Archimedes & A3000 Servicing

Contents

This module describes module-level servicing on Archimedes and A3000 computers. It covers routine maintenance of the computer and its peripherals, and fault-finding techniques for when the machine breaks down.

Opening the Machines

In order to carry out anything but the simplest of maintenance and repair work, it is necessary to remove the lids of machines. The two styles of machine have different methods which need to be used to gain entry. These are covered in the relevant service manuals, but the essential information is also given here, along with a few things which aren't covered in the manuals.

Archimedes

The Archimedes is generally the easiest of the two machines to break into. Its case is comprised of two parts: a tray on which the main PCB and keyboard sit, and a lid. The lid slides off the tray to the rear.

In order to free the lid, undo the three screws along the top at the back of the machine, and the two screws (found down small holes) at the front of the machine on the left and right side panels. The theory goes that the lid will now slide off backwards.

This rarely happens. Instead, the lid will slide back half an inch and then the sides will jam. Either push downwards firmly in the centre of the lid towards the front of the machine (this causes the sides to splay outwards) and then push back, or lever the sides out directly and push back.

A3000

The A3000 also comes in two pieces, a lid and a tray. Here, the lid should just lift off the tray beneath. Begin by removing the two metal clamps which secure the prongs from the lid at the back of the machine, and undo the screw in the centre of the bottom of the machine. Leave the four which secure the floppy drive alone!

Push the prongs from the lid at the back of the machine inwards and upwards, and the back of the lid should become free. The front, however, will still be held in by three more bits of plastic under the front of the machine. Push these in turn towards the rear, lifting the front of the lid up as you go. Be careful that the keyboard doesn't drop out as you remove the last one.

Routine maintenance for Archimedes/A3000 machines is limited to a few simple operations, which are detailed in the service manuals for the appropriate machines. Again, the essential information is covered here.

Batteries

The Archimedes machines contain a pair of alkaline AA dry cells which are used to provide power to the real-time clock chip when the computer is turned off. These should be changed every year, although they may last much longer than a year, to help prevent damage to the machine from old batteries leaking.

The batteries are found inside the machine on the left at the front. It is quite safe to change them with the power turned on; changing them with the power off is also possible as a capacitor on the board can supply the RTC chip for at least 15 minutes without the batteries being present.

The A3000 is fitted with a nickel-cadmium (NiCad) battery which is recharged when the machine is turned on and hence doesn't need replacing.

Mice

As the mice move, they pick up dust from whatever surface they are moving on and ingest it. For reliable mouse operation, they should be cleaned at the same time as the batteries are changed, and more frequently if subjected to heavy use.

Cleaning the mouse is a simple task, involving alcohol and a cotton-wool bud. Remove the ball, which is secured by a screw in older mice and by a twist ring in newer ones, and clean it. Clean the rollers inside the mouse on which the ball sits. If the mouse is really dirty inside, then remove its lid (undo the four screws at the corners underneath) and clean thoroughly.

Fan Filters

Archimedes machines are fitted with fans, whose filters should be changed yearly to prevent their clogging up with dust, which blocks the airflow through the case.

Module Level Servicing

Module level servicing involves fixing computers by swapping modules (PCBs, PSUs, etc.) rather than replacing defective components. This has a number of benefits for the technician:

The fault-finding process is very much simpler and quicker than at component level. The Archimedes machine, for instance, consists of seven modules, as opposed to several hundred components.

The equipment required to service the machine is much simpler and cheaper. There is no need to have an oscilloscope; for most jobs, a screwdriver and a voltmeter are all that is required.

Tumround time can be significantly reduced. Keeping several hundred spares in stock (as may be required for component level servicing) is usually impractical and hence spares must be ordered for each machine which is to be fixed. It is much more practical to keep a stock of modules, meaning that machines can be turned around very much faster.

For some items, the cost of a new unit is sufficiently low compared to the cost of repairing the unit that a defective part is simply thrown away. For others, such as an Archimedes PCB with a cost (at the time of writing) of around £420, the defective part is worth repairing. Acorn has a system of 'central repair' for such items, which takes in defective parts and returns recoditioned ones.

For a complete treatment of procedures and conditions for servicing machines, refer to the forthcoming Acorn document which will cover these issues (due in Feb. 91.)

The Modules

For the purposes of module level servicing, the machine is split into several modules. Servicing a faulty machine simply involves determining which module is responsible for the fault and exchanging it. A list of the modules follows, with each being treated in more detail on subsequent pages.

Power supply: a component of all machines, with two variants: an enclosed version for Archimedes which generates +/-5 and +12V, and an open version for A3000 which generates +5V only.

