Authorised CSW for repair. If the working keyboard fails, remove the main system PCB and return it to an Acorn Authorised CSW for repair.

Memory test

The screen will clear and the following menu is displayed:

```
MEMORY TEST VX.XX DEALER
Amount of Memory 2 Mbytes
Running four phase memory test.
Lower memory limit &000088BC
Upper memory limit &00141EA0

Phase one : incrementing pattern....
Phase two : Cycling bits.....
Phase three : TRUE Hierarchy.....
Phase four : FALSE Hierarchy.....

PASSED.....
PRESS <SPACE BAR> to continue
```

You should check that the amount of memory displayed is correct for the machine.

Note: The upper and lower memory limit can vary slightly between releases of the test software, hence approximate values are given.

Action if the memory test fails

If the test fails, refer to the section entitled *Action if main PCB fails* on page 1-3.

Real time test

The screen will clear and the following menu will be displayed:

```
TIME TEST VX.XX DEALER
1) CHECK THE DATE AND TIME
2) SET THE DATE AND TIME
3) CHECK THEN SET THE DATE AND TIME
```

Please select the required option ?

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:

- type 1 to check the date and time
- check that the time is correct and the seconds are incrementing correctly.

Then either press F5 (if correct) or F8 (if not correct), and press the space bar to continue.

Action if real time test fails

If the test fails, refer to the section entitled *Action if main PCB fails* on page 1-3.

UHF modulator test

The display tests are subjective tests and you should be familiar with the correct screen displays before running these tests and make a note of any failures.

The screen will clear and the following will be displayed:

```
VIDEO TESTS Vx.xx PROD-0
```

```
RUNNING Modulator Colour Tests.
```

```
PRESS <SPACE BAR> to continue.
```

Turn the TV volume control up to a reasonable listening level. When you press the space bar the screen test will commence.

The TV screen should now be displaying a test card.

You are required to:-

- 1 Ensure that the TV has its Auto Frequency Control (AFC) or Auto Tuning Control (ATC) turned ON.
- 2 Select the channel which displays the best picture possible. Do not re-tune the T.V. Do not spend too long trying to achieve the 'ideal'.
- 3 Using a capacitor adjustment tool adjust the variable capacitor on the PCB of the UUT (there is a hole in the top metal work, underneath the keyboard next to the PSU) until the colour fringing on the set of vertical black and white bars (second from last set of vertical black and white bars, to the left and below the centre of the circle in the middle of the test card) is reduced to a minimum (normally barely visible as a fast moving 'flicker').
- 4 Check the following items on the test card:
 - correct colours of the colour bars
 - clear, precise divide lines between the colour bars (minimum fringing)
 - squareness and centralisation of picture (use the grid of the test card as a guide)
 - no fringing on the vertical bars (just below the centre of the card) except for the set of bars used for tuning in (3) where the fringing must be minimal
 - general clarity of picture.
- 5 Re-adjust the capacitor as necessary but always ensure that the fringing on the set of vertical bars detailed in (3) is at a minimum.
- 6 Check that no undue buzzing or other noise (such as that produced by a poorly tuned TV) is apparent. You are prompted to press the F5 key when a satisfactory picture is obtained. This prompt is accompanied by a sound, as are all similar prompts: the sound should be clearly audible, without undue distortion, from the TV speaker.

When you are satisfied that the 'best possible' picture has been obtained press F5. If you cannot achieve the 'best possible' picture then press F8.

TV sound should be turned down at the end of this test. If a failure occurs you should press the space bar when prompted at the end of the test.

This is a subjective test, you should note any failures.

Video tests

The display tests are subjective tests and you should be familiar with the correct screen displays before running these tests and make a note of any failures.

The screen will clear and the following will be displayed:

```
VIDEO TEST VX.XX DEALER
```

```
Running Standard Colour Tests
```

```
PRESS <SPACE BAR> to continue.
```

These tests consist of a series of screen displays. You proceed through the tests at your own pace. When you press the space bar the screen test will commence.

Standard colour test

The screen test displays four colour bars red, green, blue and grey scale. Each colour bar is divided into 6 sections. The number at the top of the screen is the value sent to the individual colour gun. Only one gun is driven at a time for the red, green, and blue bars. The grey scale bar is produced by equal amounts driving each of the colour guns.

Starting from the left, the first block is no units of colour, the next block contains a small amount of red (1 unit bit 0 set) the next more red (2 units - bit 1 set) continuing along until the block is a full red (15 units of red - all bits set). The left most three blocks are out-lined with rectangles of full colour. Check that the colour increases with each block, to full intensity on the right most block. This should be true for each colour bar.

The background is divided into two triangles; one brown and one grey/blue colour. Check the linearity of the dividing line and the colour of the triangles. A cursor is made up of three squares and passes across the screen from bottom left to top right. Also verify that the cursor contains three rectangular outlines in colours green, blue and red. Check the linearity of movement and also check the transparency of the cursor as it moves across the screen. Make sure that the colours do not change as the cursor moves across the screen. Verify the border colour.

