Control
Universal

Microcomputer Systems
and Components

CONTROL UNIVERSAL LIMITED

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(six lines)

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Control Universal was founded in 1978 when its first
activity was as a sales outlet for Rockwell Microcomputers,
a role which actively continues. Since then the business has
extended into the sale of Acorn products, a wide range of
peripherals such as visual display units and printers, and
then into own manufacture of the CUBE range of Eurocard
Computer Units, such as CUBIT, CUMEM and The Industrial
Cube.

In addition, Control Universal have performed full range
design and manufacture projects for clients who have wished
to use microcomputer technology in applications as diverse
as Electronic Dart Scorers, Foreign Exchange Calculators and
Pharmacist's Prescription Analyser and Label Printer. In
some cases these projects have included every aspect of
design from system concept, styling of the enclosure,
mechanical production, circuit board layout, electronic
manufacture and test.

In 1981 the Company moved from Harlow into much larger
premises in Cambridge. In addition to appreciating Cambridge
as one of the country s most attractive towns, the Directors
recognised the advantage of being located close to both the
advanced research taking place at the University and to
other leading companies in the Microcomputer Industry, Acorn
in particular.

The future is seen as holding exceptional opportunities for
even more dramatic increases in activity, with particular
emphasis on increasing the range of CUBE cards, on local
area networks for the control of peripherals and input/
output units, and upon industrial applications generally.

THE CONTROL UNIVERSAL TEAM

DIRECTORS	Jon Dane (managing)	Dave Hunt (technical)

SALES DEPT   Phil Taylor – technical sales
Colin Stevens – order desk

PRODUCTION DEPT   David Jarvis – production controller
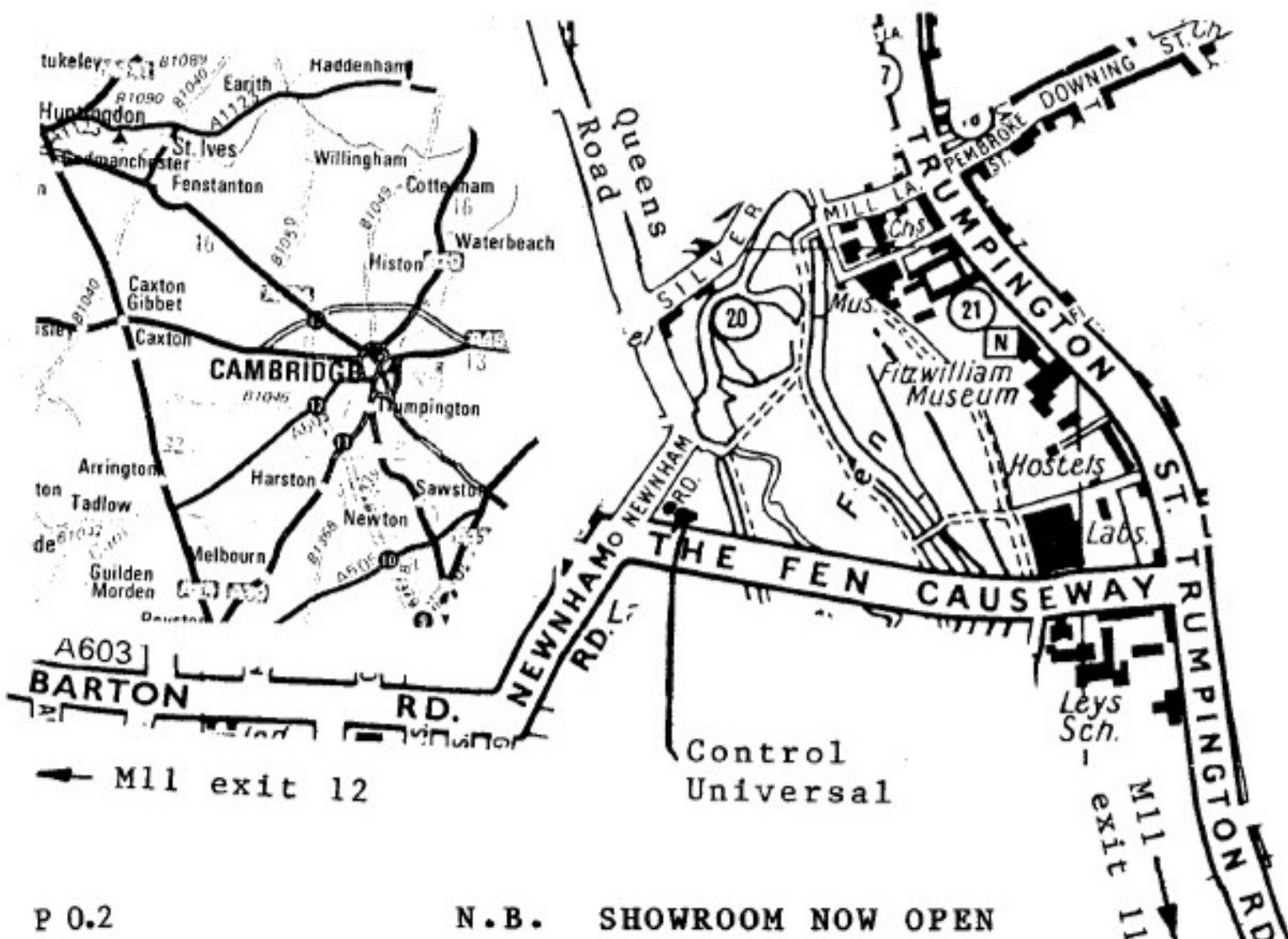
Lesley Monshall – progress enquiries

PRODUCTION TEAM   Pat Taylor
Rob Baker
Marie Lipman
Peter Whybrow
Nicola Blake
Lyn Miller

ENGINEERING DEPT   DEVELOPMENT TEAM   Dave Hunt
Phil Taylor
Jake Stewart

QUALITY ASSURANCE Derek Sapsworth

Rob Bond

ACCOUNTS   Lyn Hume

HOW TO FIND CONTROL UNIVERSAL

← M11 exit 12

Control
Universal

M11 exit 11

      N.B.   SHOWROOM NOW OPEN

CONTENTS

TERMS OF BUSINESS

1. PRICES. All prices quoted are exclusive of VAT. Currently 15% is charged on all items except books, which are zero rated. Products which include documentation have VAT levied on the whole price for the product.

2. DELIVERY CHARGES. Postage, packing and insurance charges are added to credit card and credit account orders, but are free on orders paid in advance.

3. PAYMENT. Access, Barclaycard and Visa are accepted as payment. Credit accounts are opened on the strict understanding that invoices will be paid within 30 days of presentation. The payment terms must be observed for all goods delivered, and there is no entitlement to delay payment on the grounds that an order is not complete.

4. TITLE. Control Universal Ltd retain title to all goods until paid for in full.

5. COPYRIGHT WARNING. Copyright restrictions exist on all hardware designs and software in products sold by Control Universal Ltd. The price paid entitles the purchaser to make use of or sell the item bought, but does not include the right to make any copies.

6. GUARANTEE. All products sold by Control Universal are guaranteed for 90 days from the date of delivery, and will be replaced or repaired in the event of a failure being due to the supply of faulty materials or workmanship by Control Universal Ltd.

7. LIABILITY. All sales are made by Control Universal Ltd on the strict understanding that all liability for any consequential loss is excluded.

QUANTITY DISCOUNTS

The Control Universal Range of Computer Units in Section 2 is subject to a quantity discount according to the following table..

Quantity ordered	1 - 9	10 - 49	50 - 99	100 +	500 +	1000 +
Price Charged	net	-8%	-15%	-23%	-29%	-35%
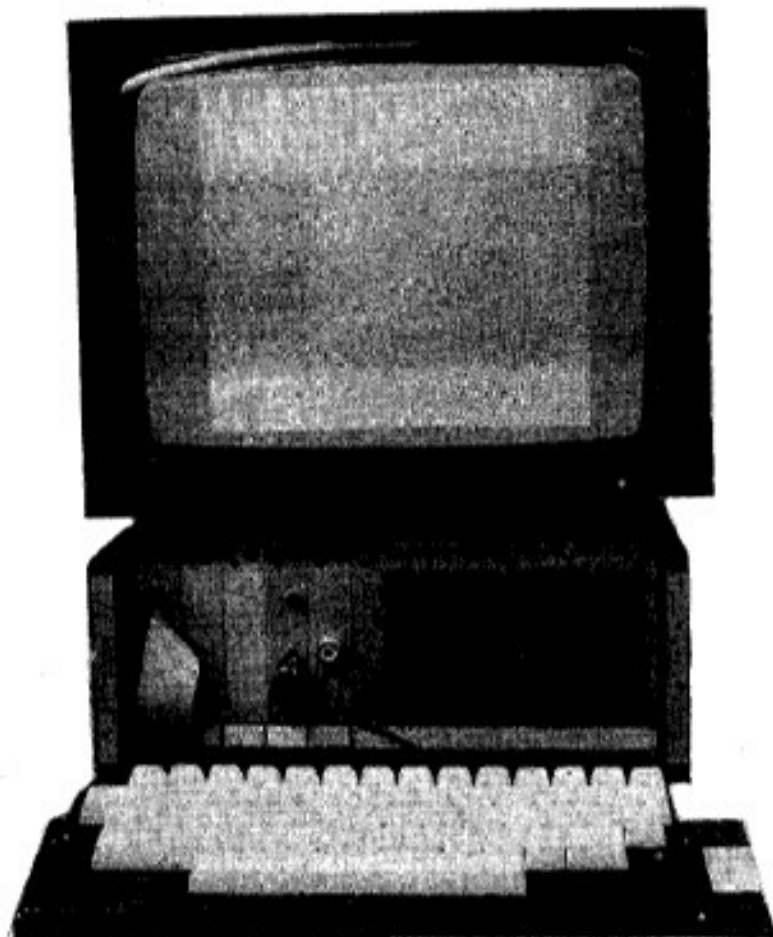
SYSTEM 10   1 DOUBLE
SIDED DISK,
MONOCHROME

SYSTEM 15   1 DOUBLE
SIDED DISK,
COLOUR

SYSTEM 20   2 DOUBLE
SIDED DISKS,
MONOCHROME

SYSTEM 25   2 DOUBLE
SIDED DISKS,
COLOUR

The four members of the CUBE SYSTEM are compatible, fully engineered disk based computers, using rack mounted Eurocards following the Acorn standard data bus arrangement. All feature the CU-GRAPH high resolution graphics display, 64k bytes of DRAM memory, one or two double sided disk drives, and include in the price both the appropiate high-resolution monitor and the keyboard.

In each case the processor unit is the 6502 based CUBIT, although the 6802 based CUMOT and the 6809 based CUNINE are interchangeable alternatives. With the CUBIT card is the CUBOS operating system which is designed to support a disk operating system that runs Acorn Atom BASIC and is planned to also accomodate BBC BASIC.

The enclosure is a Eurorack with 12 one inch wide slots. Seven of these accomodate the disk module with one or two disk drives, and of the remaining five are allocated as follows:

Slot	1	2	3	4	5
Monochrome SYS 10, 20	CUBIT	CU-DRAM 64k	CU-GRAPH-mono	CU-PRINT	Spare
Colour SYS 15, 25	CUBIT	CU-DRAM 64k	CU-GRAPH-mono	CU-GRAPH-extn (colour + print)	Spare

Thus in each case there is a spare slot, but there is anyway no

reason why a customer requiring more spare slots should not order a full 19" wide rack at small extra cost. The 12" format is offered because of its convenient size and the power to cope with most requirements.

These computers are COMPLETE with keyboard, video, all cables and connectors, and DOUBLE SIDED DISKS. Add only the software of your choice, and a suitable printer, and you are ready for work. The screen format of all of the systems is 80 columns by 25 rows, and the monitor supplied with each system has the resolution to cope with this performance. The monochrome screen displays 16k bytes on the screen, and the colour extension involves no trade-off in resolution, as the screen display increases to 48k. The whole of this memory is separate from the computer memory, while uses only 256 bytes to communicate with the graphics processor chip.

The price build-up of CUBE systems is shown because of the intention of offering the user an advantage over other computers in that any item in the system may be deleted or replaced or added to without price penalty in order to achieve exactly the desired system.

Part	SYSTEM 10	SYSTEM 15	SYSTEM 20	SYSTEM 25
CUBIT	75	75	75	75
CUDRAM	99	99	99	99
CU-GRAPH	180	360	180	360
CU-PRINT *	40	0	40	0
DISK CONTROLLER	134	134	134	134
DISK DRIVE	250	250	500	500
DISK MOUNTING UNIT	15	15	20	20
DISK CABLE	15	15	25	25
OPERATING SYSTEM	40	40	40	40
CU-KEY	40	40	40	40
MONITOR	139	495	139	495
RACK	80	80	80	80
POWER SUPPLY	60	60	60	60
ASSEMBLY CHARGE	30	30	30	30
totals	1197	1693	1462	1958
order code	1410	1415	1420	1425

* A printer interface card is added to this list for system 10 and 20 to achieve a complete system ready for use. The CU-GRAPH extension included in the colour computers systems 15 and 25 has a built-in printer interface.

Single sided disks, costing 195.00 are available as an option to the double sided disks, but our advice is that the small difference in cost is amply repaid by the higher performance.

Note that all of the above systems use the standard data bus that is common to Acorn and Control Universal products, so any of the Eurocards from either range may be added to any of the CUBE systems.

Deliveries are scheduled to commence in September 1982.

CU-KEY is currently an unenclosed keyboard. An enclosure which also adds the option of a 25 key numeric and special function keypad is expected shortly.

CUBOS OPERATING SYSTEM FOR 6502-BASED CUBIT

CUBOS is supplied in a 4K EPROM and resides from $F800 to $FFFF. It is a 2k program from hex F800 to FFFF. The lower half of the PROM is taken up with part of the 10k version of Atom BASIC called CU-BASIC. It supports the Acorn disk operating system, the full 10k version of Acorn Atom BASIC, and includes drivers for decoding the CU-KEY qwerty keyboard and driving a video card. Versions are available for the Acorn 40 column card and CU-GRAPH in both text and graphics, and for the Acorn 80 column card in text only. In addition, it has the following built-in features:-

MEX - MEMORY EXAMINE AND CHANGE. Displays in hexadecimal and binary form the contents of a specified memory address, and allows the user to step forwards and backwards in memory through adjacent locations, and to change data at will. There is also a HOLD command which continuously examines a specified location. This is particularly useful for checking i/o ports as they change in real time.

GO to address specified.

CRC - CYCLIC REDUNDANCY CHECK. Produces a four digit hex value based on the data between specified memory locations. This is especially useful for the checking and identification of PROMs.

RAM - MEMORY TEST. Checks the operation of RAM memory between specified locations.

Turnkey. Up to 64 characters can be stored in the CUBOS PROM which will be treated as initialization characters as if they came from the keyboard upon switch-on.

DOS   At switch-on CUBOS checks for the existence of the DOS ROM, and if found to be present, the system enters the Disk Operating System automatically.