Main PCB: four major variants: A3000, A305/310, A440, A4x0/1

Floppy disk drive: 3.5" 800k (standard density). Two variants: a Sony drive fitted to A305/310 and A440 machines and a Citizen drive fitted to A3000 and A4x0/1.

Keyboard: a 103-key IBM AT-style keyboard. Two variants: a membrane keyboard for A3000 machines and a conductive rubber pad keyboard for Archimedes.

Mouse: a 3-button mouse. Two variants: one for A305/310 and A440 machines, and another for A4x0/1 and A3000 machines

Monitor: a rebadged Philips CM8832 colour monitor is the standard colour monitor supplied with Archimedes and A3000 systems. The machines can, however, connect to a wide variety of different types of monitor.

Monitor lead: a 9-pin D to SCART lead. Two versions: an old, short, stiff lead supplied with A305/A310 and A440 machines, and a new, longer, flexible lead supplied with A3000 and A4x0/1 machines.

This list is not exhaustive - such items as Econet modules, backplanes, expansion cards and hard disk drives may also be found inside machines. However, the list of modules above provides a reasonable 'core' of modules which any machine may be expected to have.

The Power Supply

The power supply supplies regulated, low voltage DC to the circuitry in the machines, and hence is an important part. It is also responsible for dealing sensibly with faults, such as short circuits, so that machines do not catch fire every time a paper clib gets dropped inside. For this reason, the power supply is not to be serviced in any way other than by direct replacement. This restriction also applies to component level service centres.

Power supplies have proven reliable during the machines' lifetimes so far. Whether this state will continue into the future or not remains unclear.

The power supplies are all switch-mode units. Rather than having a bulky and heavy mains transformer, large filtering capacitors and an inefficient series regulator, they rectify mains directly, and chop it at supersonic frequencies. In this way, the size of transformer and filter capacitor required can be dramatically reduced. In addition, by varying the mark-space ratio of the chopped mains, the output may be regulated without any need for a series regulator. Typical efficiencies of 85% may be achieved, as opposed to 55-65% for a linear PSU.

Archimedes PSU

The Archimedes PSU is fully enclosed in a perforated metal case. It delivers +/-5 and +12V to the system, thus being able directly to power a fan and a hard disk drive. It has an IEC mains outlet on the back, which may be used to power a monitor. Note that this outlet is not switched, and therefore remains live unless the mains supply to the machine is switched off.

The PSU is fixed to the bottom of the case by four screws. Removal of these will free the power supply, but it is usually necessary to remove either the back panel of the machine or its fan before the power supply will come free.

A3000 PSU

The A3000 PSU delivers a single rail of +5V. It is enclosed in a cardboard cover. It has no mains outlet. To remove, free the cardboard cover at the PCB side of the PSU to reveal the PSU itself. There is a single fixing, in the centre of the PSU, which should be removed. The PSU will just lift out.

The Main PCB

The main PCB is the heart of the system. It carries processor, ROM, RAM, display hardware, sound hardware and all of the peripheral interface circuitry which makes up the computer. Each type of machine has its own PCB. There are some common faults and undesirable features of the circuitry of the PCBs; these will be dealt with in the next few pages.

A305/A310

These systems were supplied with no hard disk controller fitted, and either 0.5 or 1 MB of RAM on the circuit board. 0.5MB systems are upgradable to 1 MB systems simply by plugging in another 0.5 MB of RAM as 16x4464 dynamic RAM chips into the sockets on the board. The machine is not designed to have a hard disk controller added by soldering in the relevant chips; instead, a suitable interface card should be used.

A440

These systems have a hard disk controller fitted, and the memory area on the PCB is reworked to give 4MB with 32 1x1Mbit DRAM chips fitted. In addition, the clock circuitry is somewhat different to that on the A305/A310 board, allowing the machine to drive 64kHz monochrome workstation monitors.

A3000

The A3000 PCB is the first one from Acorn to use SMT (surface mount technology.) The four custom chips are soldered directly to the top side of the board, rather than being socketed in conventional PTH (pin through hole) sockets. All of the other components on the board, with the exception of some passives (resistors and capacitors) are mounted conventionally. There is no HDC fitted, and only 1 MB of RAM, although there is an expansion connector which allows this to be expanded to 4MB.

A4x0/1

These machines have a reworked version of the old A440 PCB, with the primary change being made to the memory system, which now accepts 1,2 or 4MB in 4x256k ZIP packages.

Common PCB problems

There are a number of problems with the circuitry of the machines which can lead to problems, especially in the peripheral area. These are detailed below, with details of causes and possible remedies.

