

# ACORN

## HIGH PERFORMANCE COMPUTER SYSTEMS



# *Archimedes 440*



Acorn   
The choice of experience.



Archimedes 440 is the flagship of the award-winning Archimedes range of high-performance personal workstations. Combining the proven advantages of Archimedes' high-speed processing with additional built-in memory and data storage, the 440 takes Archimedes forward to new levels of professional computing ability. A four-slot backplane for plug-in cards gives increased expansion capability, allowing connection with a wide range of information and control systems. Four megabytes of fully addressable RAM and 20 megabytes of fast-access hard disc data storage match the processing power of the Archimedes cpu to give outstanding program execution speed. High-resolution monitors exploit Archimedes performance in the most demanding graphics applications.

## The Archimedes Advantage

The unique advantage of Archimedes lies in combining the exceptional speed of the Acorn 32-bit RISC processor with the flexible range of high-performance hardware, software and expansion capabilities. For example, the 6502 Emulator allows many programs written for the widely used BBC Model B and Master Series Microcomputers to be used unchanged on Archimedes. Similarly, the optional PC Emulator allows Archimedes to run a vast range of PC-compatible software. Existing programs can therefore be fully utilised while new software is brought in to take advantage of Archimedes' features and performance.

Readily available software for Archimedes includes spreadsheets, business graphics, database and accounting systems.

## High Level Languages

For program development, Archimedes is supplied with BBC BASIC V, an extended version of the highly acclaimed BBC BASIC. Programs written in this easy to learn but powerful interpreted language can execute at speeds out-performing those in machine code on almost all personal computers. Alternatively, industry-standard professional language compilers, including FORTRAN, C, Pascal and LISP, are available so that Archimedes' processing power can be used to increase productivity in scientific, technical and research applications.

## Networking Solutions

In line with the importance Acorn attaches to networking, Archimedes can be linked to many computer networks and data systems. A choice of modems and terminal emulation software is available. The Ethernet connection module, now under development, opens the opportunity for linking to this widely used professional computer networking system, while the optional Econet module offers a proven low-cost networking solution. The serial and parallel interfaces and four-slot backplane for expansion cards allow interconnection with a wide range of data networks, monitoring and control systems, electronic equipment and peripherals.



Archimedes 440 presents an unrivalled combination of:

- **USABILITY.** Industry-standard high-level languages and BBC BASIC allow users to start programming right away.
- **COMPATIBILITY.** Many existing BBC Microcomputer and PC programs can be run unchanged on Archimedes using the 6502 and PC Emulators.
- **EXPANDABILITY.** Plug-in expansion cards extend the power and range of the Archimedes system.
- **PRODUCTIVITY.** Processing speed, fully addressable RAM and extremely fast data transfer rates mean rapid development of fast-running programs.
- **VERSATILITY.** With sophisticated sound, high-resolution graphics, extensive colour facilities, and sheer number-crunching power, Archimedes 440 offers the ideal solution for a wide range of microcomputer applications.

## RISC TECHNOLOGY

The heart of the Archimedes personal workstation is the Acorn RISC Machine (ARM) 32-bit processor. Designed and developed at the Acorn research centre in Cambridge, the ARM cpu gives Archimedes a decisive advantage in processing speed, compared with computers using standard 'off-the-shelf' microprocessor chips.

In ordinary processors, a large number of instructions are built into the chip, including many that are complex but rarely used. This slows down execution of the instructions that are most often used. RISC technology greatly reduces the number of processor instructions and simplifies them so that they can be executed much more quickly. The rarely used complex instructions are replaced by a series of simple RISC instructions, incurring a negligible penalty compared with the vastly increased speed at which the commonly used instructions are executed.

## PROCESSING SPEED

Full advantage has been taken of the ARM 32-bit processor by the Archimedes operating system (Arthur), which exploits the processing speed of RISC technology, and provides a sophisticated WIMP environment which offers control in a friendly, graphics-led way. In contrast, many microcomputers use a standard 16-bit operating system which directly addresses only 640 Kilobytes of RAM and has to be controlled using cryptic commands. The result is a decisive advantage to Archimedes in processing speed and usability over rival microcomputers. Benchmark tests show Archimedes 440 giving performance comparable with vastly more expensive computers.