Assembler. Atom BASIC includes a machine code assembler.
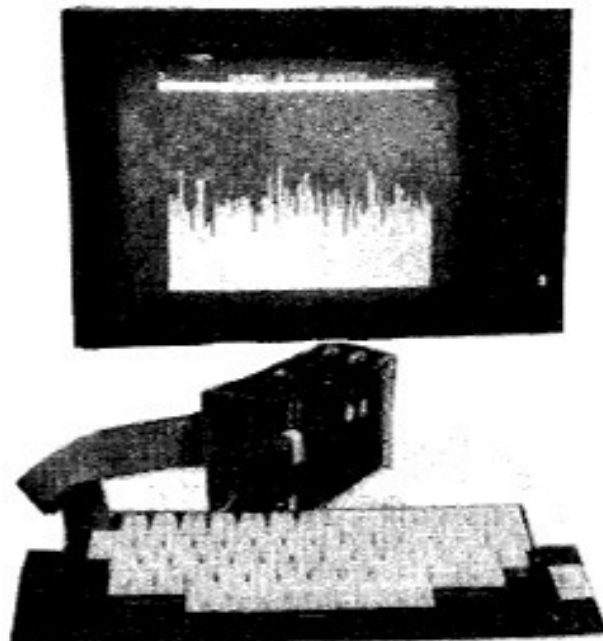
CUBOS OPERATING SYSTEM

Memory Map

FFFF F800	CUBOS operating System	4k EPROM F000 – FFFF
 F000	CU–BASIC (assembler and DIM statements + high level PLOT commands)	
 E000 D000	CUDOS Disk operating system CU–BASIC floating point extension or EDIT text processor or Industrial Control Language	4k EPROM E000 – EFFF RAM or EPROM
 C000	CU–BASIC integer BASIC or ADE machine code assembler	RAM or EPROM
 3000	User RAM 36k bytes free	RAM
 2800 2000	Disk based utilities and floating point variables Disk file area	RAM
 0400	Peripherals	i/o
 0000	Operating system RAM	RAM

1218CG CUBOS operating system on PROM for CU–GRAPH   25.00
1218FC CUBOS operating system on PROM for Acorn 40 column vdu   25.00
1218EC CUBOS operating system on PROM for Acorn 80 column vdu   25.00

799SH CUDOS Disk operating system for CUBOS for SHUGART drives   50.00
799TO CUDOS Disk operating system for CUBOS for TOSHIBA drives   50.00
799TA CUDOS Disk operating system for CUBOS for TANDON drives   50.00

804   CU–BASIC. Acorn Atom 10K BASIC, for use with CUBOS   50.00

INDUSTRIAL CONTROL UNIT

This two or three card system consists of the CUBIT 6502-based single board computer and a choice of video cards, bolted together and connected with a three way backplane. It comes complete with a CUBOS operating system, and can accept the CU-KEY qwerty keyboard. A popular addition is the Acorn Atom 10K version of BASIC (which includes a machine code assembler and Control Universal's modification to drive the graphics facilities on the 40 column video card) and 8K of battery-backed CMOS RAM memory, both of which are carried on a CU-MEM.

CODE	DESCRIPTION	PRICE
1170	Industrial Control Unit Level 1	195.00

       Includes:
605	CUBIT 1K	
740	Acorn 40 column video	
943	Three way backplane	
1218	CUBOS operating system	

1172	As above, but with 80 column vdu card	245.00
1174	As above but with CU-GRAPH monochrome vdu card	275.00
1176	As above but with CU-GRAPH colour vdu card	455.00

1171	Industrial Control Unit Level 2	385.00

       As 1170 above, but with the following additions:

660	CU-KEY	
535	CUMEM	
1045	8K CMOS RAM (4 chips type 5516)	
804	CU-BASIC (10K Atom BASIC)	

1173	As above, but with 80 column vdu card	435.00
1174	As above but with CU-GRAPH monochrome vdu card	465.00
1174	As above but with CU-GRAPH colour vdu card	645.00

CUBIT

MULTI-PURPOSE 6502 CARD
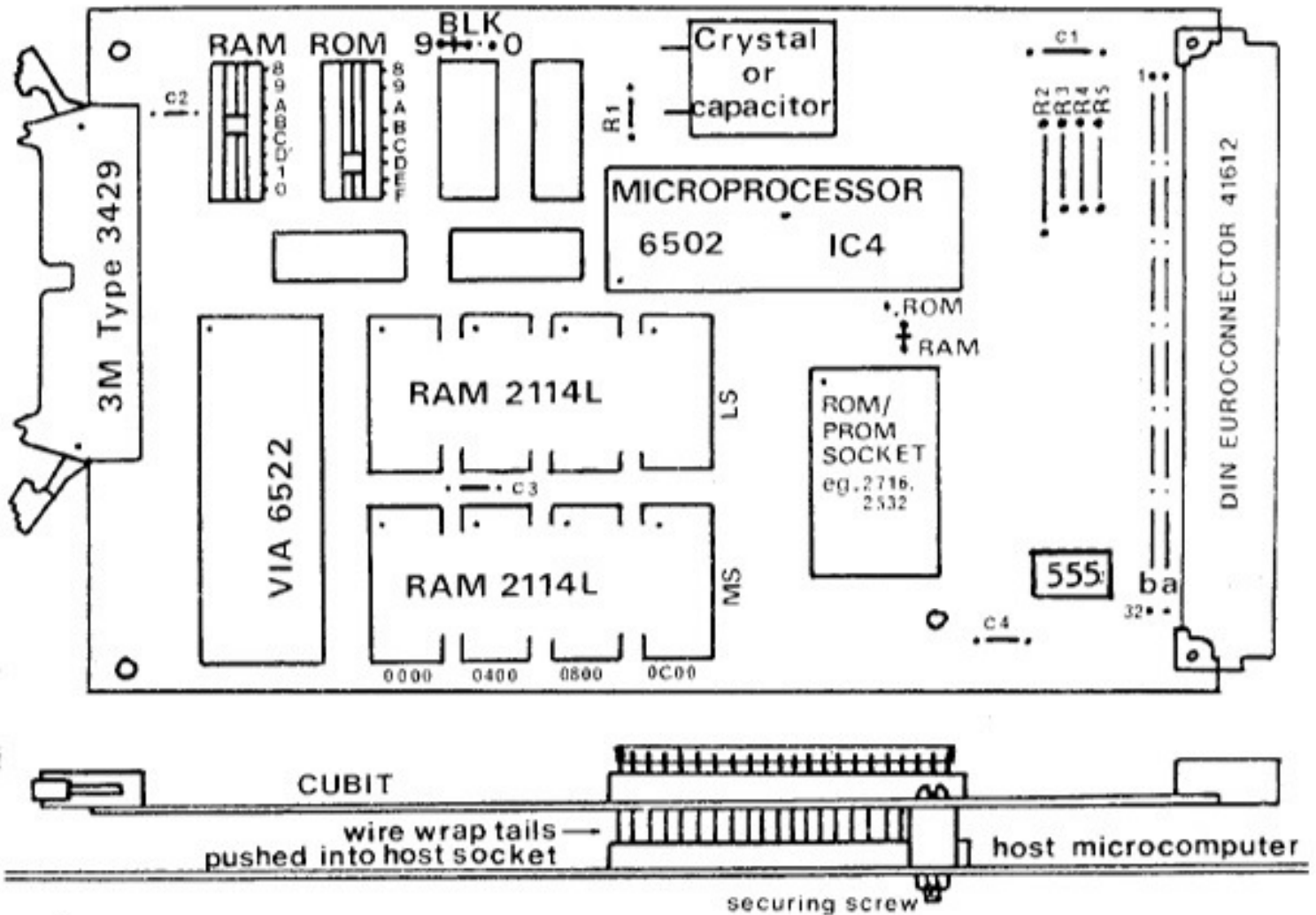
CUBIT is a Eurocard sized (100mm x 160mm) microprocessor module with four main functions.

1. As an extension card to 6502-based computers, particularly the Rockwell AIM 65, adds 4K bytes of RAM memory plus a socket for a 2k or 4k byte ROM or EPROM. This ROM socket can be arranged to take a further 2k bytes of RAM memory. It also provides a VIA (6522) input/output chip giving 20 i/o lines via a 26 way ribbon cable connector, and a 64 way DIN connector (which can take a 64 way ribbon cable) for connection on to the Acorn standard computer bus. This gives the user access to all the Acorn and Control Universal computer cards.

2. As a interface between 6502-based computers and the Acorn and Control Universal range of computer cards, which includes VDU cards, memory cards, PROM programmer, floppy disk controller and many more.

3. As a stand-alone single board computer. All the facilities described above are available, and the CU-KEY qwerty keyboard and CUBOS operating system, described separately in this catalogue, complete its usefulness as an independent computer. See also the section on the Industrial Control Unit, which allows the use of BASIC with CUBIT.

4. As a memory and i/o extension. When plugged into the data bus without a 6502 on board, all the facilities of RAM, ROM and i/o can be accessed from

the host computer.

The mark 5 version of CUBIT, which is the current issue, incorporates a 555 timer chip which provides power-on restart. This improves the usefulness of the card, especially as a single board controller.

Fuller details can be found in the user manual on CUBIT, available without charge from Control Universal or your CUBIT dealer.

CUBIT

INTERFACE VERSION

- WITHOUT CRYSTAL OR 6502 PROCESSOR CHIP

This version has wire-wrap tails on the microprocessor socket to allow it to be plugged into the micro socket of the host computer. No 6502 or crystal is supplied, but in place of the crystal a capacitive oscillator is fitted, which allows the card to operate as a stand-alone computer simply by fitting the 6502 chip. This arrangement runs nominally at IMHz, but does not have the accuracy of a crystal.

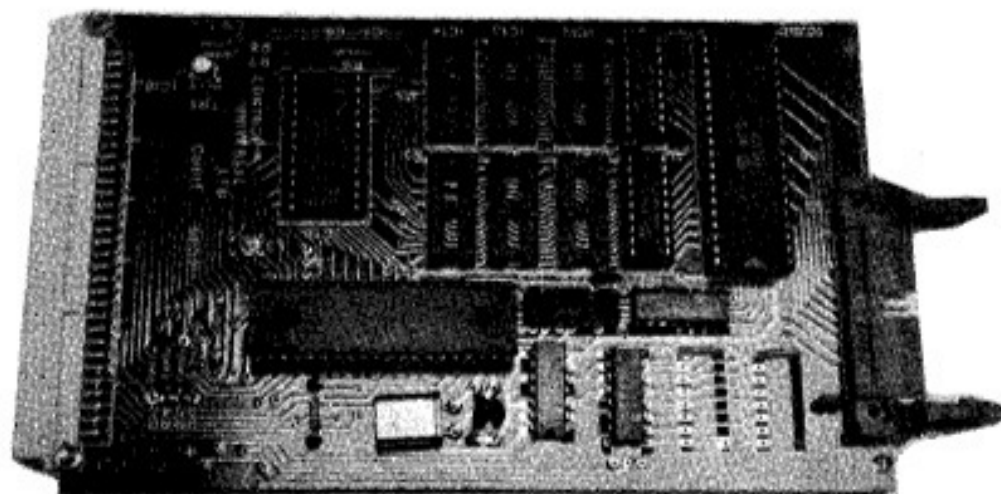| code	description	price
600A	COMPLETE ASSEMBLED & TESTED WITH 4K RAM	70.00
600K	COMPLETE WITH 4K RAM IN KIT FORM	55.00
600D	COMPLETE ASSEMBLED & TESTED WITH OK RAM	59.00
600K	KIT OF PARTS WITHOUT RAM OR 6522 (i/o CHIP)	44.00

SINGLE BOARD COMPUTER VERSION

- WITH CRYSTAL AND 6502 MICROPROCESSOR

605A	COMPLETE ASSEMBLED AND TESTED WITH 4K RAM	79.00
605	COMPLETE ASSEMBLED AND TESTED WITH 1K RAM	70.00
605K	KIT OF PARTS WITH 1K RAM	55.00
607	ASSEMBLED & TESTED WITHOUT RAM OR 6522 (i/o CHIP)	54.00
608	BARE PRINTED CIRCUIT BOARD ONLY	25.00
1214	4K PROM WITH "CUBOS" OPERATING SYSTEM FOR CUBIT (see page 1.3)	25.00

C U N I N E

6809 SINGLE BOARD COMPUTER

CU—NINE is part of the same family as CUBIT, and features a similar arrangement, of crystal controlled microprocessor, provision for 4k of RAM using 2114L chips, a 6522 providing 20 i/o channels, a socket for a 2K or 4K ROM or EPROM, with a data bus connection to the Acorn standard, so ensuring full compatibility with the entire Acorn and Control Universal range.
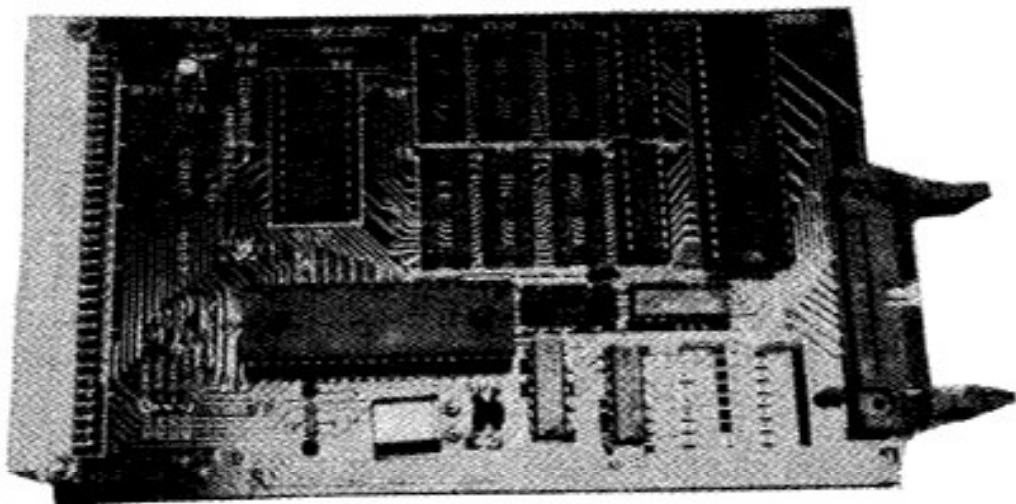

Fuller details in the user manual on CUNINE, available without charge from Control Universal or your CUBIT dealer.

| code	description	price
585A	COMPLETE ASSEMBLED AND TESTED WITH 4K RAM	£89.00
585	COMPLETE ASSEMBLED AND TESTED WITH 1K RAM	£80.00
585K	KIT OF PARTS WITH 1K RAM	£65.00
588	BARE PRINTED CIRCUIT BOARD ONLY	£25.00

C U M O T

6802 COMPUTER WITH 4K RAM, 4K ROM, 20 i/o CHANNELS

CUMOT is part of the same family as CUBIT, and features a similar arrangement, of crystal controlled microprocessor, provision for 4k of RAM using 2114L chips, a 6522 providing 20 i/o channels, a socket for a 2K or 4K ROM or EPROM, with a data bus connection to the Acorn standard, so ensuring full compatibility with the entire Acorn and Control Universal range.