Serial Port

There are a number of problems with the serial interface circuitry in the machines.

Baud rates. Many machines nowadays (including cheap Taiwanese PC clones) are capable of running their serial ports at 38.4kbaud and even 115kbaud. The Archimedes/A3000 is limited to 19,200 baud, which proves to be a limiting factor if the machine is used with the latest types of 9,600 baud modems with data compression.

Split baud rates. For many applications, the serial port is run with transmit and receive baud rates set identically. If they are to be different, then only the transmit baud rate will be set accurately. This is not a problem, provided that the receive rate is low enough that the small error in its frequency is insignificant. As a guide, 1200 baud will work fine, but 9600 will not.

Line levels (not A3000.) The serial port on Archimedes drives the line with +/5V levels, to the RS423 specification. This will drive most RS232 peripherals, although the RS232 spec. calls for levels of +/-9V or greater. Some RS232 peripherals, however, will not work correctly with the Archimedes' levels.

Failure to comply to standard (A305/A310/A440 only.) The early machines were fitted with a serial port chip which failed to implement the RS423 protocol correctly, which caused data to be corrupted. RISC OS contains a software patch which will cure the problem; for those with Arthur 1.2, the RS423 Line Driver patch is a module available from Acorn. This is not a problem with A3000 and A4x0/1 machines.

Buffer failure. There have been reports that the buffers which buffer RS423 in and out of the machine are prone to failure.

Parallel Port

The parallel port is a Centronics-compatible unidirectional parallel printer interface. It is designed as a printer interface, but has been put to other uses, such as providing 8 output lines from the machine and as a connection for dongles (hardware keys for software protection.)

Failure to drive Integrex Colourjet printers (A305/A310/A440 only.) The timing on the parallel port is slightly wrong for these printers. There is an FCO for the cure, which involves fitting one extra chip and can be carried out by any component level service centre.

Failure to drive early Qume Crystalprint Publishers. A fault in the Qume's firmware is to blame; Qume supply an alternative ROM which should be fitted in the printer.

Analogue RGB

The Analogue RGB output is susceptible to static damage (A305/A310/A440 only.) This results in the early demise of VIDC, and is a component level repair. A3000 and A4x0/1 have static protection diodes added which cure the problem.

Sound

A305/A310/A440 machines may produce excess background noise through their internal speaker. There is an FCO describing the fix for this, which involves adding a single capacitor to increase the power supply rejection of the power amplifier chip used.

Sony drives (A305/A310/A440)

The Sony drives fitted to the early machines have caused a number of problems.

Loss of disk eject button. The disk eject button is fixed onto a clip projecting from the front of the drive, and pokes through a hole in the front of the machine. It is not difficult for it to become detached from the drive. This makes ejecting disks difficult - an object needs to be pushed through the hole in the front of the case. The cure is to glue the button on.

Loss of drive head shield. The top head shield in the drive is also prone to falling off. Remove the head shield from the drive (don't attempt to stick it back on) and test the drive. If it has been damaged, Sony will replace it.

Failure to align with the front panel. If the drive is not pointed upwards far enough, disks inserted may catch on the lip of the front panel hole rather than drop properly into the drive. This will result in a 'drive empty' error message being produced when a disk is accessed. Either tilt the drive upwards further in its cradle, or place a couple of layers of insulating tape along the front of the disk drive mounting bar.

No earth. If the drive is not earthed properly (i.e. not screwed down), it will again produce 'drive empty' errors.

Citizen drives (A3000/A4x0/1)

The Citizen drives fitted in modern machines cure the above problems, by having their own front panel (no alignment problems) and disk eject button. They do have a couple of quirks of their own:

Problems when more than one drive fitted. If two or more drives are fitted and accessing one causes all of the drive in use LEDs to light, then the main drive needs to be replaced. This is, again, covered by an FCC,.

Incompatible with Archimedes interface. Two lines (the 'disk changed' line and an earth) need to be notched out of the cable to the drive. This is already done on all machines fitted with these drives.

Keyboard

Problems with the keyboards tend to be the usual ones of bits being dropped or liquids being poured in. The A3000 keyboard is relatively immune to damage of this sort, as it is a membrane keyboard and hence the switch contacts are hidden between a pair of layers of plastic.

Archimedes Keyboard

The Archimedes keyboard is a separate unit, connected to the main unit via a coiled cable. The cable is terminated in a mini DIN plug. These plugs have thin, brittle connectors and it is possible to damage them by inserting the plug incorrectly. If the plug is damaged, straightening the pins is almost impossible, as they are too brittle. Fit a new plug or procure a replacement keyboard lead instead.