## ADVANCED CAPABILITY

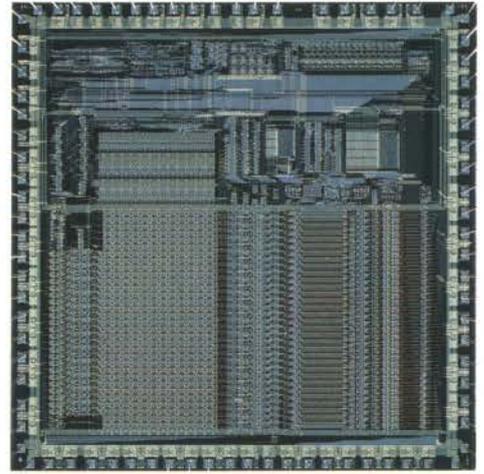
The exceptional processing speed of Archimedes 440 brings many benefits. Firstly and most obviously, large computations are executed more quickly. Recalculating complex spreadsheets or reformatting long documents causes tedious delays on an ordinary PC, but can be performed in moments by Archimedes 440. Long programs compile so quickly that software development productivity is substantially improved. Fast data transfer rates work with the processing speed and enormous RAM of the 440 to allow the virtual elimination of disc reading delays in many applications. Serious artificial intelligence and expert system applications, demanding intensive data processing, can be developed and run productively with Archimedes 440 power.

Secondly, the performance of Archimedes 440 opens up entirely new possibilities for developing speed-critical microcomputer programs using high-level languages. Routines that on other microcomputers would have to be written painstakingly in machine code can be programmed straightforwardly in a high-level language. Interpreted BBC BASIC can be used to create animated graphics. Language compilers can be used to write the most complex professional software. Interactive 3-D modelling, on-screen page layout, shaded full-colour animations, all can be developed quickly with spectacular results, using widely available programming skills.

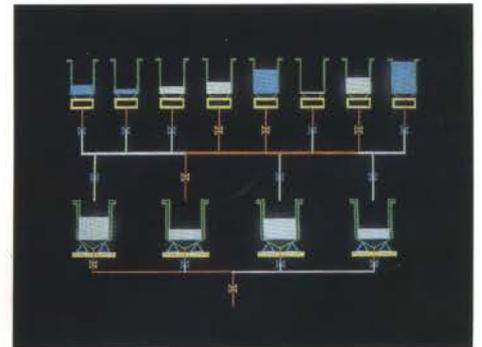
## GRAPHICS AND SOUND

High-resolution colour and monochrome graphics make Archimedes ideal for applications requiring visual and diagrammatic displays. With a choice of monitors giving resolutions up to  $1280 \times 976$  (monochrome) and colour selections up to 256 on-screen shades from a total 4096, exceptional graphical effects can be achieved. Coupling these with Archimedes' processing power allows the development of CAD systems with lightning fast redraw times, interactive modelling with instant response, colour animations with complex movements. Desk-top publishing systems can be developed taking advantage of the high-resolution display to show illustrations and type styles at their best. Fast ripple through of format changes is ensured by Archimedes' processing power.

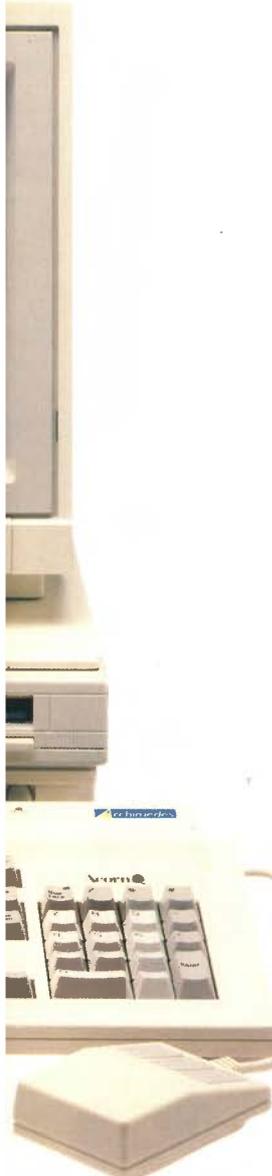
The audio capability of Archimedes is astounding. Eight voice digital stereo sound, stereo output jack for connection to hi-fi systems, and the optional MIDI interface to music synthesisers, all open up exciting opportunities for creative sound generation and control.



The Acorn RISC chip.



A plant mimic diagram in a real-time process control system.