Fuller details in the user manual on CUMOT, available without charge from Control Universal or your CUBIT dealer.

code	description	price
645A	COMPLETE ASSEMBLED AND TESTED WITH 4K RAM	79.00
645	COMPLETE ASSEMBLED AND TESTED WITH 1K RAM	70.00
645K	KIT OF PARTS WITH 1K RAM	55.00
648	BARE PRINTED CIRCUIT BOARD ONLY	25.00
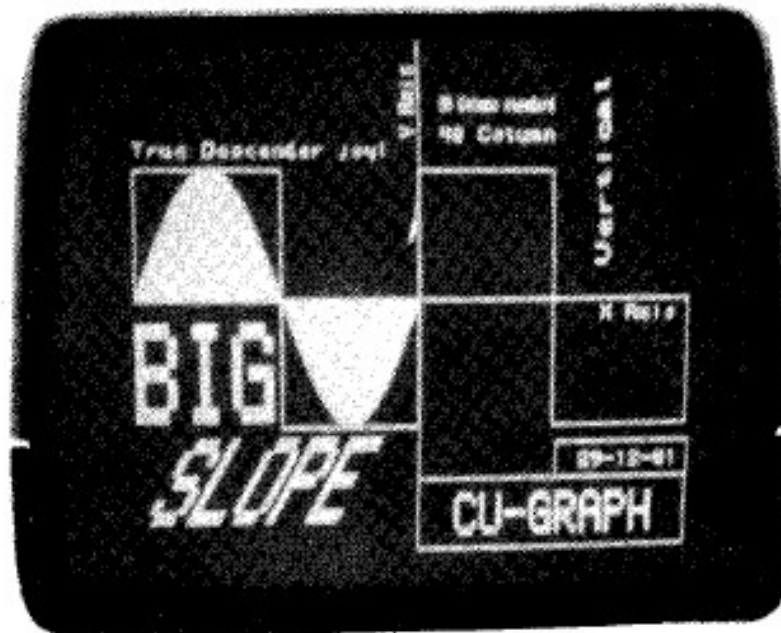
Cubit and Acorn compatible graphics card, 8 colours in 512 x 256 pixels.

Uses EF9366 graphics processor chip. Each plane of colour (red, green, blue) displays 16K Bytes of memory, giving 512 x 256 resolution; each pixel can be red, blue, green, white, yellow, cyan, magenta or black.

Only 256 bytes of the host computer memory are used, all 48K bytes of screen memory being on the memory map of the EF9366 only.

Text display can be superimposed on graphics, and can be up to 85 columns by 32 rows, using an on board generator of 96 standard characters. Each character can be scaled for height, width, slope, and orientation, all independently.

The user can define his own character set without restriction and can also, by defining a picture display unit as something larger than a single pixel (eg. 4 pixels wide by 2 pixels high) obtain a vastly increased palette of available colours, although at reduced resolution.

The EF9366 also permits fast hardware vector generation and light pen user input. The CU-GRAPH memory can be interrogated by the computer for output to monochrome or colour printers.

Outputs are provided as RGB and sync. CU-GRAPH is constructed as two boards called CU-GRAPH-mono and CU-GRAPH-extension, together they are referred to as CU-GRAPH-full colour. CU-GRAPH-mono is a Eurocard using the standard Acorn data bus and carries the EF9366 processor, address decoding and the 16K Bytes of dynamic RAM required for full graphics resolution in monochrome. There is also an output suitable for driving a bleeper to provide a BELL signal so completing the use of CU-GRAPH as a terminal. CU-GRAPH-extension is a similar sized board mounted piggy-back on CU-GRAPH-mono. It carries the further 32K Bytes of dynamic RAM necessary for 3 planes of colour at full resolution, plus a centronics type printer interface and 26 way ribbon cable connector.

Driver software for use on Acorn and Cubit systems is available now, together with a high resolution graphics version of Acorn Atom BASIC.

CODE	DESCRIPTION	PRICE
590	CU-GRAPH-mono assembled and tested	180.00
591	CU-GRAPH-extension assembled and tested	180.00
592	CU-GRAPH-mono in kit form	160.00
593	CU-GRAPH-extension in kit form	160.00
594	CU-GRAPH-full colour assembled and tested	360.00
595	CU-GRAPH software driving listings for use with CUBOS *	10.00
596	CU-GRAPH-mono PCB only	40.00
599	CU-GRAPH-extension PCB only	40.00

* supplied free with all other items on this page.

CUBAN – 8-BIT ANALOG AND DIGITAL UNIVERSAL INTERFACE

- 16 CHANNELS ANALOG TO DIGITAL, EIGHT BIT
- 1 CHANNEL DIGITAL TO ANALOG, EIGHT BIT
- TWO EIGHT BIT DIGITAL I/O PORTS, WITH FOUR CONTROL LINES
- PROVISION FOR ON-BOARD SWITCH AND LED I/O SIMULATION
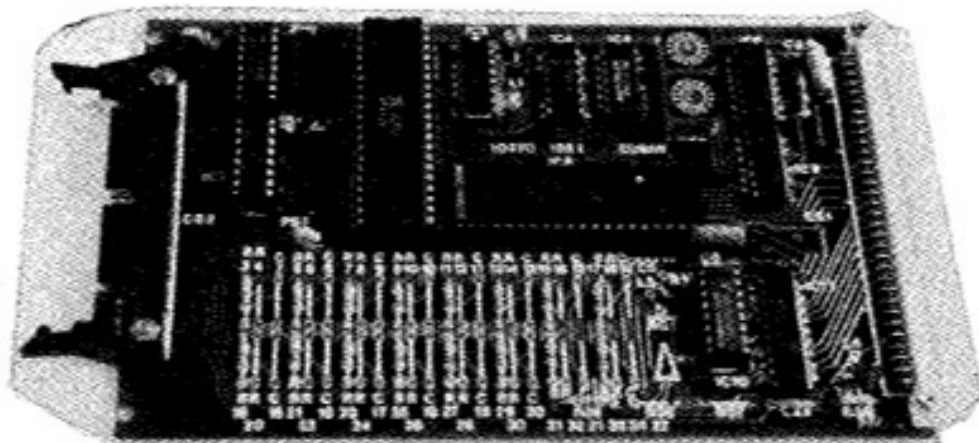
CUBAN was developed jointly between Control Universal and MEDC, Paisley College, and appeared in a series of articles written by Peter Williams, John Ferguson and Jake Stewart in Wireless World, under the series title of "Interfacing Microcomputers".

CUBAN is a Eurocard with the standard Acorn microprocessor bus, and so can be used with all Acorn and Control Universal processor cards, and via an interface card with a range of other microcomputers such as PET, Apple, TRS80, ZX81 etc.

It is particularly relevant to educational uses as it combines digital input and outputs, analog inputs and outputs, and a means of simulating digital inputs and outputs on board.

The National ADC0817CCN has a conversion speed of 100 microseconds per channel, and can have time constants applied to each of the 16 channels individually, or to all at once, or both, and there is on-board provision to do this. The accuracy is plus/minus one bit, or, with the alternative ADC0816CCN device, is plus/minus half bit.

The Ferranti ZN425E has a conversion speed of 1 millisecond.

There is provision for fitting an LM317T regulator on board, which allows the user to regulate the board supply of 5v to exactly 2.55v, thus arranging for each bit to represent 0.01v.

PRICES

610	PRINTED CIRCUIT ONLY WITH MANUAL	25.00
611	ASSEMBLED AND TESTED WITH HIGHER PERFORMANCE ADC0816	140.00
612	ASSEMBLED AND TESTED WITH STANDARD ADC0817	120.00
614	KIT OF ALL PARTS WITH ADC0817, PLUS MANUAL	90.00

CU-MEM — THE UNIVERSAL MEMORY CARRIER

- UP TO 16K BYTES OF NMOS OR BATTERY-BACKED CMOS RAM
- OR UP TO 64K BYTES OF PROM OR ROM
- OR A COMBINATION OF RAM AND ROM
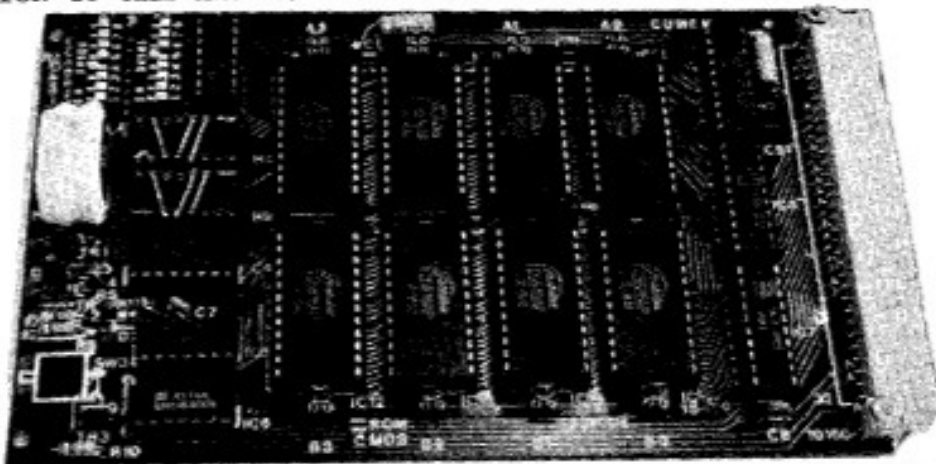
CU-MEM is a Euro-card using the standard Acorn bus, with eight 28 pin sockets, each of which can take the industry standard range of 24 and 28 pin memory devices, offering RAM, ROM and PROM options. The sockets are arranged in two banks, which can be individually selected for their position in memory (in 8K divisions) and for the type of memory device used. This allows the popular option of a bank of RAM (up to 8K) and a bank of PROM (up to 16K using the 2564 or similar).

All CU-MEMs are sold with automatic power-on reset, which both helps protect the battery-backed RAM from corruption, and gives automatic power-on start for Acorn systems which do not otherwise self-start.

Every CU-MEM also has a battery for preserving data when CMOS RAM type 5516 is used. (note that 6116 type can be used in the CU-MEM, but does not permit battery backup). The battery is trickle charged at all times that the board is supplied with its normal operating voltage of 5v, and, when fully charged, can be expected to hold up the memory for several months. The length of time of data retention is influenced by temperature, battery age, manufacturing tolerance variations of the memory chips' consumption and the number of charge/discharge cycles that the battery has gone through. When the power is lost at the mains, the voltage decays over a short period of time from 5v to 0v. As the value passes 4.5v, the CU-MEM generates a RESET on the microprocessor, thereby preventing random writing cycles which could corrupt the data.

The following are some of the types of memory that can be used on CU-MEM, many of which are offered for sale in the Integrated circuit section of this catalogue, section 14.

```
RAM      Mostek 4802 (2k bytes)
         Toshiba 2016 (2k bytes),
         5516 (CMOS 2k bytes, suitable for battery back-up)
         Hitachi 6116 (CMOS 2k bytes, not suitable for battery back-up)
         Intel 2816 (2k bytes)
ROM      Rockwell 2316 (4k), 2332 (4k), 2364 (8k)
EPROM    Texas 2516 (2k), 2532 (4k), 2564 (8k)
         Intel/Mostek 2716 (2k), 2732 (4k), 2764 (8k)
EEPROM   Hitachi 48016 (2k)
```

NEW! Toshiba have announced an 8k x 8 CMOS RAM, which can be used on CU-MEM. This will provide up to 64k bytes of battery backed CMOS RAM on one card! Keep in touch with us for details.

code	description	price
	MANUAL ONLY - FREE FROM CONTROL UNIVERSAL OR YOUR CUBIT DEALER	
534	CU-MEM PCB ONLY, WITH MANUAL	25.00
535	CU-MEM ASSEMBLED AND TESTED, BUT NO MEMORY DEVICES	70.00
535K	CU-MEM IN KIT FORM WITHOUT MEMORY DEVICES	55.00
536	CU-MEM ASSEMBLED & TESTED WITH 16K BYTES NMOS MEMORY	104.00
537	CU-MEM ASSEMBLED & TESTED WITH 16K BYTES CMOS MEMORY	132.00
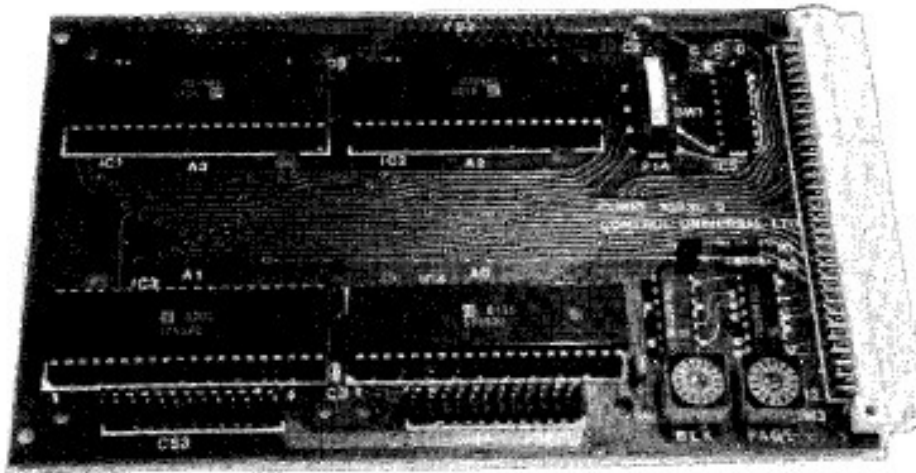
CUBIO carries four 40 pin sockets and is an exceptionally versatile unit that allows the use of either the cheaper Peripheral Interface Adaptor (PIA), which is sold as either the Rockwell 6520 or the Motorola 6821, or the more expensive but higher performance Versatile Interface Adaptor (VIA), which is sold as the Rockwell 6522. PIAs have 16 i/o lines, as has the VIA, but the VIA has in addition 4 control lines, which can be used as i/o, two timers, serial/parallel and parallel/serial shift registers and interrupt handling facilities.

code	description	price
630	PCB only with manual and circuit diagram	£25
631	Fully assembled and tested with no PIAs or VIAs	£45
632	Fully assembled and tested with four PIA devices	£53
633	Fully assembled and tested with four VIA devices	£65

CU-DRAM   64K BYTES DYNAMIC RAM CARD

CU-DRAM is a new development by Control Universal scheduled for deliveries in August 1982. It utilises eight 64k bit dynamic RAM chips to give 64k bytes. Since most microcomputers require part of their memory map to be reserved for an operating system ROM and input/output devices the card is provided with 16 switches which allow the user to de-select those areas of memory which are used for other purposes. This can be done in blocks of 4k, and may be in any combination of selected and de-selected 4k blocks. A block is defined as starting from X000 to XFFF in hexadecimal, where X is the code selected from 0 to F.

The devices used require a 5v supply only and are rated at 280nS. The board design allows the RAM to be used at more than 1MHz, and when the faster RAMs become available, the board will be able to operate at 2MHz.