For cleaning jobs, the keyboard can be opened by undoing the screws under the case. The keyboard PCB will then separate from the two case halves. In order to remove the keys, undo the screws from the underside of the PCB which hold the keys on; they will then come free as a block. The PCB and keys can be cleaned using PCB cleaner.

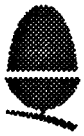
Note that the keyboard is regarded as being two separate modules: the keyboard case and the PCB. The PCB does not include the RESET switch cover: it is part of the case. Remove it before returning a keyboard for central repair!

A3000 Keyboard

The A3000 keyboard is an integral part of the machine, and hence does not have a lead to break. Instead, the membranes connect directly to the A3000 PCB. Use a little care when removing these, as they are fragile: hold the white reinforcing strip and pull evenly and gently. Unplugging the membrane allows the keyboard to be removed.

For faults which cannot be remedied by cleaning, the A3000 keyboard is replaced as a complete unit.

Mouse



Mice are, by their very nature, susceptible to damage, either from mistreatment or from accumulation of dirt. The latter should be tackled as part of a machine's routine servicing. A number of problems have occurred with mice, especially the older (A305/A310/A440) type; the more modern variety appear to be more reliable.

Plug failure. The mouse lead, like the keyboard lead, is terminated in a mini DIN plug. Plugging a mouse into an A3000 is a tricky job, and again needs to be handled with care if the plug is not to be damaged. The cure is, again, to fit a new plug.

Lead failure. There have been cases of fatigue failure in leads: the leads are not very well protected on exit from the mouse, and are vulnerable to being severely bent if the mouse is pushed backwards until it hits a solid object. Either replace the lead, or cut the lead a couple of inches from its entry into the mouse, and refit.

'Drunk' mice. Elderly mice can be a little reticent to do as they are told. A drunken mouse can sometimes be sobered up by cleaning; if this fails, then twiddling the presets inside the mouse may help to set it back on its feet. This cure, however, tends not to last very long, and is something to be done while waiting for the replacement mouse to arrive.

Monitor and lead

The standard colour monitors supplied with Archimedes systems are rebadged Philips CM8832s. Acorn provides no support for servicing these monitors - no manuals, no spares - and so servicing must be carried out by a Philips service centre, such as Granada Microcare. The monitors seem quite reliable, with the only noteworthy weakness being in the vertical scanning circuitry, which can fail to scan. This leaves the entire picture on the screen compressed onto one line.

Some monitors are upset by the presence of synchronisation signals on the green colour outut. Monitors with any form of AGC (automatic gain control) will display a fully or mostly white screen with a distinct tinge of green. The outputs of some early systems are insufficient to drive some monitors properly, too - the picture appears dim, even with the brightness turned up. There is an FCO for both of these.

Beware if you attempt to attach a low-res monochrome monitor to an A4x0/1 machine. The monitor should be plugged into the 'SYNC' output on the back of the machine (not 'video'), and a link needs to be made inside the machine to add brightness information to this line.

If you wish to attach a high-res monochrome monitor to an A440/A4x0/1 machine, and it requires composite video input (rather than separate sync and video lines) then it is permissible to short the 'SYNC' and 'VIDEO' outputs together - a BNC T-piece being the ideal tool for the job.

Monitor Lead

The monitor lead supplied with A305/A310/A440 machines was thick short and stiff, and lacked decent strain relief around the D-type connector which plugs into the machine. This lead, therefore, also tends to suffer from fracturing of conductors. Replace it with a new lead - they are much longer and more flexible and have adequate strain relief. They also allow the monitor to be placed beside the machine while still connected, which is a boon for anyone who needs to work inside a machine - you don't need to put it back together before testing.

Fault Finding Hints

The first thing to do when presented with a faulty machine is to reset its CMOS RAM: hold down the 'Delete' key on the keyboard while turning the machine on. Keep it pressed for a couple of seconds after power-on, to give the machine time to come out of reset and see it.

There are two sorts of faults. There are those where the diagnosis is obvious ("The mouse doesn't work"), and those where it isn't. For the former, attempt to rectify the obvious fault by substituting a good part. Use the Test Disk to make sure that the machine is working completely, and return.

For the others, look for the obvious. Is it all plugged together correctly? Is the monitor power LED on? Is the machine's power LED on? If not, check mains leads and fuses.

The next step, assuming the fault still isn't obvious, is to replace the system's monitor, monitor lead and keyboard with working ones. Test again, and if the system works, the faulty module can be found by substituting the original one back in, one at a time.