Press F5 if the display is correct, or press F8 if not. If the test fails, refer to the following section entitled *Action if video tests fail*.

High resolution monochrome display

This test is not done.

Standard VGA display

The same display is used in a VGA mode as in the standard colour test. Repeat all the checks that were performed on the standard monitor test on the standard VGA display.

Note: The border is removed in the standard VGA tests. Press F5 if the display is correct, or press F8 if not. If the test fails, refer to the following section entitled *Action if video tests fail*.

Super VGA display

You are presented with a screen display that contains 16 squares, made from shades of red, green, blue and grey. Check that the image is sharp, clear and stable on the screen.

Note: The border is removed in Super VGA tests. Press F5 if the display is correct, or press F8 if not. If the test fails, refer to the following section entitled *Action if video tests fail*.

Video identification test

This test is not done.

Action if video tests fail

If there is no display check that there is power on the monitor (green LED on) and that the brightness and contrast controls are sufficiently advanced. If a video cable adaptor is in use then make sure this corresponds to one of the types described in the *Monitor Connections* appendix in the appropriate Welcome Guide.

Switch the machine off, hold down the key marked "." on the numeric keypad and switch the machine on holding down this key for at least a further 10 seconds. This has the effect of resetting the monitor configuration to match the type of monitor connected. If this fails to solve the problem then substitute a known good monitor and cable and try again.

If this action still fails to produce a display, remove the top cover of the computer (see *Part 2 - Disassembly and assembly*) and check on the main PCB that the shunts on LK6 pins 3 and 4 and LK6 pins 5 and 6 have not been dislodged. As a final action, remove the main PCB and return it to an Acorn Authorised CSW for repair.

If the **display is corrupted**, check the adaptor cable (if used) against those listed in the *Monitor Connections* appendix in the appropriate Welcome Guide and reset the monitor configuration via the power up "." process. Check the monitor and cable by substituting with known working items and repeat the power up "." process. If the fault proves to be with the main computer then you must return the main PCB to an Acorn Authorised CSW for repair.

Summary screen

At the end of the screen tests a final summary screen will be displayed.

Press the space bar to continue.

Test report

At the end of this sequence of tests, a report screen shows the status of the tests.

```
REPORTS VX.XX DEALER
```

```
PASSED   Hardware Check
PASSED   Memory Test
PASSED   Floppy Disc Test
PASSED   Keyboard Test
PASSED   CMOS RAM Test
```

```
PASSED   Time Test
PASSED   Mouse Test
PASSED   Parallel Port Test
PASSED   Serial Port Test
PASSED   Sound Test
PASSED   Video Test
PASSED   IDE Interface Test
```

```
TESTS PASSED : 1 Loop completed
PRESS <SPACE BAR> TO CONTINUE
```

A list of the test pass/fail results are displayed, allowing you to note any failures. If any failures occurred, repair the UUT if possible and start the test procedure again.

The hard disc (if fitted) is parked ready for the UUT to be powered down.

Appendix F - Tools for software testing

Backing up the test disc

Before you start testing, make a backup copy of the Acorn Dealer Test Disc (0294,825) using the **Backup** option on the floppy disc drive icon.

Validating the test equipment

Before carrying out any of the tests in this chapter, validate the test equipment. To do this, follow the procedures given in the chapter entitled *Appendix E - Software testing*.

If the test equipment fails, you should repair the test equipment and retest on a known working unit.

Creating a test IDE hard disc

WARNING:

IT IS NECESSARY TO REPLACE THE CUSTOMER'S HARD DISC BEFORE RUNNING THE TEST SUITE, AS RUNNING THE HARD DISC TESTS MAY DESTROY THE DATA HELD ON THE DISC.

To avoid overwriting the customer's hard disc during testing, prepare a test hard disc. You will need the following equipment:

- IDE hard disc to be initialised (UUT)
- ARM250 Dealer Test Disc (Acorn part number 0294,825)
- A4000 series test station, which is made up of an A4000 series computer with the hard disc removed and a keyboard attached.

OR

A3020 test station, which is made up of an A3020 computer with the hard disc removed.

Note: do not use a customer's computer for this test.

- Standard RGB colour monitor (Analogue RGB) and cable.

Notes:

- 1 Throughout the test procedure make sure that the power is the last connection made before a test commences, and the first connection removed when a test is complete.
- 2 The mains supply voltage must be within the rated voltage range as indicated on the PSU input label.
- 3 If a message is expected and has not appeared within 30 seconds then record the fault and repair the machine. If an error message appears, record the fault and, if possible, continue the test and then repair the machine.
- 4 If the test equipment fails three consecutive UUT's for the same fault, validate the equipment using a known good UUT and repair as necessary before continuing with the test.

Procedure to create a test IDE hard disc.

1 A4000

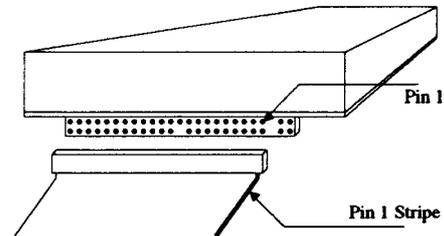
Connect the two cables to the hard disc, taking care to plug the two cables in correctly. Replace the top cover.