In addition, CU-DRAMs can be used together, up to 16 at a time, by writing to their their board select register, which will select one out of 16 to be active. Each CU-DRAM is defined as being bank number 0 to 15 by links. By this means, CU-DRAMs can provide up to 1MByte of RAM.

There is also a 28-pin PROM/ROM socket for a 4k or 8k device into which is plugged a replacement for the host computer's firmware resident at hex F000 to FFFF. This prevents memory address clash when the board select facility is used.

code	description	price
670	CU-DRAM assembled and tested with 64k bytes dynamic RAM	99.00
678	CU-DRAM printed circuit board only + manual, circuit	40.00

CU-PRINT

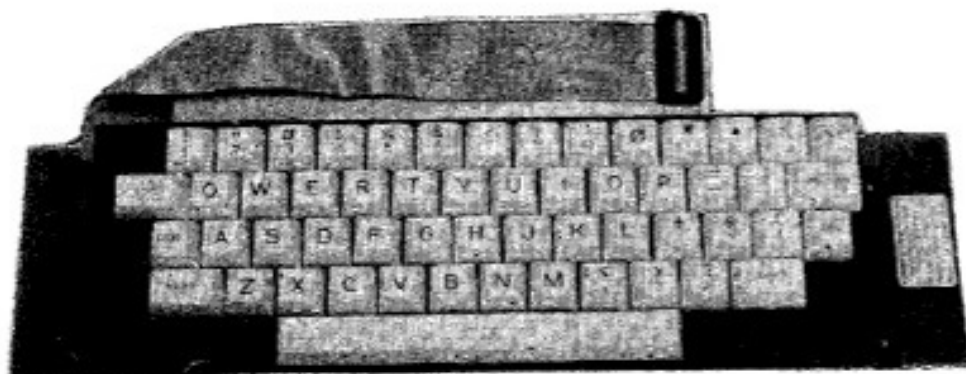## INTERFACE CARD FROM ACORN BUS TO CENTRONICS CONNECTOR

CU-PRINT is a new development by Control Universal scheduled for deliveries in August 1982. It employs a 6522 i/o chip (VIA) with two 16 position rotary switches to provide decoding down to page. (256 bytes). It can be used with all CUBE/Acorn bus systems to provide connection between the processor and a printer with a Centronics type parallel printer interface.

This card is especially useful with graphics printers as all eight bit are valid and controllable.

540 CU-PRINT printer interface assembled and tested	40.00
548 CU-PRINT printed circuit board only with circuit diagram	25.00
489 Printer interface cable to connect CU-PRINT to printer	15.00
1300 Swap service.	10.00

To use this card of Acorn systems 2, 3, and 4 the DOS chip needs a minor modification. Send your DOS chip to us quoting code 1300 and we will amend it so that CU-PRINT works with these systems.

53 key non encoded keyboard (keys are decoded by polling from the operating system, each key has a place on the cross matrix) designed to plug into CUBIT, CUNINE or CUMOT single board computers. The new CUBOS operating system for the 6502-based CUBIT supports this keyboard, which, together with CU-MEM, Acorn 40 column video card and Acorn Atom BASIC make up the Industrial Control Unit described on page 1.5.

The RESET key is protected by a time delay from accidental operation. To use the RESET the key should be held down for longer than 1 second.

CU-KEY is currently sold unenclosed. A case has been commissioned and should be ready in the third quarter of 1982. It will include provision for a 25 key numeric and function keypad.

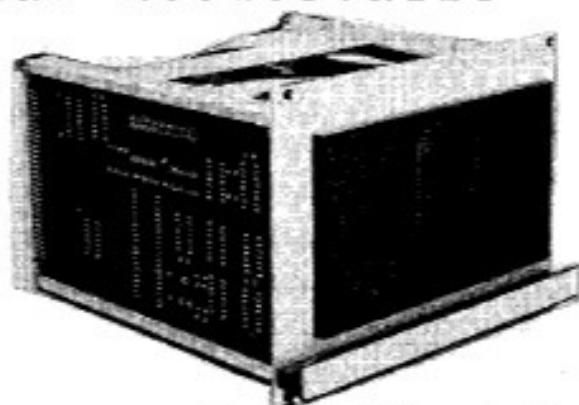| CODE	DESCRIPTION	PRICE
660	CU-KEY 53 KEY QWERTY KEYBOARD	40.00

BACKPLANES
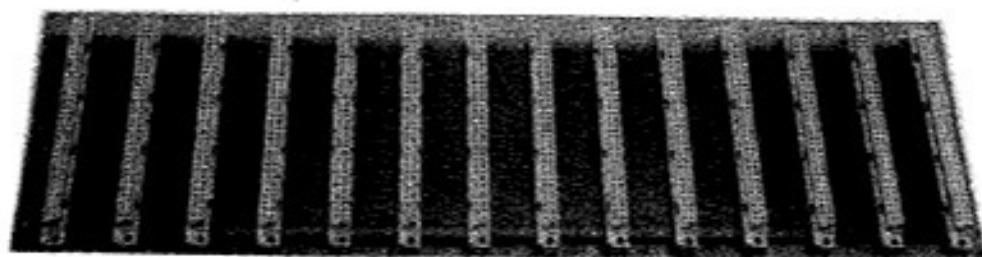
Control Universal backplanes are designed for mounting standard Eurocard DIN sockets on 1" spacing. The DIN type code is 41612, and the version is 64 way using rows a and b.

The backplane pcb provides bus connections between all of the A row pins, and between all of the b28 (IRQ) b29 (NMI) and b30 (sync) pins. Pin 19 is regarded as committed to supplying the EPROM programming voltage of 26v for use with the EPROM programmer.

Code	Description	Price
954	14 Way buffered	73.00
953	13 " buffered	68.00
952	12 " buffered	63.00
951	11 " buffered	58.00
950	10 " buffered	54.00
949	9 " buffered	49.00
948	8 " buffered	44.00
947	7 " buffered	39.00
946	6 " buffered	34.00
945	5 " buffered	29.00
944	4 " unbuffered	20.00
943	3 " unbuffered	16.00
942	2 " unbuffered	11.00

The first socket on the backplane has long wire wrap tails, and so allows a 64 way ribbon cable to be plugged onto the back of it without the use of a bus extender card. The cable is shown on page 17.1 and allows a rack extension to be used with the AIM 65 and the Atom.

DISK DRIVES AND ACCESSORIES

The module illustrated fits a standard 5.25" mini-floppy disk drive into a Eurorack. See the sections on Acorn System 3 and 4 for illustrations of fitting one drive into a single height rack, and two drives into a double height rack.

CODE	DESCRIPTION	PRICE
	DRIVES	
770	Disk drive, single side, single density (128kb unformatted)	195.00
771	Disk drive, double side, double density, 512kbytes unformatted	250.00
	(suitable for single density operation with Acorn controller; double density requires controller based on 8272 chip, or similar)	
	DISKETTES	
515	Box of 10 single sided 5.25", 35/40 tracks, reinforced centre	22.00
520	Individual single sided disk, same spec as 515.	3.00
516	Box of 10 double sided 5.25" disks, 4 track, reinforced centre	33.00
521	Individual double sided disk, same specification as 516	4.00
	ACCESSORIES	
775	Disk cable – connects controller card to drive	15.00
780	Disk cable for two drives – connects controller to 2 drives	25.00
785	Disk mounting kit – metal work for disk module illustrated	15.00
	CONTROLLERS	
765	Floppy disk controller assembled and tested.	134.00
766	Floppy disk controller in kit form	129.00
	DISK OPERATING SYSTEMS	
796	DOS for 6502 based Acorn system 3 or 4 with 40 column VDU	60.00
797	DOS for Acorn Atom	60.00
798	DOS for 6502 based Acorn system 3 or 4 with 80 column VDU	70.00
807	FLEX – international standard DOS for 6809 based disk system	70.00

DISK OPERATING SYSTEMS FOR AIM 65 – SEE PAGE 2.16
DISK OPERATING SYSTEMS FOR USE UNDER CUBOS –SEE PAGE 1.4

	UTILITIES DISKS (appropiate disk supplied free with each DOS)	
808	FLEX utilities disk	10.00
809	Atom utilities disk	10.00
810	CUDOS utilities disk	10.00
811	AIMDOS utilities disk	10.00
812	Acorn system 3 or 4 utilities disk	10.00

The Acorn Floppy Disk Controller has its own detailed description in this catalogue, page 3.12. For manuals on all the above see section 6.
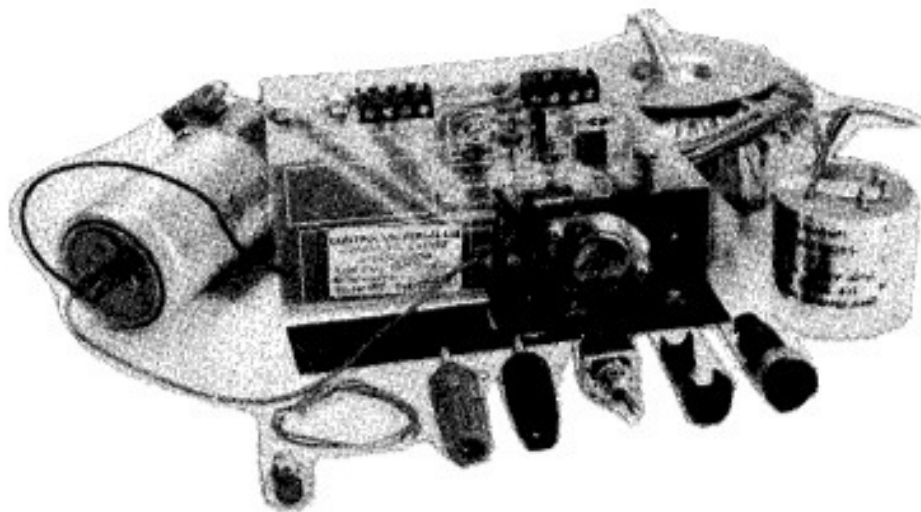
All power supplies are sold as open frame unenclosed units, fully assembled and tested. A toroidal transformer is used in all cases and a heat transfer bracket is provided. However, it is up to the customer to provide any additional heat sinking mass (eg. the chassis of the system) that may be necessary to run the power supply at its desired rating. Each unit includes mains switch, terminals, neon indicator, filter, fuses on supplies above 1A, over voltage, over current and over temperature protection.

CODE		5 volts	25 volts	12 volts	+- 12 v	+-15 v	price
431	CUPS-1	5 amps					45.00
432	CUPS-2	5 amps	0.5 amp				50.00
433	CUPS-3	5 amps	0.5 amp	2 amps			58.00
434	CUPS-4	5 amps	0.5 amp		0.1 amp		58.00
435	CUPS-5	5 amps	0.5 amp			0.1 amp	58.00
standard wire colour		red	white	yellow	yellow/ orange	pink/ mauve	

439   Rockwell's own power supply for new enclosure   50.00

USES: CUPS-1   Fully populated Atom with extensions, general purpose logic supply

CUPS-2   AIM 65. 25 volt for AIM printer and EPROM programming

CUPS-3   Computer systems with disks, eg AIM with CU-DISK, Acorn system 3, 4. 25v for AIM printer and EPROM programming

CUPS-4, CUPS-5 Logic supply, plus op amp and RS 232.

Some products made by Control Universal and offered in previous catalogues are no longer listed. However, some product does remain available, and in any case some items can be made to special order if the quantity justifies it.

Such products include:

AIMSTART module - now listed as vector-start module on page 17.1

PROM daughter board - listed on page 17.1

DIN to DIN card - listed as bus extender card on page 3.15

CUBIT interface cable - still a current product but listed as 64 way interface cable on page 17.1

Industrial AIM enclosure. None left in stock, but enquiries for quantity will be welcomed.

Metal AIM desk top enclosure. Some currently available - please enquire.

AIM 65 blue and white plastic case now brown and white and improved in design - see enclosures section 12.

AIM 65 vacuum formed plastic case - some second AIM 65s in plastic cases may soon be available - keep in touch.

Tangerine vdu interface for AIM 65. Not now recommended as the Acorn vdu cards and CU-GRAPH are superior. However, please enquire if this product is of special interest to you.

BASE 2 printers - deleted. No product available.

Computerist products - no longer being handled, but we still have a Memory plus in stock - see bargains page 17.1

AIM 65 magazine "INTERACTIVE" now sent free direct by Rockwell, inc., Anaheim, California, USA, to whom requests should be addressed.

CONTROL UNIVERSAL SOFTWARE FOR AIM 65 SYSTEMS

The following Control Univeral software represents "application routines", ie those pieces of operating software, or "firmware" which permit the user to employ Control Universal products in a particular computer system.

CUMEX AIM 65 monitor extension for driving video display and external Centronics type printer. It is 835 bytes long, and is specific to either the Acorn 40 or 80 column VDU interface cards, for which this is a full solution including properly executed delete routine. Execution of this program (ie. type *=GHJK {return} G {space}) causes the CUMEX program held at hex GHJK to alter the AIM 65 ouput vector so that the ouput stream goes to the video and to the expansion connector for the external printer as well as to the built-in 20 column led dispay and thermal printer.

PROMER is the program for using an Acorn EPROM programer with the AIM 65. For convenience, this program is included in the same chip as the video and printer driver, which is then supplied in the same form whether for video and printer, or for the PROM programmer, or for both.

Memory Requirements:

```
                        CUMEX 835 bytes, address as below
    hex 9400 to 997F    Acorn vdu   (40 col)
    hex 1000 to 187F    Acorn vdu   (80 col)
    hex 9980 to 99FF    Acorn PROM programmer
    hex A000 to A3FF.   AIM 65 VIA for printer i/f
```

The following versions of the software are available:-

```
1217X4   PROMER and CUMEX in a 4k EPROM at hex 8000, 40 column  10.00
1217X8   PROMER and CUMEX in a 4k EPROM at hex 8000, 80 column  10.00
1217S4   PROMER + 40 col CUMEX in 4k EPROM at choice of address 20.00
1217S8   PROMER + 80 col CUMEX in 4k EPROM at choice of address 20.00
```

The hex 8000 version is intended for use with the CUBIT extension to AIM 65, and in this version the PROMER is called at 8000 and the video and printer driver at 8480.