A system which still doesn't respond can have now have one of three things wrong with it -the PSU has failed or has a short across its outputs, the main PCB has failed or an add-on inside the case is causing the malfunction. Eliminate the latter by removing all expansion from the board - Econet modules, backplanes and expansion cards, and retest.

Assuming that the machine still doesn't work, turn it on while looking at the keyboard LEDs. They should all flash when the machine is turned on, go out for a second or two, and then 'Caps Lock' and 'Num Lock' should light. The initial flash shows that the PSU is working -the keyboard controller chip flashes the LEDs as it is reset on power-on. The LEDs then lighting shows that the processor (and RAM, ROM and some I/O) is working, as they light on a command from the ARM. This test should indicate which of the two remaining modules (PSU or PCB) to change first.

A useful hint is that the PSU will click at a rate of 1-2Hz if it has a short circuit across its outputs. This may, of course, be due to a paper clip which has inadvertantly fallen into the machine!

Field Change Orders (FCOs)

There follow a set of FCOs (Field Change Orders) for Archimedes machines. Most of them refer to the older machines (A305/A310/A440.) They should give an idea of the faults which have been found frequently on Archimedes, and the repairs which are necessary to cure them. Note that, in most cases, only component level service centres should perform these fixes.

FCOE008 (A305/A310/A440)

FCO E008 - Fix to cure excessive background noise

DESCRIPTION

Acoustic pick-up causing hum from the internal loudspeaker is reduced. Please note that the noise on earlier computers when 'BREAK' or `ESCAPE' is pressed is due to a software problem with earlier versions of Arthur, and will be cured when Arthur **1.2** is fitted.

INSTRUCTION

Remove the circuit board from the computer.

Fit a 10v or higher 100uF capacitor between pins 7 (+ve) and 4 (-ve) of IC68. The capacitor should be kept as close as possible to the IC, and should be secured to the PCB using glue, or hot wax. RS part number 104-477 is a suitable capacitor. Please note this change from previous instructions.

Replace the circuit board, and test the computer. In particular, check that the loudspeaker sound works correctly.

FCOE009 (A305/A31 0/A440)

FCO E009 - Fix to cure problems with some monitors

DESCRIPTION

RGB output levels are too low to drive some monitors. Also sync on green is no longer required. This modification need only be carried out at the request of the customer. However, it may be performed at the same time as FCO E008, and it is recommended that if a board is being re-worked for FCO E008 it is reworked or FCO E009 at the same time.

INSTRUCTION

There are two methods, the first being suitable for those with vacuum desoldering equipment. The second is suitable for those without this equipment, to prevent damage to the circuit board.

FIRST METHOD:
Remove the circuit board from the main unit. Desolder resistors R39, R20, R41 an R59, and remove them from the main circuit board.

Fit 3x 43.2 ohm 1% 0.25w resistors to R20, 41 and 59, leaving R39 empty. If 43.2 ohm resistors are not available, 43 ohm 1% 0.25w may be used as an alternative. These are available from Farnell, part number MRS2543R, or RS, part number 148-168.

Replace the circuit board in the computer. Test the computer.

SECOND METHOD:

Remove the circuit board from the main unit.

Cut the leads to resistors R39, R20, R41 and R59, leaving enough of the lead on the board to allow new resistor leads to be soldered to the existing leads except on R39. The leads on R39 may be cut right back to the circuit board. Fit 43.2 ohm or 43 ohm resistors to positions R20, R41 and R59, by soldering the resistor leads to old leads. The new leads should be cropped close to the resistor, but allowing this new solder join to be effected.

Replace the circuit board in the computer, and test the computer thoroughly.

FCO E011 (A305/A310/A440)

FCO E011 - Fix to Reduce Video Noise

DESCRIPTION

Breakthrough of system noise occurs onto the screen. This shows as rippling on screen, and is particularly noticeable with colour monitors. This seems particularly prevalent when running 'ArcWriter'.

INSTRUCTION

Remove the circuit board from the computer.

Identify IC17, the VIDC chip. This chip is the closest of the four main chips to the back panel. Further towards the back of the computer you will find R67. This is the nearest to VIDC of a whole row of resistors. Take a 1N4148 diode, from the leads and crop them so that the diode can be connected parallel to R67. Solder the diode to R67 so that the cathode (the end of the diode with a dark stripe) is next to 013 - i.e. closer to the end
of the board. 1N4148 diodes are widely available, for example Farnell stock them as part number 1N4148, or RS part number 271-606.

The second part of the work instructions vary as to whether or not you have vacuum de-soldering equipment.