A3020

Connect the cable to the hard disc, taking care to plug the cable in correctly. Replace the top cover.

WARNING:

Incorrect connection of the Hard Disc to the computer can result in permanent and unrepairable damage to the Hard Disc. Always ensure that the cable is connected to the left hand set of pins, with the 'Pin 1' stripe to the right (looking at the rear of the drive).



2 Connect the test station and the monitor to the mains supply. Do not turn on.

3 Insert the test disc into the floppy disc drive and turn on the monitor.

4 Turn on the test station whilst holding down the Delete key and Shift key (until the auto-boot file is executed).

5 The following menu is displayed:

```
MENU VX.XX UN-DEF
```

- (A) Test Suite
- (B) Individual Tests
- (C) Load / Save CMOS
- (D) Quit

Select the test type of your choice. Select the **Individual Test** option by typing B.

6 From the list that follows, select the option **Format IDE drive 4** by pressing O (for the A3020) or R (for the A4000). A configuration screen will then appear which will be followed by the initialiser screen. The disc is then initialised. For details of the hard disc initialiser program, refer to the information given in the section entitled *Hard disc initialiser* on page E-7.

7 When initialising is complete, you will be asked to press the space bar to continue. This produces the report screen that displays the pass/fail message.

8 Press the space bar and, when requested, turn off the test station.

9 Turn all the mains supplies to the equipment off.

10 Disconnect the UUT, from all associated equipment, in reverse order to that detailed earlier in this procedure.

If any fail messages have occurred, try the above again using another piece of equipment.

The hard disc is now ready to be inserted in the customer's computer to test the computer system.

Replacing the customer's hard disc

If you created and fitted a test IDE hard disc, you need to replace it with the customer's original hard disc. To do this follow the instructions given below:

- 1 Replace the test hard disc with the original hard disc, using the procedure given in *Part 2 - Disassembly and assembly*.
- 2 Check the refitted hard disc starts up properly –power up the equipment, click the mouse over the hard disc icon and ensure a directory viewer appears.

Saving the customer's CMOS RAM settings

You need to save the contents of the CMOS RAM before any of the tests are run, and restore them when the last test is over, otherwise the settings will be overwritten

This is because the test software uses the CMOS RAM to control the test sequence and store the results.

Follow the procedure given below to save the customer's CMOS RAM settings.

- 1 Insert the ARM250 Dealer Test Disc (0294,825) into the floppy disc drive.
- 2 Hold down the Shift key and switch the computer on (do **not** touch the Delete key). Keep the Shift key held down while the computer powers up.

The following menu will be displayed:

```
MENU VX.XX UN-DEF
(A) Test Suite
(B) Individual Tests
(C) Load / Save CMOS
(D) Quit
```

Select the test type of your choice

- 3 Select option (c) Load / save CMOS by pressing the c key.
- 4 The Load / save CMOS selection will be confirmed and then the screen will display the following menu:

```
LOAD / SAVE CMOS RAM VX.XX UN-DEF
1. Save CMOS RAM to disc.
2. Load CMOS RAM from disc.
3. Exit Program.
Please select the required option ?
```
- 5 When prompted, enter the filename (including the full directory path if 'necessary) that you want the CMOS RAM saved to.

- 6 Remove the data disc and put it in a safe place.
- 7 Exit program when finished.
- 8 Switch off the computer.

Restoring the CMOS RAM settings

When you have finished testing, you need to restore the customer's original CMOS RAM settings:

- 1 Press the Shift and Break keys simultaneously. This produces the top level menu:

```
MENU VX.XX UN-DEF
```

```
(A) Test Suite
(B) Individual Tests
(C) Load / Save CMOS
(D) Quit
```

Select the test type of your choice

- 2 Select option (C) Load / save CMOS. This produces the following menu:

```
LOAD / SAVE CMOS RAM VX.XX UN-DEF
1. Save CMOS RAM to disc.
2. Load CMOS RAM from disc.
3. Exit Program.
```

Please select the required option ?

- 3 Select option 2, and replace the test disc in the floppy drive with the data disc which holds the stored CMOS RAM settings.
- 4 When prompted, enter the filename (including the full directory path if necessary) that contains the customer's CMOS RAM configuration settings. Press Return.
- 5 Remove the data disc when prompted.
- 6 Press the space bar to continue.
- 7 Type 3 to exit the program.

Reader's Comment Form

A3010/A3020/A4000 Module Level Service Manual

We would greatly appreciate your comments about this Manual, which will be taken into account for the next issue:

Did you find the information you wanted?

Do you like the way the information is presented?

General comments:

If there is not enough room for your comments, please continue overleaf

Cut out (or photocopy) and post to:

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Acorn House
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Cambridge CB4 4AE
England

Name:

Name of organisation:

Nature of business:

Address:

This information will only be used to get in touch with you in case we wish to explore your comments further