AIMDOS

Memory Requirements:

```
    hex 0000 to 03FF   RAM for AIM 65 and disk housekeeping
    hex 0400 to 06FF   RAM for disk - based utilities
    hex 0700 to 0FFF   RAM for disk catalogue and file handling
    hex 7000 to 7FFF   RAM or PROM for video and printer driver and
PROMER.
    hex 8000 to 8FFF   EPROM containing disk operating system.
    hex 9400 to 997F   Acorn vdu   (40 col),
    hex 1000 to 187F   Acorn vdu   (80 col)
    hex A000 to A3FF.  AIM 65 VIA for printer i/f
    hex F000 to FFFF   EPROM replacement for AIM 65 Z22 ROM
```

ACORN MICROCONTROLLER CARD
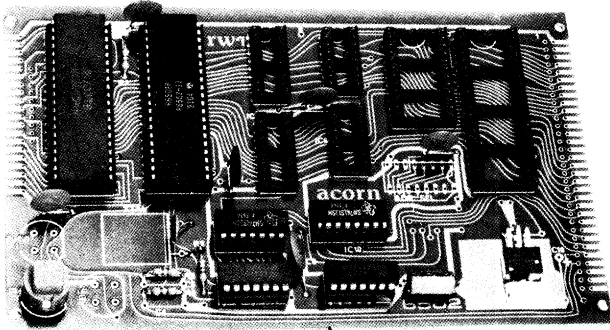
This Acorn Eurocard (100 x 160 mm) single board microcontroller
is based on the 6502 processor. The standard controller is
provided with 6502, 128 bytes of RAM, 16 lines of i/o, capacitor
controlled clock and address decoding and logic. This board also
has provision for up to four and a half kilobytes of ROM, 1 K
bytes of RAM (2114) and 32 lines of i/o (two x 8154); a crystal
controlled clock is also optional. The processor used employs
pipelining giving fast execution times (4us for load accumulator,
6us for jump to subroutine and 2us for internal register
operations).

The i/o device used is the INS8154 whose sixteen lines are single
bit addressable, can be individually configured and are TTL
compatible.   A hand shake mode is provided facilitating
asynchronous data transfer at a high speed, and direct interface
to peripherals. A wide variety of memory i/o configurations can
be selected by wire links in the address select socket on board.

The standard Eurocard edge connector carries the address and
databus, eight control lines, sixteen i/o lines, the single DC
supply rail and 5v regulated output from the on board regulator.
The opposite end of the card has 16 i/o lines, two control lines
and 5v output.

This board with the crystal controlled clock and other options
becomes the 6502 CPU in the Acorn systems 1, 2, 3 and 4.

CODE	DESCRIPTION	PRICE
714	6502 Controller card	50.00
716	6502 Controller card in kit form	45.00
355	Acorn System 1 technical manual with details of above	5.00

ACORN 6502 CPU
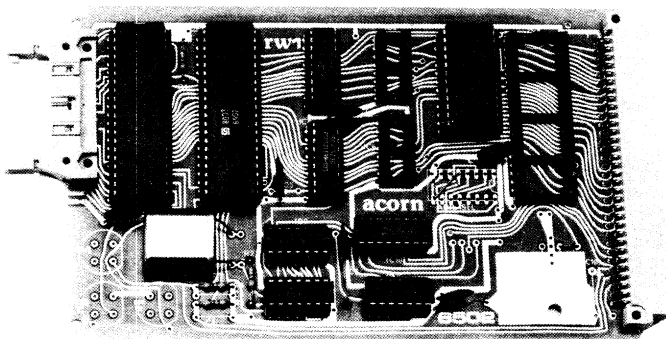
The 6502 CPU is designed for use in the Acorn systems 2,3 and 4 and it plugs onto the standard Acorn 8 or 14 slot backplanes. The 6502 microprocessor is run from a 1MHz crystal controlled clock and a TTL device provides address decoding.

On the card is 1K byte of static RAM in 2114's and an 8154 i/o device provides 16 i/o lines, 8 of which connect to a ASCII keyboard via a 20-way ribbon cable connector. Other lines on the 8154 can connect to the cassette interface via the the backplane.

A second 8154 can be fitted giving a further 16 i/o lines on the 64-way connector and a ROM can also be added to carry the Operating Systems software. (Alternatively this can be on a static RAM card, or CU-MEM)

For spare chips see separate list.

CODE	DESCRIPTION	PRICE
715	6502 CPU card assembled and tested	63.00
717	6502 CPU card in kit form	58.00
720	As 715, with keyboard interface	80.00
721	As 720, in kit form	75.00
355	Tech manual for System 1 with details of above cards	5.00

P 3.2
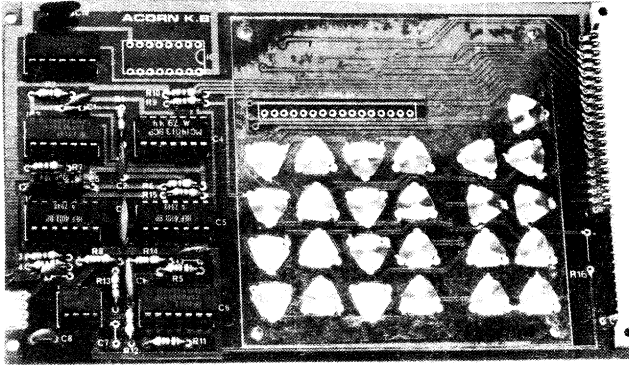
The upper Eurocard of the system 1 is available without keypad and display when it performs as a cassette interface card in system 2. It may also be added to systems 3 and 4 if desired. The Computer Users Tape Standard (CUTS) frequency—modulates data on to a standard audio cassette recorder with two tone system in which 2.4KHz represents a logic 1 and 1.2KHz a logic 0.

CODE	DESCRIPTION	PRICE
935	Cassette interface in kit form	20.00
936	Cassette interface assembled and tesed	30.00
794	Cassette operating system (COS) ROM	20.00
356	Cassette Operating System Manual	5.00
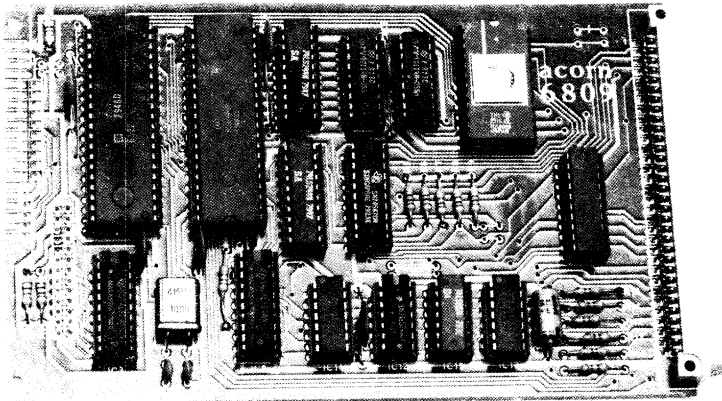
This Eurocard (100 x 160 mm) is a plug-in replacement for the 6502 CPU card to upgrade Acorn Systems 3 and 4 to use the advanced facilities of Motorola's 6809 8-bit processor and is ideally suited to run high level languages such as Pascal. The Acorn 6809 is provided with an operating system in 2K which handles the Acorn VDU, ASCII encoded keyboard and printer; it is readily expanded and very user friendly.

The hardware provides for direct plug-in connection to Centronics type printers and encoded keyboards and all 6809 signals are taken off the board via the Acorn bus 64-way edge connector. The address and data lines are buffered and 1K of user RAM is provided. The major components fitted are:-

DIN standard indirect edge connector.
20-way and 26-way IDC connectors for keyboard and printer.
MC 6809 microprocessor.
2K ROM (Initially 2716) 4K and 8K compatible.
1K RAM (2x2114)
BIPOLAR PROM for address decoding.
6522 two ten bit parallel i/o port for keyboard and printer.
Random logic devices for address decoding.
Bus buffers.

The Acorn 6809 is provided with a User's manual which describes how to use the monitors commands, and includes programming examples.

An international standard disk operating system, called FLEX, is available to run with this card. This system allows the user access to disk files on a system 3 or system 4, and to buy standard software from software houses to run under FLEX.

CODE	DESCRIPTION	PRICE
725	6809 CPU card	118.00
807	FLEX	70.00
359	6809 CPU users manual	5.00

# A C O R N   8 K   S T A T I C   R A M   C A R D
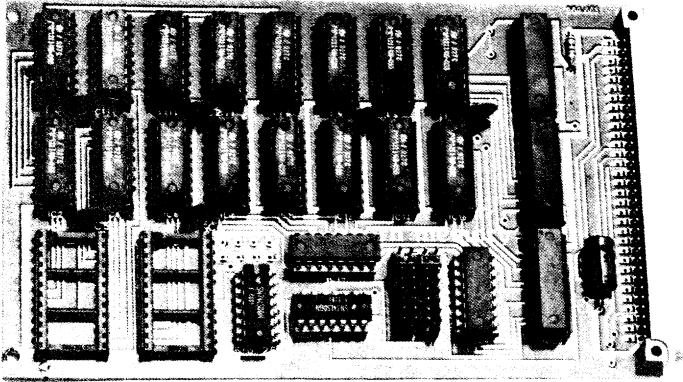
This Eurocard offers 8k of static RAM plus two sockets which each can accept a 4k ROM or EPROM. The 8k RAM bank and the 8k ROM bank can be independently located in memory to commence in 8k intervals throughout the memory may. eg. each may commence at hex 0, 2000, 4000 etc, though to F000.

730	Acorn 8k static RAM card, asembled and tested	£87
735	Acorn static RAM card as above, with no RAM fitted	£55
736	Acorn static RAM card without RAM, in kit form	£48
363	Acorn static RAM card technical manual	£1

ACORN 32K DYNAMIC RAM
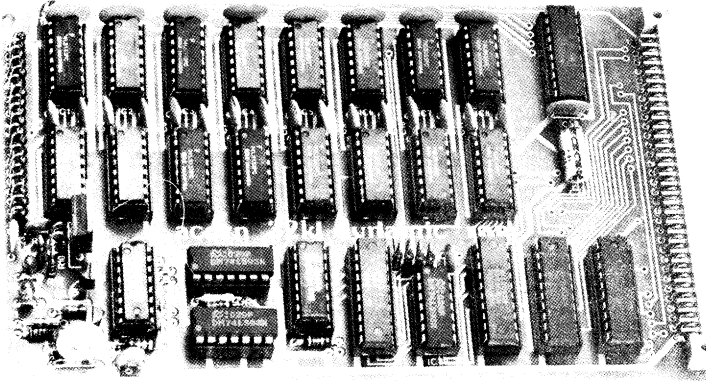
This Eurocard provides 32768 bytes of Random Access Memory for a computer system using the Acorn standard data bus. Such systems include any Acorn or Control Universal (CUBIT range) computer, or a computer using the Acorn bus as an expansion bus, as achieved with the Rockwell AIM 65 using the CUBIT extension system.

The devices used are 5v only 16k bit dynamic RAMs organised as two banks of 16k bytes. Timing is generated in synchronism with the 1MHz CPU clock and the hardware refresh circuitry allows random access of the memory in any clock cycle.

The RAM is organised into four sections each of which is 8k bytes. These four sections can each be linked to begin at hex addresses 0, 2000, 4000, 6000, 8000, C000 and E000. In Acorn systems 2, 3 and 4 the card will usually be used to provide 8k bytes of program space at C000 to DFFF and 24k bytes of text space at 2000 to 7FFF. A 16k byte card can then be used to fill the remaining space from 8000 to BFFF is required. The Acorn Dynamic RAM cards can be freely mixed with static RAM cards and they can be paged if wished.

680 Acorn 32k DRAM card, assembled and tested   £149
681 Acorn 16k DRAM card, assembled and tested   £126
374 Acorn 32k DRAM card manual   £2
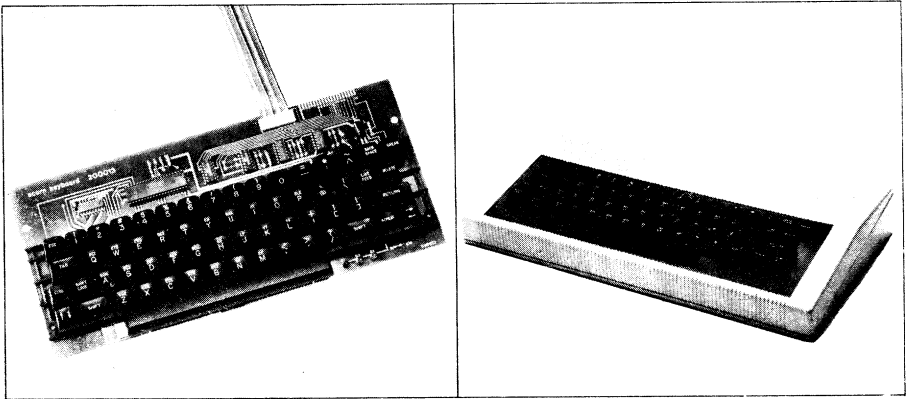
The Acorn keyboard uses high quality 62 key mechanism. The keyboard encoder circuit has a 2 key rollover feature enabling fast typing speeds. ASCII is a 7-bit code for up to 128 characters and the keyboard outputs this code in parallel in seven signal lines at TTL level (TTL logic 0, +5v logic 1). A single +5v supply at 80mA is required to run the keyboard. All connections to the keyboard are normally via a 20-way flat ribbon cable which connects straight to Acorn computer sytems, using either 6502 or 6809 processors.

On the keyboard are some special function keys. Two of them connect straight to the output connector on individual signal lines giving a logic 0 when pressed. One may be used to reset the computer (break) and the other can be connected to an input port on the computer for examination by the users own software. Two other keys, control and shift, change the character set produced by the keyboard encoder to give ASCII control characters and upper/lower case selection. There is a shift lock key and another key locks the keyboard into a TTY caps mode (Teletype capitals).

Three LED's on the circuit board indicate TTY caps mode, shift mode and power on.

CODE	DESCRIPTION	PRICE
930	Keyboard, cased, for system 2,3 or 4	£136.00

ACORN 40 COLUMN VDU INTERFACE
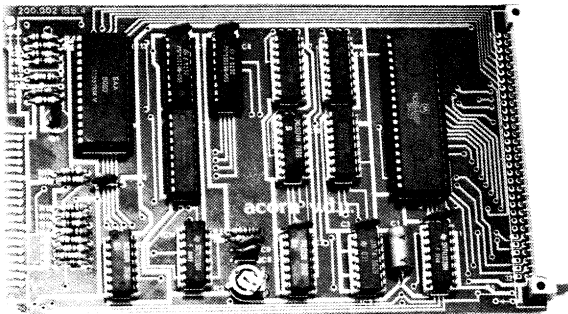
The Visual Display Unit Controller board connects to the standard Acorn bus, as used by Acorn Eurocard products and CUBIT computers and bus extensions. It provides a TV display for all such systems with 1k of RAM memory mapped on the host computer data bus. Text and Teletext graphics are transparently written onto the screen by the CPU.

The intelligent device is a 6845 VDU controller which provides all the synchronisation signals to drive a 625 line 50 fields per second VDU, together with refresh addresses for the character RAM. Characters are then fed to an SAA5050 character generator which produces the necessary dot patterns to create the characters to refresh the VDU.

The SAA5050 produces teletext characters and special effects (such as flash and double height) and has Red Green and Blue drive outputs giving coloured text and graphics.

The card will drive a monchrome or colour tv monitor directly via RGB or composite signals, plus sync, or via an encoder and modulator will drive colour tv. In monochrome, colours appears as shades of grey.

The technical manual supplied with the card has listings of a software driver for 6502 processor. When this card is supplied in a system, the software drivers are incorporated in the operating system.

740	Acorn 40 column VDU assembled and tested	£100
741	Acorn 40 column VDU in kit form	£92
363	Acorn 40 column VDU technical manual	£1

P 3.8

A C O R N   8 0   x   2 5   V D U   I N T E R F A C E

The VDU interface is a 100 x 160mm Eurocard which connects via a 64-way plug and socket to the standard Acorn computer bus. It produces a 1 volt composite signal which drives the 75 ohm input on a monitor.