# Specifications

## CENTRAL PROCESSING UNIT

ARM (Acorn RISC Machine)  
32-bit Reduced Instruction Set microprocessor  
Typical processor performance: 4 MIPS

## MEMORY

**Dynamic RAM**  
4 Mbytes, fully addressable  
Non-volatile RAM (CMOS, battery backed):  
240 bytes user configuration  
16 bytes real-time clock  
**ROM**  
512 Kbytes  
*Contents:*  
Machine operating system (Arthur)  
BBC BASIC V and BASIC Editor  
Advanced Disc Filing System (ADFS)  
Advanced Net Filing System (ANFS)  
Desk Top Manager  
*Character sets:* ISO 8859, Latin 1-4, Greek

## DATA STORAGE

**Floppy discs:**  
3.5" double sided, 1 Mb capacity (unformatted)  
**Hard disc:**  
Built-in 20 Mbyte  
Continuous data transfer rate 3.3 Mbit/sec

## DISPLAY

Medium resolution monochrome  
*High resolution monochrome:*  
Mode 22 (1280 × 976) – Graphics and text  
Mode 23 – Text only (144 characters, 54 lines)  
*Medium resolution colour:*  
Screen modes 0-17

Text	Graphics resolution	Number of colours
20×32	160×256	4, 16, 256
40×32	320×256	2, 4, 16, 256
80×32	640×256	2, 4, 16, 256
132×32	Text only	16
40×25	Text only	2
40×25	Teletext	16
80×25	Text only	2, 4, 16
132×25	Text only	16

*High resolution colour:*  
Screen modes 0-17 plus  
Screen modes 18-20

Text	Graphics resolution	Number of colours
80×64	640×512	2, 4, 16

**Outputs:**  
Analogue RGB + sync, 9-pin D-type socket  
High resolution mono video, 2 × BNC  
Monochrome composite video via internal link option

## MONITOR OPTIONS

*Medium resolution monochrome:*  
12" screen  
*Medium resolution colour:*  
14" screen

## SOUND

Two-channel stereo with 7 stereo positions and 8 voices  
One internal loudspeaker  
3.5 mm stereo jack for 32 ohm stereo headphones or amplifier

## KEYBOARD AND MOUSE

103-key 'enhanced PC' style keyboard  
Two-key rollover with programmable auto-repeat rate  
Adjustable holder for function key labelling cards  
Three-button mouse with programmable movement scaling

## INTERFACES

**Serial interface**  
Standard 9-pin RS 423/232 D-type plug  
Software selectable Rx and Tx baud rates, 75-19200 baud  
**Parallel interface**  
25-pin D-type socket  
Centronics 8-bit compatible

## EXPANSION OPTIONS

**Internal module**  
ECONET Local Area Network connection via optional internal plug-in module  
**Integral backplane**  
Four expansion slots on integral backplane  
Three 64-way DIN 41612 connectors (expansion card interfaces)  
One 96-way DIN 41612 connector (co-processor or expansion card interface)  
**I/O expansion card**  
(Input/Output interface to support many existing BBC applications)  
Double width. Provides user port, 1MHz bus and A-D port, similar to those provided on the Master 128 including the connector types. Previous Master 128 operating system calls are in general supported.  
**ROM expansion card**  
Single width card providing five 32-pin sockets for a range of ROM/EPROM types, and two static RAM sockets which can be upgraded to include rechargeable battery back-up.  
**MIDI expansion card**  
(Musical Instrument Digital Interface)  
This is an upgrade to the I/O expansion card, contained within the I/O card's double width. The MIDI standard interface is supported. An EPROM upgrade to the I/O card is included to enable operating system level control of the MIDI ports.

## STANDARD SOFTWARE

**Welcome Suite**  
Tutorials and Utilities and Demonstrations  
Painting program  
Music program  
Font Designer and choice of standard fonts  
6502 Emulator – runs many programs written for BBC Microcomputers  
Floating Point Emulator – performs floating point calculations

## DOCUMENTATION

Archimedes Welcome Guide  
Archimedes User Guide

## DIMENSIONS AND POWER SUPPLY

**Computer unit:**  
Width 362 mm, depth 406 mm, height 97 mm (excluding feet)  
**Keyboard unit:**  
Width 485 mm, depth 205 mm, height 46 mm (excluding feet)  
**Monitor, medium resolution monochrome:**  
Width 305 mm, depth 303 mm, height 280 mm  
**Monitor, medium resolution colour:**  
Width 320 mm, depth 350 mm, height 387 mm  
**Power input:** 198 to 264V AC (50Hz)

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