Identify the decoupling capacitor (marked 'A') that is closest to the VIDC towards the back of the circuit board. This is also close to 012. If you have vacuum desoldering equipment, desolder this decoupling capacitor. If you do not, crop the legs to the capacitor such that you can solder to the removed legs on the circuit board. Fit a 22uF axial lead electrolytic capacitor, working voltage 6.3v or higher to the circuit board in place of
this component. If you have de-soldered the previous capacitor, you should fit this capacitor in the location of the removed de-coupler, otherwise, solder the legs of the new capacitor to the remaining legs of the decoupling capacitor. Note that this is a polarised component and you will need to observe the polarity. The +ve connector should be made to connector closest to R68 and 69, and the -ve connector should be made closest to Q12. Farnell's part number 030 **34229** is a suitable capacitor.

Re-assemble the computer, and test. You may wish to test the computer using ArcWriter.

FCO 2000 - Improvements to Winchester Circuitry on A440

DESCRIPTION

This deviation improves the performance of the Winchester circuitry, removing the problem of intermittent lock failure of the phase locked loop which would be visible to the user as excessive re-reads. This would particularly show up as soft errors on verify.

METHOD

Cut two tracks, to isolate IC37 pin 12. Add a wire link on the solder side of the board between the plated through holes VIA 'A' and VIA 'B'. Use insulated wire.

Fit an 8k2 resistor between VIA `B' and VIA 'C'. Check for continuity between VIA 'C' and IC37 pin 12.

Fit a 1 n2 capacitor between IC37 pins 10 and 12. This value is quite critical, and is sometimes difficult to source. Farnell do, however, stock it against the part number shown below.

Fit a 1N4148 diode in parallel with the 8k2 resistor, following the circuit on diagram 2 for orientation.

Refer to diagram 3. Remove R125, using vacuum desoldering equipment. If this equipment is not available, cut the legs of this component close to the printed circuit board. If an associated 'piggy-back' capacitor is also fitted to this resistor, it should also be removed.

Fit a 47pF capacitor into the vacated position R125.

Fit a 22k resistor between the +5v connection (PL7) and the further end of the capacitor in position R125.

The components used are available from Farnell, the following part numbers are suitable:

8k2 resistor	BTF48K2
1 n2 capacitor	146-460
1N4148 diode	1N4148
47pF capacitor	146-485
22k resistor	BTF422K

FCO2002 (A305/A31 0/A440)

DESCRIPTION

Timing problems with printer control lines have led to spurious operation of some printers. This has proved particularly noticable when using Integrex colour printers in graphic mode while line feeding • a spurious line feed being generated.

INSTRUCTION

1. Remove the circuit board from the computer.

2. Identify R24. Cut the leg of R24 closest to IC9, and carefully move the free end of R24 away from the adjacent resistor. Secure R24 to the PCB with adhesive (for example Loctite TAC PAC), leaving the free end of R24 available for soldering.

3. Prepare new IC (74HC14) by:
   a. Removing pins 5,6,8,9,10,11,12 & 13.
   b. Lift pins 1 and 4 ready to solder leads
   c. Lift pins 2 and 3 and solder them together

4. Position new IC into IC15 piggyback fashion so that pin 1 of the new IC is directly above pin 1 of IC15. Solder pins 7 and 14 of IC15.

5. Solder thin insulated lead from pin 1 to the new IC to the free end of R24. Solder a second insulated lead from pin 4 of the new IC to the vacated pad of R24. Keep these leads as short as possible, and secure them to the new PCB with adhesive.

6. Reassemble the computer and check operation of the printer port.

The 74HC14 IC is widely available, it can be ordered from Acorn (part number 0747,014), or from FameII (part number MM74HC14N, MM74HC14B1N, PC74HC14P or SN74HC14N).

Please note that it is particularly important that the profile of this modification is kept as low as possible, to ensure that there is no fouling of the modification on any podules that may be fitted to the computer.

FCO2003

DESCRIPTION

Some G65SC51 ICs fitted to Archimedes computers may exhibit certain problems relating to Serial I/O. More recent production of these ICs have been screened to ensure that this problem does not occur.

INSTRUCTION

1. Identify IC9 inside the computer. If it is marked CMDG65SC51 with a date code of 8801 (1988 week 1) or later then this computer does not meet modification. If, however, the date code is earlier than this date, proceed to number 2.

2. If this IC is not socketed then this modification should not be attempted. You should return the circuit board of the computer for modification, and fit a spare PCB which has already been modified to the customer's computer.

3. Remove IC9 from its socket, and fit a new CMDG65SC51 with a date code of 8801 or later in its position. Pin 1 should be towards the rear panel of the computer. Check to ensure that all pins in the IC are correctly in the socket.