The screen is mapped to a 2K byte area of memory which usually resides at locations 1000 to 17FF (hex). An MC6845 programmable controller IC provides the addresses for the screen memory, and the horizontal and vertical sync signals. Access to the screen memory is transparent with either a 1 MHz or a 2 MHz CPU clock.

A character generator ROM contains the full ASCII character set, and also produces recognisable symbols on the screen for many of the control codes. If required special character sets may be obtained by fitting a user-programmed 2716 EPROM.

A 12 MHz dot clock is used to serialise the data from the character generator ROM and this is then fed to a video amplifier which provides a composite video output from the card. The high 12 MHz data rate used to produced 80 characters on a line may be unsuitable for UHF modulator applications, and in-order to view the 80 x 25 screen monitor diagonal of 10 inches or more will normally be required.

Software to drive the 80 x 25 VDU is contained within special versions of the systems 3 and 4 operating systems ROM's.

CODE	DESCRIPTION	PRICE
910	VDU card, 80 column Not available in kit form	£150.00
798	80 column DOS for 6502	£70.00
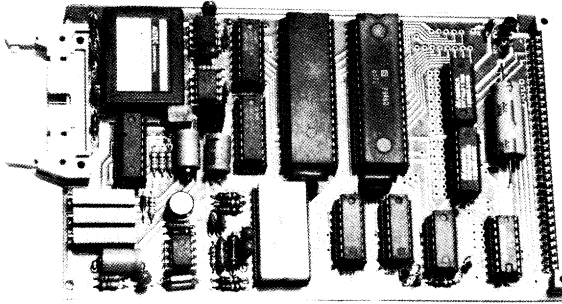
The analog interface offers the Acorn system user laboratory standard facilities for the examination and control of analog signals. It is a 100mm x 160mm Eurocard and connects to the standard Acorn bus using a 64-way indirect connector (DIN 2-row) and employs the following devices:-

DAC1222 (2 off)
12 bit Digital to Analog convertors; fully buffered with BI-FET OP AMPS, giving output voltages in the range -5.12v to +5.11v a resolution of 2.5mv.

ADC1210
12 bit Analog to Digital converter, with eight channel analog multiplexer and sample and hold circuit. Input voltage range -5.12v to +5.11v, resolution 2.5mv.

LH0071
Precision voltage reference (10.24v) removing any need for range adjustment or calibration on the ADC or the DAC's.

6522
Versatile interface adapter. Controls the ADC enabling software programmable conversion rate using internal timers and full interrupt control of the analog system.

The board also has a single bit digital input and output signal, enabling a storage osilloscope or X-Y recorder to be driven directly by the analog outputs, using the digital output for the z axis (beam on/off or pen down/up) and the input for the interrupt control.

ADC conversion rates:- 12 bit up to 10,000 conversion/sec.
8/10 bit up to 25,000 conversion/sec.

Connections. 8 analog inputs, 2 analog outputs, at -5.12v to +5.11v.
Digital input, output at TTL level
10.24v reference output.

All interleaved with reference ground lines.

| CODE	DESCRIPTION	PRICE
865	Analog interface	158.00
	Not available in kit form.	
367	Analog interface technical manual	1.00
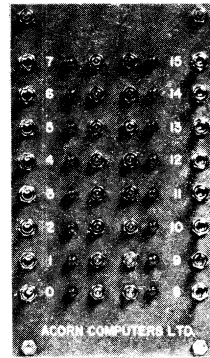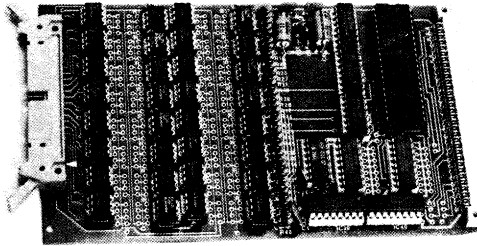
The laboratory interface is designed for use on the standard Acorn Data Bus and provides 16 optically isolated connections each of which may function as input or output to the computer system. A remote circuit board with 16 semiconductor switches and LED indicators may be connected by up to 25 metres of 40-way flat ribbon cable to the Eurocard.

The remote circuit board has 16 connections each of which is set to input or output using a switch. In its output mode each connection can drive loads drawing current at up to 3 amperes each from the remote supply DC voltage which may be in the range 6 to 48v. A catching diode on each output allows inductive loads to be used. In input mode each connection is driven by contact closures to remote supply common. An LED indicates the state of each connection in input or output mode.

The remote supply voltage is optically isolated from the Acorn system on the interface Eurocard giving the computer immunity to electrical noise generated by the load switching. Noise produced by other equipment at the remote station is also isolated and ground loop problems encountered in the laboratory environment are eliminated. The remote supply can be different to the computer 0 volt line by as much as 48v peak.

| CODE	DESCRIPTION	PRICE
860	Laboratory interface i/o with 16 i/o lines, outputs can drive 3A	122.00
861	Laboratory interface remote switch panel	85.00
862	Laboratory interface interconnection cable, 5 metres long	21.00
368	Laboratory interface technical manual	1.00

P 3.11

ACORN DISK CONTROLLER
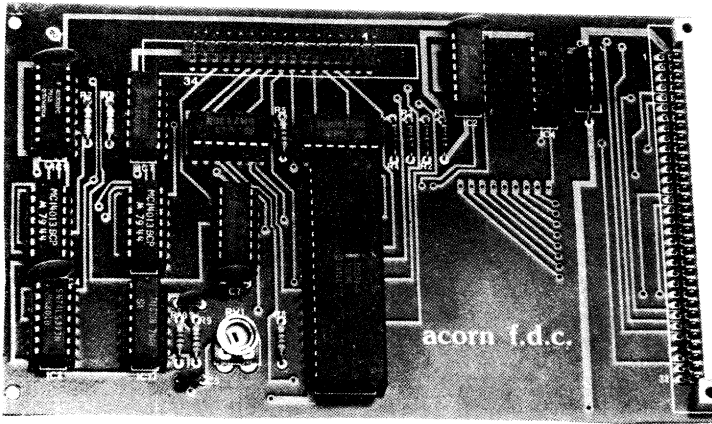
This Eurocard (100 x 160 mm) connects to the standard Acorn bus and provides an interface to one or two drives. It is capable of controlling four drive surfaces on two double sided drives. Single or double track density drives may be used. A 34-way flat ribbon connects to the drives after the Shugart interface standard. The intelligent device used is the Intel 8271. A number of disk operating systems are available for use in various systems.

CODE   DESCRIPTION   PRICE

765   Floppy disk controller assembled and tested.   134.00
766   Floppy disk controller in kit form   129.00
357   Technical Manual for DOS, drive and controller card   3.50
364   Extract from Technical Manual 357, for controller only   1.00

For details of Disk Operating Systems and disk accessories, see section on Disk Drives and Accessories, page 2.14.

ACORN PROM PROGRAMMER
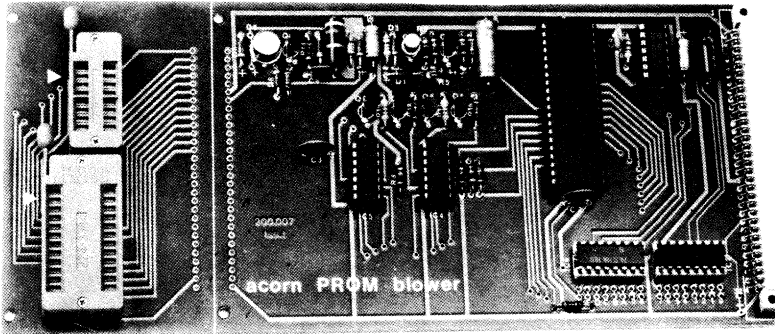
This board conects to the standard Acorn bus and may be used to program bipolar PROMs of the 74S571 type and PROMs types 2758, 2516, 2716 and 2532 ie. 5v only 1K, 2K and 4K byte devices.

A tecnical manual is supplied with the board which includes an assembly listing of a 1.5 K byte program allowing device type selection, copying of a ROMs contents into RAM, verification of a ROM contents against RAM and the blowing of a ROM to match the RAMs contents. A cyclic redundancy check is performed on ROM giving a signature identifying ROM data. The program requires that a Acorn Operating system 2,3 or 4 type, or CUBOS is present.

The programming board is longer than the usual Acorn Eurocard so that the two low insertion force ROM sockets are accessible from the front of the system. If desired this extra piece of board can be removed and connections to sockets on a remote panel can be made.

A +12v supply is required for 745571 devices and a +26v supply is required for the EPROMS. Power supplies for Control Universal and Acorn rack mounted systems supplied by Control Universal come complete with the necessary +26v supply.

CODE	DESCRIPTION	PRICE
790	PROM programmer card, software included	65.00
791	PROM programmer card in kit form	60.00
792	PROM programming software for Acorn systems 3 and 4, supplied on disk at hex 2800	9.00
793	PROM programming software in PROM for use with AIM 65 and CUBIT, in PROM at hex 8000	10.00
789	PROM programming software on disk for use with AIM 65 disk systems, at hex 2000	9.00
366	Technical Manual for PROM progrmmer	1.00

ACORN VERSATILE INTERFACE
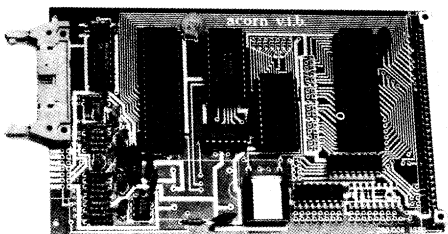
This board connects to the standard Acorn bus and provides interfaces via the three integrated circuits listed below.

6522 - VERSATILE INTERFACE ADAPTER
This device has two i/o ports which are each ten bit parallel, TTL level (ie. 8 individually programmable data bits plus 2 control bits) and a pair of interval timers for providing real time interrupts. One port connects to side B of the bus connector, the other via a high current buffer to the front of the board, where a 26-way connector may be fitted. This connector is pin compatible with Centronics, Anadex and other printers.

INS 8255 I/O PORT
Provides three eight-bit ports, two of which can be programmed to be all output or all input, and one can have direction programmed in two groups of 4 bits.

MC6850 UNIVERSAL ASYNCHRONOUS RECEIVER/TRANSMITTER - (UART)
This device provides serial interfacing together with an MC14411 bit rate generator IC and a 1.8432 MHz crystal which enable standard baud rates in the range 75 to 9600 baud to be selected. Edge connectors on the front of the board provide a 20mA teletype connection and a RS232C connection. The 20mA serial input is via an optical isolator giving ground isolation between interconnected Acorn systems. The RS232C interface requires a +/- 12 volt supply which may be either connected via the front edge connector or can be provided by an optional on board 5v to +/-12v converter module.

For spare chips see separate list.

| CODE	DESCRIPTION	PRICE
870	Versatile Interface Board	94.00
871	As above, in kit form	89.00
872	ADI +/-12v supply	7.50
489	Printer interface cable 1m long to connect VIB to Centronics-type printer connector.	15.00
365	Technical manual for versatile interface board	1.00

ACORN BUS EXTENDER
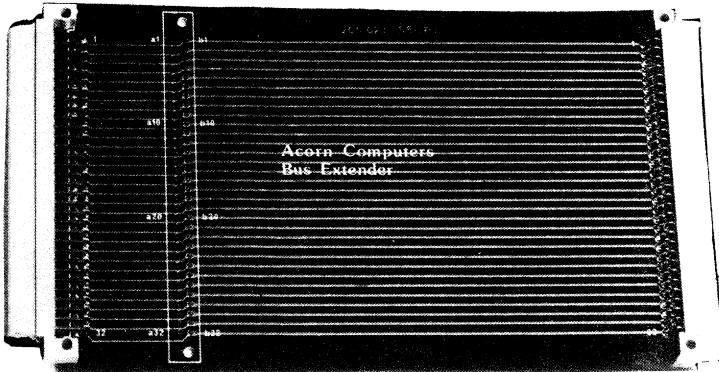
The Acorn Bus Extender is a Eurocard (100mm x 160mm) which plugs into any backplane plug using the DIN 64 way two row a/b socket. This brings the 64 connections to the front of the Eurocard rack where a socket projects out. Any other Eurocard can then be plugged into the extender card, leaving the Eurocard clear of the rack for easy access, allowing it to be serviced or developed while operating in the system.

635 Acorn Bus Extender Card   25.00

EUROCARD FRONT PANELS
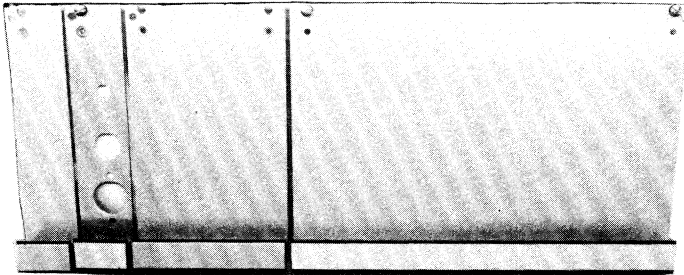
835 Eurocard Front Panel for all standard cards requiring
     no cut out - eg. memory cards   5.00
840 Eurocards Front Panel for Acorn CPU cards, 20 way plug   7.00
841 Eurocard Front Panel for CUBIT cpu cards 26 way plug   7.00
845 Eurocard Front Panel for Acorn VDU cards with holes for
     phono socket, DIN socket and reverse video switch   7.00
850 Eurocard Front Panel for Acorn VIB card   7.00
855 2.8" wide front panel to cover end gap in 19" racks   8.00
856 7" wide front panel to cover disk module gap   12.00

ACORN IN-CIRCUIT EMULATOR
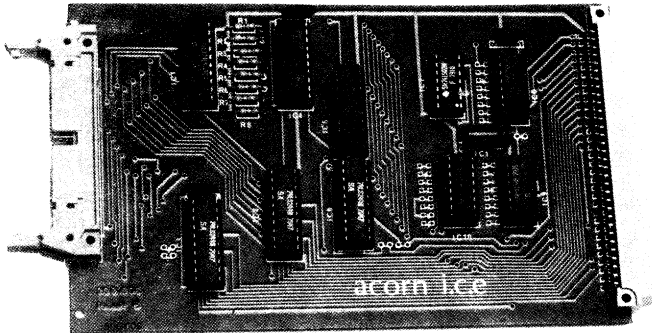
The In-Circuit Emulator (ICE) allows a computer system employing
the standard Acorn data bus to connect to a second microprocessor
target system by way of its processor chip socket. Once
established this connection may be used to test hardware and to
evaluate software in the target system. The ICE is extremely
useful in the development of new microprocessor products and in
the test and repair of existing equipment.

The ICE hardware is carried on a single Eurocard (160mm x 100mm)
which connects to the standard Acorn system bus. A 40 way flat
ribbon plugs into the front of the ICE and provides connection
to the 40 way dual in-line plug for the target processor socket.

In operation the the ICE relocates any two blocks in the target
system to appear as blocks A and B in the host system. The
selection of the two blocks is achieved by writing to the ICE
control register which is a latch on the ICE card. After setting
the control register any read or write operations by the host
system to its blocks A or B are sent down the ICE cable into the
target system. In this way the target system hardware may be
accessed for testing with the same bus timing as would appear
from its own processor. As the block selection is under software
control programs for testing the target hardware can dynamically
relocate the whole of the target memory map to be tested.

The ICE is principally designed for use with the 6502 processor.
The ICE 6809/6802 adaptor allows the ICE to be used with a target
system designed for either the 6802 or the 6809 processors. This
may be done regardless of the type of processor in the host
sytem, as the purpose of the ICE is to make memory areas in the
target system available to the host system for reading and
writing.

695	Acorn In-Circuit Emulator with technical manual	70.00
679	In-circuit emulator 40 way cable	15.00
698	ICE 6809/6802 adaptor	15.00
375	Acorn ICE card technical manual	1.00

P 3.16
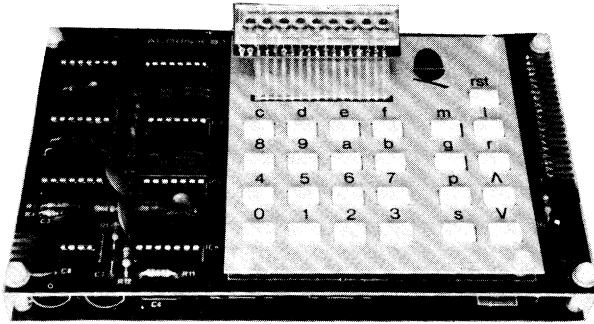
The 6502 processor Eurocard (100 x 160 mm) has crystal control, 1K bytes of RAM and 512 bytes PROM containing a system monitor. A second Eurocard is mounted above it using pillars and the two are connected by ribbon cable. The top card has a click action 25 key hexadecimal keyboard and an eight digit seven-segment LED display.

The system monitor contained in two fusible link PROMS(74S571) is very easy to use and provides the following facilities using one of the 8154 devices as a keyboard interface and display driver.

RESET, MEMORY ALTER AND EXAMINE, GO

RESTORE, allows continuation in original environment of program after break

BREAK POINT INSERT/REMOVE allows setting and cancellation of break point anywhere.

SAVE TO TAPE - transfers memory contents between given locations on the tape.

LOAD FROM TAPE - loads data into locations specified by the first two bytes on tape.

The monitor also includes a character font for seven segment representation of the complete ASCII character set.

The system 1 is provided with a users manual which includes an introduction to binary numbers, descriptions of the 6502 internal architecture and Acorn hardware, a listing and explanation of the instruction set and monitor program and a step by step introduction to machine code programming complimented by 16 original applications programs.

CODE	DESCRIPTION	PRICE
335	Acorn system 1 users manual	5.00
1100	Acorn System 1 (including manual)	79.00
1105	System 1 RAM i/o CHIP INS 8154	9.00
1110	System 1 mains adaptor	7.00

P 4.1

A C O R N   S Y S T E M   2
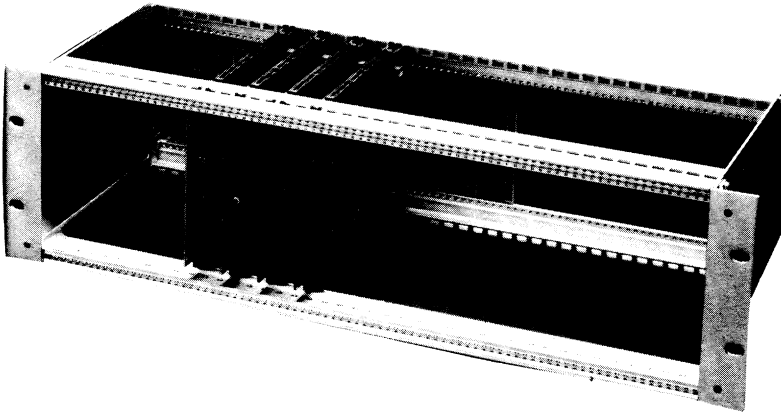
Provides the basis for the addition of more Eurocards. The system 2 contained within a 19" card frame consists of the following Eurocards all of which are described individually in this catalogue.

6502 CPU (code 720)
This is a crystal 6502 processor card, with a 2K byte Cassette Operating System (COS) and a keyboard interface.

VDU Interface (code 740)
- 40 column x 25 lines, 8 colours including black and white.
The COS provides drivers for display of text and graphics and hardware scrolling.

MEMORY BOARD (code 735)
Carries 4K bytes of RAM (a further 4K may be added) and the 4K BASIC ROM. A second ROM containing a floating point package and scientific functions may be added. Customers may specify CU-MEM as an alternative to this memory card, at no extra cost.

CASSETTE INTERFACE (code 935)
Using this board, programs and data may be stored on an audio cassette recorder.

The four boards are connected in the card frame using an 8-slot backplane with two part Eurocard DIN connectors.

Please note that a keyboard is usually required for this system. Printers and TV monitors suitable for this system are listed elsewhere in this catologue.

CODE	DESCRIPTION	PRICE
1115	ACORN SYSTEM 2 Consists of 6502 CPU card, cassette interface, VDU interface, 4K RAM card frame with 4 Eurosockets, cassette operating system in ROM, 4K BASIC in ROM	£320.00
1120	ACORN SYSTEM 2A As System 2 with 8K RAM card, card frame with 8 Eurosockets, 8K BASIC in 1 ROM + 1 EPROM, front panels and connectors, in a Euro-rack enclosure with 5v 3A power supply.	£480.00
930	Keyboard, cased for system 2, 3 and 4	£136.00

P 4.2
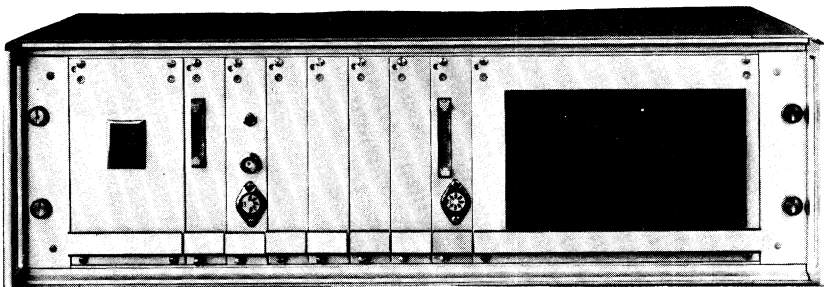
The system 3 in its minimum form is a system driving a single disk. The hardware consists of a card frame, backplane with 4 sockets, 6502 CPU, VDU interface, 8K RAM, floppy disk module, DOS (Disk Operating System) and resident 4K BASIC.

The mini floppy disk drive is mounted in a 7" module together with its controller card and provides approximately 100K bytes of storage. A DOS ROM on the CPU card controls the drive and handles files and input/output eg: the parallel ASCII keyboard and memory mapped VDU.

Software may be loaded from disk or contained on ROM. All the Acorn Eurocards are compatible with this configuration, allowing enormous variations on a modular basis. The illustration above shows the addition of a further 3 RAM cards (giving 32K bytes of memory in total) and a versatile interface board.

Please note that a keyboard is usually required for this system. Printers and TV monitors suitable for this system are listed in sections 10 and 11.

Customers may specify CU-MEM in place of Acorn 8K RAM cards for use in these systems at no extra cost.

| CODE	DESCRIPTION	PRICE
1125	ACORN SYSTEM 3	775.00
	Consists of 6502 CPU card, Teletext-type VDU card, one 8K RAM card, floppy disk controller and one drive, card frame, backplane for 3 cards, DOS EPROM 4K BASIC in RAM	
1130	ACORN SYSTEM 3A	1075.00
	As System 3, with two 8K RAM cards buffered back-plane for 8 cards, 8K BASIC on disk, with front panels for all cards in a 3U case, with 5v/5A, 12v/2A power supply	
930	Keyboard, cased, for system 2, 3 or 4	136.00

ACORN SYSTEM 4A
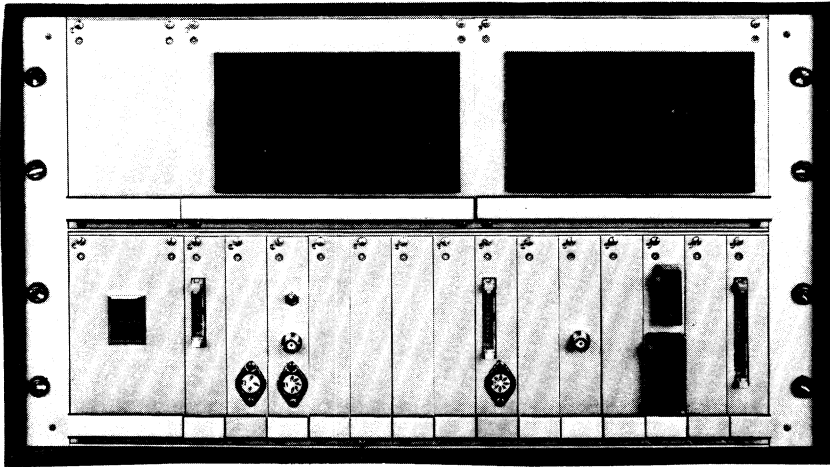
The system 4A is housed in a double height rack with capacity for up to 14 Eurocards. The minimum system has as standard two floppy disk drives, power supplies, card frame buffered 14 slot backplane, 6502 CPU, VDU interface, 16K RAM and disk controller. A DOS(Disk Operating System) controls both disk drives and a disk with utilities programs including disk copy is supplied with each system.

Customers may spcify CU-MEM in place of the Acorn 8K RAM card at no extra cost.

The system illustrated has the additional audio cassette interface, 32K bytes of RAM and serial and parallel interfaces using the versatile interface board.

Please note that a keyboard is usually required for this system. Printers and TV monitors suitable for this system are listed in sections 10 and 11.

CODE	DESCRIPTION	PRICE
1135	ACORN SYSTEM 4A	1525.00
	With 6502 CPU, VDU card, two 8K RAM cards, disk controller, 2 drives, two card frames, buffered backplane for 14 cards, DOS EPROM, 8K BASIC on disk, with front panels fitted to all cards in a 6U case with 5v 5a, 12v 2a power supply	
930	Acorn ASCII keyboard	136.00

P 4.4
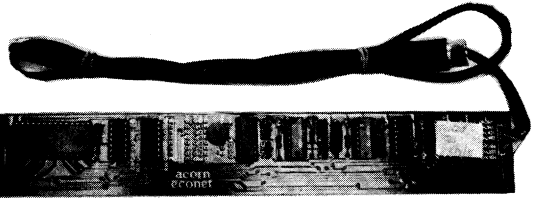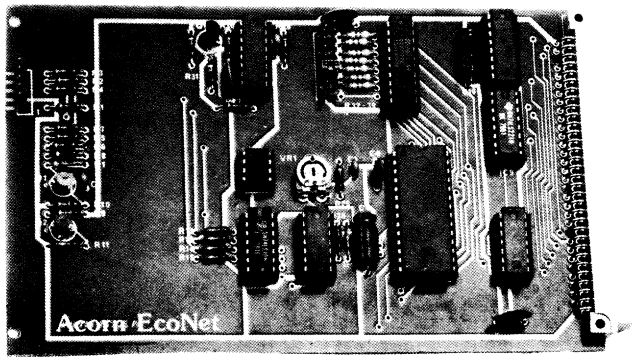
The Econet communications network system was developed by Acorn to enable a number of Atoms and/or other systems to communicate with one another and to share facilities such as disks and printers.

All stations have equal status and, unless specifically prohibited, any station may communicate with any other without recourse to an intermediary. The only unique station is the one that generates the network clock, but this may be an Atom or larger system.

ECONET EUROCARD INTERFACE

The Econet Eurocard is the system version of the Econet interface card that fits into the Atom computer. It plugs into the backplane and carries the ROM with the low level Econet software to allow the host system to be linked to other Acorn products.

ATOM ECONET INTERFACE

The Econet Interface for the Atom is specially shaped to fit inside the Atom case, using connectors already provided. The 4K Econet ROM is plugged into the expansion ROM socket at hex A000.

ECONET SPECIFICATION

Up to 255 stations per Econet.
Econets may be joined together by Gateways.
Connection by 4-wire cable to each station.
Station separation up to 1 kilometre.
Data transfer rate up to 210 kilobaud.
Differential signals for high noise-immunity and minimal radiation.
Clash detect circuitry, collision-arbitration algorithm minimise need for retries.
Econet executed automatically on BRK.

CODE	DESCRIPTION	PRICE
911	Econet card for Atom	45.00
912	Econet module on Eurocard for rack mounting	65.00
914	Econet operating ROM for Atom econet module	25.00
915	Econet operating ROM for Eurocard module	25.00
916	File server disk for Acorn System 3 or 4	100.00

P 4.5

ACORN SYSTEM SOFTWARE

794 CASSETTE OPERATING SYSTEM (COS)   supplied in ROM 20.00

The Acorn COS is designed for use with system 2. It is supplied as a 2k ROM
which provides operating vectors, keyboard, 40 column video and printer driver
software. It provides a tape mass storage system using a domestic cassette
recorder and the CUTS recording system. (Computer Users Tape Standard), and
relies on the Cassette Interface, which is described in its own section in this
catalogue, page 3.3.

BASIC

Acorn system BASIC is configured in two sections. The 4k integer BASIC provides
the general purpose routines for line numbering, subroutines, input and output
to and from keyboard, video, printer, disk, tape etc., integer arithmetic and
string handling. Any command not understood by integer BASIC is referred to the
BASIC extension.

Two versions of the extension are available. Floating point BASIC extension
provides floating point arithmetic to nine significant figures, trigonometrical
and exponential functions, graphics and numerical evaluation of a string.

ONLI extension to BASIC is also available, as an alternative to floating point.
ONLI is short for ON-LINE and is designed for real-time applications involving
timers and input and output channels such as in machine control or experiments.

Acorn Atom BASIC is available for use in a 6k version for system 3 and 4, and in
a 10k version for CUBIT systems operating under CUBOS. The 6k version offers
dimension statements and a machine code assembler as an alternative to the
floating point extension, and the 10k version offers these facilities in
addition to the floating point extension.

795	4k BASIC on PROM	25.00
800	8k BASIC on disk	40.00
801	8k BASIC on PROM	50.00
803	ONLI 2k extension on PROM for use with system 2, 3 or 4	90.00
804	ONLI 2k extension on PROM for use with Atom	90.00
813	6k Atom BASIC for use in system 2 3 or 4 on disk	40.00
814	8k Atom BASIC for use in system 2 3 or 4 on PROM	50.00
804	10k Atom BASIC for use with CUBIT under CUBOS on disk "CU-BASIC"	60.00
817	10k Atom BASIC for use with CUBIT under CUBOS on PROM "CU-BASIC"	60.00

ASSEMBLER

805   Assembler/Disassembler/Editor on disk   25.00
This 4k software provides a wide range of facilities for two pass 6502 machine
code assembly. It is most suitable for disk systems and makes extensive use of
the advantages offered by disks. Features include labels, arithmetic,
disassembly, and linked files.