Note that the CMDG65SC51 IC should ONLY be ordered through Acorn, (part number 0706,552). When you send a service report to Acorn with the removed IC9, you will be sent a further one.

It is imperative with this operation that the old G65SC51 is returned with the service report.

FCO2007 (A4x0/1)

Field Change Order No. 2007
Date of Issue 27th July 1989
Applicable to (product) Archimedes 400/1 series. Model 410/1

REASON FOR ISSUE
When upgrading above unit with second floppy disc drive incorrect LED operation may be observed. i.e. LED lit when drive not selected.

TYPES AFFECTED
(eg serial no/issue/level)

27 - AKB40 - 1000001
TO
27 - AKB40 - 1002499

DESCRIPTION OF CHANGE
Ensure that machine to be upgraded is of the type, and within the serial number range indicated above, follow the attached rework procedures.

CLAIM PROCEDURE
Following the fitting of the replacement Disc Drive, Service Engineers shoud complete a Service Report clearly stating the Serial No. of the Host Unit and the FCO No. (above). Also claiming the FCO Credit Rate (below) for labour charges. The faulty Disc Drive should be returned with the Service Report. Acorn will verify the informaton, process the claim for labour charges in the normal manner and issue a replacement disc drive.

REWORK DOC.
REFERENCE (SID Doc. ref)
FCO2007

FCO CREDIT
RATE £8.00 (Eight)

SPECIAL INSTRUCTIONS:-
All products in manufacture after serial No. 1002500 will not exhibit problems.

ARCHIMEDES A410/1 COMPUTER - CITIZEN FLOPPY DISC DRIVE
MODIFICATION WHEN FITTING SECOND FLOPPY DISC DRIVE

DEALER UPGRADE

A problem has been identified when a second Floppy Disc Drive upgrade is fitted to within the Archimedes 410/1 computer. The problem manifests itself by showing both disc drive LED's being lit when either of the disc drives is accessed.

A Field Change Order (FCO 2007) has been authorised by Acorn to effect the replacement of the original drive within the computer. Details of how to detect the problem and the means of rectifying this problem are given below.

REPLACEMENT INSTRUCTION

1. Remove the unit from the packaging and set aside the packaging for re-use following the repair.

2. Remove the upper case by unscrewing the 5 fixing screws, 3 are located at the rear and 1 on each side. Slide the upper case towards the rear of the computer.

3. Gently disconnect the data cable and the power cable from the drive. Note the orientation of these cables before they are removed.

4. Unscrew and remove the 2 fixing screws which secure the floppy drive bracket to the saddle.

5. Carefully slide the disc drive bracket and the floppy drive assembly towards the rear of the unit. Turn the drive over to check if component number R61 is fitted. This device is located adjacent to the MOD rev box. If R61 is fitted, proceed to No.6. If not, refit the drive and leads - no further action is required. Therefore, proceed with the fitting of the Second Floppy Disc Upgrade as described in the fitting instructions suppled with the upgrade kit.

6. Remove the disc drive from the bracket by removing the 4 fixing screws - retain these for later use.

7. Fit the new disc drive into the bracket - refit the 4 fixing screws. NOTE - the new drive can be identified **by** checking that R61 is NOT fitted.

8. Gently slide the bracket and disc drive assembly back into the front plastic moulding ensuring that the disc drive bezel is flush or within 0. 5mm of the front face.

9. Refit the data cable and power cable (check orientation). Carry out the second Floppy Disc Upgrade as per the instructions supplied with the kit.

10. Slide on the upper case and refit the 5 fixing screws. Submit the unit for testing.

11. Configure the drives as per the instructions supplied with Floppy Drive Upgrade Kit, AKD51. Ensure that the drive select switch on the disc drive is set correctly.

12. Test the disc drives by powering up the unit, and using a formatted and verified disc, carry out the following sequence:-

i) Catalogue Drive 0: Check drive 0 LED is on only
ii) Catalogue Drive 1: Check drive 1 LED is on only

13.The original disc drive should be suitably packed and returned to the Acorn Spares and Warranty Department, Fulbourn Road, Cherry Hinton, Cambridge, with a fully completed Service Report. A replacement unit will be sent to you to replenish your stock. Distributor dealers should return the exchanged drive to their distributor for action - not to Acorn direct.

NOTE: This modification is to overcome a fault when the Second Floppy Disc Drive is added to the Archimedes A410/1 computer. If R61 is fitted to either drive then both drive select LED's will illuminate regardless of which drive is accessed. This modification applies to Archimedes 410/1 computers with a second drive fitted Single floppy drive machines do not require modification.

All AKD51 upgrade kits should contain Citizen drives which are correct, i. e. R61 is not fitted. It should be noted that both drives to be used must have R61 removed.

*Before fitting a new drive check that R61 is not present.

When completing the Service Report, please ensure that the full serial number of the host computer AND the Second Drive Upgrade Kit is quoted accordingly. Failure to do so will result in the Service Report being returned without action.

Please note: R61 is mounted upon the disc drive PCB by means of surface mount technology. NO attempt should be made to remove this component. Any unauthorised rework of this drive will invalidate the warranty of the modified item.

FCO2008

F I E L D C H A N G E O R D E R
Acorn Computers Ltd

Field Change Order No. 2008

Date of Issue 6th September 1989
Applicable to (Product) A310 (AKB15), A440 (AKB20)

REASON FOR ISSUE

The FPU (AKA20) and SCSI (AKA30) expansion cards required the host machine to contain a MEMC1 A (as opposed to MEMC1).

TYPES AFFECTED

(eg. serial nos/issues/levels)

Any AKB15 being fitted with a SCSI (AKA30) expansion card
NOTE: FPU (AKA20) may NOT be fitted to A310 (AKB15).

Any AKB20 being fitted with a FPU (AKA20) or/and a SCSI (AKA30) expansion cards.

DESCRIPTION OF CHANGE

Fit MEMCIA upgrade as per attached Technical Information Sheet.

CLAIM PROCEDURE

Following the fitting of a FPU (AKA20) or a SCSI (AKA30) and the necessary MEMC1A Upgrade (AKA22) from stock. Service Engineers should complete a Service Report clearly stating the Serial No's. of the FPU (AKA20) or SCSI (AKA30) and the host unit (AKB15 or AKB20), the FCO No. (above) and claim the FCO Credit Rate (below) for labour charges.

Acorn will verify the Serial No's, process the claim for labour charges in the normal manner and issue a replacement MEMC1 A Upgrade.

REWORK DOC. REFERENCE (
SID Doc.ref)'
FCO2008

FCO 2008 (contd.)

FCO CREDIT RATE
£16.00 (sixteen)

SPECIAL INSTRUCTIONS

PLEASE NOTE:- A Floating Point Unit CAN NOT be fitted to an Archimedes 310 (AKB15).

MEMC1A UPGRADE

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

Applicable models

* Archimedes 310
* Archimedes 440

PURPOSE

To upgrade existing machines to include a MEMC1A memory controller. This is a necessary upgrade before fitting Acorn SCSI and (440 only) Floating Point expansion cards, and also increases performance generally by about 10%. This modification is not required on Archimedes 400/1 series, Acorn R140 or A3000 systems.

PARTS REQUIRED

All models:

* MEMC1 a (part number 2201,375)
* MEMC1A PAL (0277,401)

Archimedes 440 only:

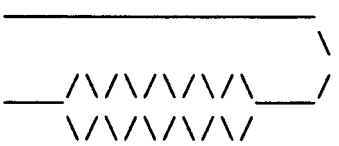
* 33R resistor (0502,330).

PCB MODIFICATION PROCEDURES

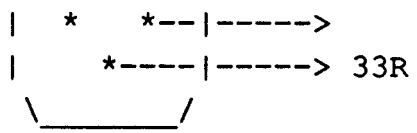
WARNING:
TAKE ALL PRECAUTIONS REGARDING STATIC ELECTRICITY AND EARTHING IN ACCORDANCE WITH BS 5783

ARCHIMEDES 440 ONLY

1. Switch off and disconnect the computer from the mains supply
2. Remove the top cover and the backplane (if fitted) disconnect the power leads, and remove the main PCB, in accordance with the disassembly instructions given in the service manual.
3. Desolder and remove transistor 014 from the board.
4. Desolder and remove 330R resistor R121 from the PCB.
5. Take a new 33R resistor (part number 0502,330) and form it as shown below:



6. Solder the resistor between the emitter and base pads of 014 on the PCB as shown below.



7. Using the correct tool, remove the MEMC device from position IC45, and replace with a new MEMC1A (part number 2201,375), making sure that the orientation of the device is correct - the cut-off corner of the chip should match the corresponding feature of the socket.

8. Remove existing PAL from position IC44, and replace with a new MEMC1 A PAL (part number 0277,401).

9. Reassemble the computer.

10 Test

11 Complete the 'Installation details' on the Upgrade Guarantee form (part number 0476,363).

ARCHIMEDES 310

Follow steps 1-2 and 7-11 only of the 440 modification procedure detailed above.