WORD PROCESSING/TEXT EDITING

This 4k software package allows the creation of text files, which can be saved
and loaded with tape or disk, and can be output to a printer with a variety of
formatting commands, includes right hand text justification, and control of the
printer to modify print styles. Editing facilities allow the fast location and
altering of one or more defined strings anywhere in the text.

1305	EDIT for system 2, 3 or 4 for use with 40 column VDU card	40.00
1306	EDIT for system 2, 3 or 4 for use with 80 column VDU card	
	or for use with Systems 10 - 25 and CU-GRAPH	40.00
1350	WORDPACK for Atom - uses the user socket at hex A000	26.00
1351	WORDPACK for Atom run under Econet - uses socket at hex C000	40.00
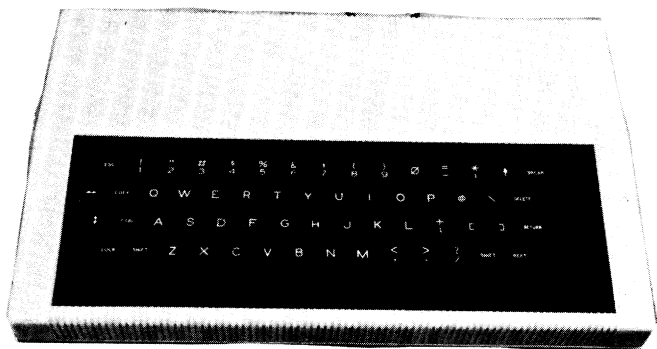
The Atom measures 15" long x 9.5"deep x 2.5" high. It contains a full sized keyboard laid out in the conventional typewriter way, the full travel, light pressure keys give a positive reliable action.

The Atom is ready to use with any colour or monochrome tv, or with a simple modification can be used with a video monitor. Colour output is built-in for use with a monitor; the PAL encoder is required for use with colour tv.

The minimum Atom has an initial 2K of RAM and 8K of ROM which can be increased to 12K of RAM and 12K of ROM. BASIC and ASSEMBLER (machine code), graphics and sound output, and direct cassette and TV interfaces are standard features.

The printer interface output requires the addition on board of a i/o chip 6522 and a 74LS244 buffer.

See separate catalogue entries for the following Atom accessories:-

Econet - local area network communication to other Atoms and central disk and printer facility. Page 4.5
Games, business, teaching and mathematical software on tape. Page 5.3 - 5.20
Word processor software on PROM   Page 5.17
Disk pack   Page 5.2
PAL encoder   Page 5.2
Forth programming language Page 5.12

CODE	DESCRIPTION	PRICE
880	Atom with 8K ROM + 2K RAM	150.00
881	Atom with 8K ROM + 2K RAM in kit form	120.00
885	Atom with 12K ROM + 12K RAM	250.00
890	Atom 4K floating point ROM	20.00
900	Power supply - 8v at 1.8a unregulated	10.00

ACORN ATOM DISK PACK
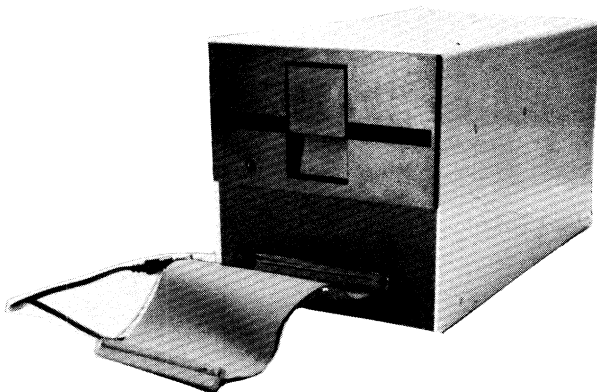
The new disk pack made by Acorn for use with the Atom offers amazing value for money. If put togther from the parts at Acorn standard prices, it would cost well over 400. However, for 299 this unit comes complete with single sided single density disk drive, disk controller, disk operating system, power supply for itself and to drive the Atom that it is plugged into, 64 way cable to connect to the Atom and full documentation. The capacity of the drive is up to 92kBytes, arranged in up to 31 files. Loading or saving a 4k program takes less than 1 second.

882   Acorn Atom disk pack   299.00

ACORN ATOM UHF COLOUR INTERFACE (PAL ENCODER)
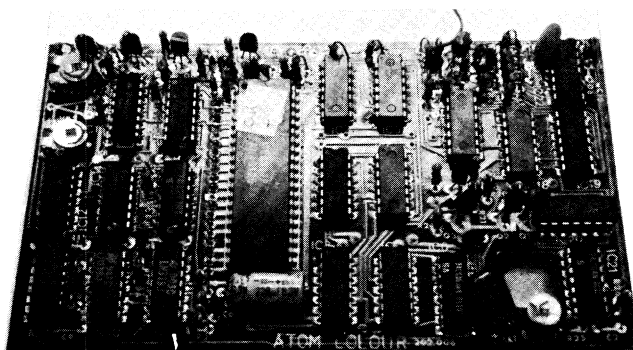
The PAL encoder is a small board designed to fit inside the Atom to give it the facility to generate a colour signal suitable for feeding directly into an ordinary colour television, to give a full colour display.

925   Acorn Atom PAL encoder   39.00

P 5.2

PROGRAMS FOR THE ATOM FROM ACORNSOFT

GAMES PACK 1

ASTEROIDS

Your spaceship is encountering an asteroid storm; you must shoot the asteroids before they collide with your ship; but beware that large asteroids will break into smaller asteroids when hit. As in the popular pub version the game keeps a ladder of the ten best scores, together with the names of the scorers. Program 4K, graphics 6K.
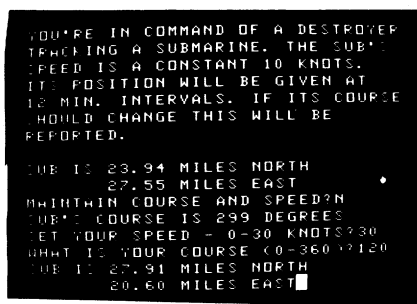
SUB HUNT

You are in command of a destroyer tracking a submarine; knowing the submarine's course and position you must choose your course and speed to catch it. Program 1K, graphics ½K, needs floating-point.
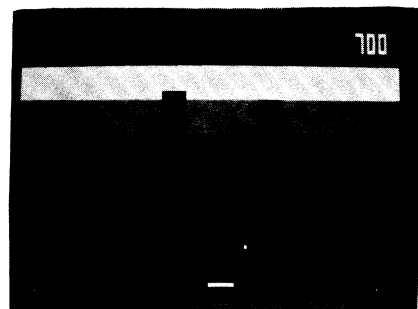
BREAKOUT

Breakout is a version of the popular pub game in which you score points for knocking bricks from a wall. Balls can get trapped behind the wall and knock out a great many bricks. To add to the skill the balls undergo two changes of angle and speed, and when hitting a ball two angles of reflection are possible. The game keeps a record of the highest score. Program 3K, graphics 1-2K.

GAMES PACK 2
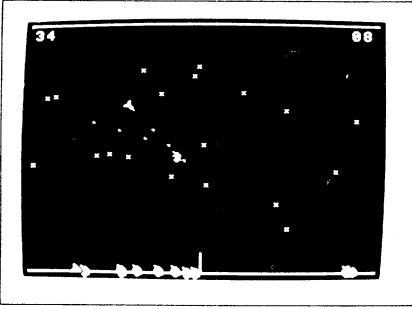
DOGFIGHT

A two-player game in which each player controls a plane from the keyboard, and tries to shoot down the opponent without crashing into the stars. Each player has control of the direction of flight, a fire button, and an accelerate control. Program 4K, graphics 6K.
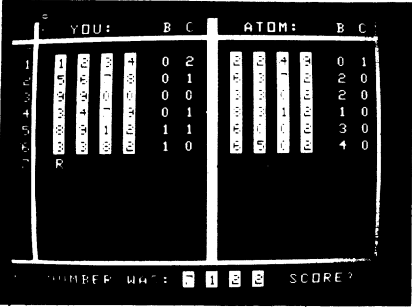

MASTERMIND

Guess the computer's code before the computer guesses yours; a test of logical deduction and reasoning. Program 3K, graphics ½K.
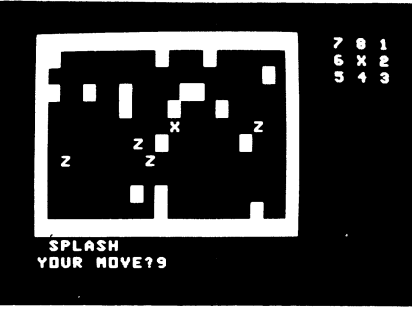
ZOMBIE

Your plane has gone out of control and you are plummeting into the unknown. You land on Zombie island; your only hope of survival is to lure all the zombies into the swamp. In desperation you can try a jump into hyper-space! Program 3K, graphics ½K.

GAMES PACK 3
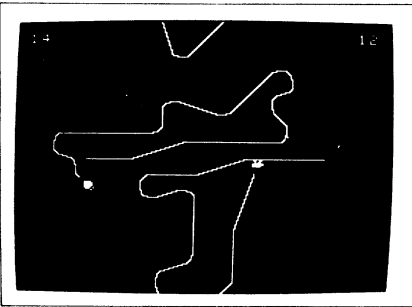
RAT TRAP

Move your rat without colliding with the trails left by either rat, and entangle your opponent before he entangles you! With high-speed action-replay feature. Program 4K, graphics 5K.

P 5.4

LUNAR LANDER

Land a spacecraft on a lunar crater; instrument panel gives readout of altitude, velocity, fuel remaining, and drift velocity, and provides control over thrust and drift. Program 1K, graphics ½K.
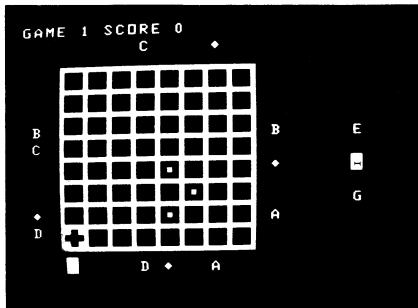
BLACK BOX

Deduce the position of four invisible objects in the Black Box by firing rays at them and observing how they are reflected or absorbed. Program 3K, graphics ½K.

GAMES PACK 4
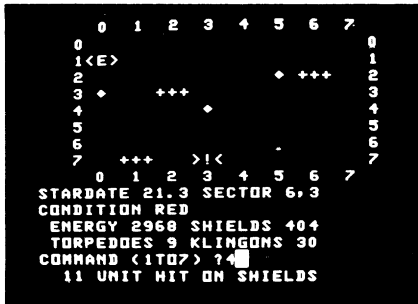
STAR TREK

A full implementation of the now classic computer game in which you must rid the universe of Klingons. With short and long-range scans, galactic map, phasers, photon torpedoes, shields, etc. Program 5K, graphics 1K.
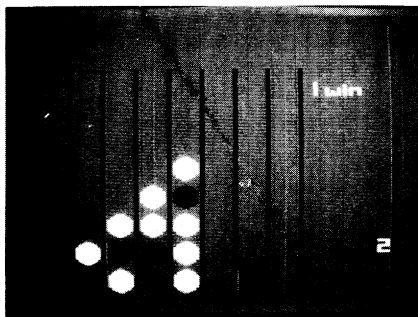
FOUR ROW

You and the computer take turns in placing marbles on the board, and the first to get a line of four marbles horizontally, vertically, or diagonally, wins. Program 5K, graphics 6K.

P 5.5
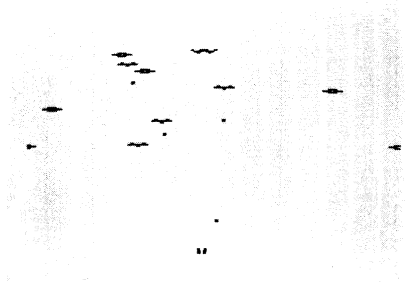
SPACE ATTACK

Earth is being invaded by hostile aliens; armed with a laser-gun you must repel the invasions and avoid being hit by the gunner ships. If you fail, the mother ship lands and the invaders take over. The game becomes progressively harder with each subsequent invasion; if you survive ten invasions the earth is saved! Program 3K, graphics 6K.
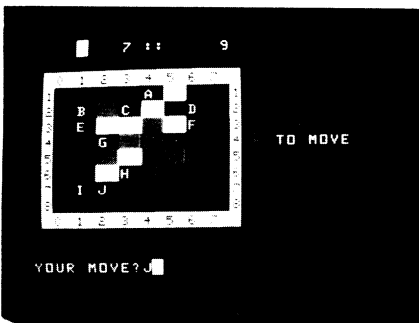
GAMES PACK 5
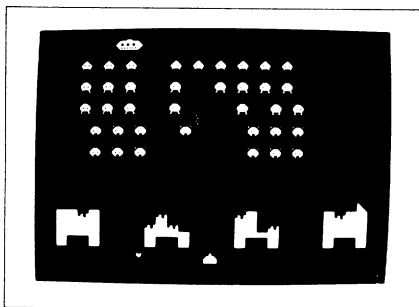
INVADERS

The most popular video game, with invaders, flying saucers, shelters, and full sound effects, now available for the ATOM. Program 5K, graphics 6K.
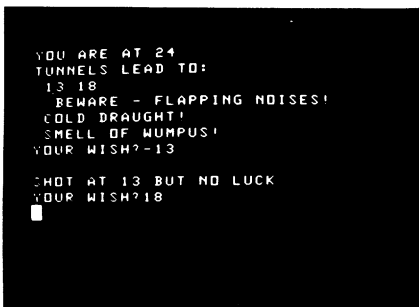
WUMPUS

You are wandering in a network of caves inhabited by the Wumpus. Discover where he lurks and shoot him before he eats you; the pits and bats don't make things any easier. Program 2K, graphics ½K.

REVERSI

Reversi, also called Othello, is played with counters that are black on one side and white on the other; players take turns in placing and turning over counters, and the player with the most counters wins. Program 3K, graphics ½K.
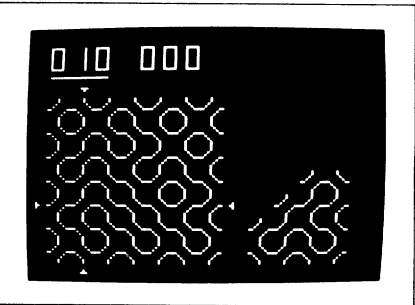
P 5.6

GAMES PACK 6
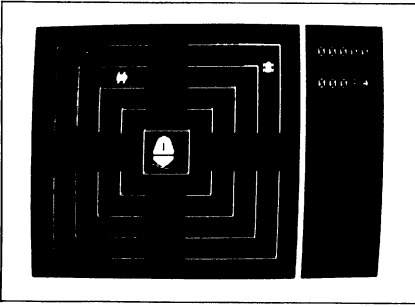
DODGEMS

Steer your car around the lanes, collecting points, but avoid the computer-controlled car which is programmed to collide with you. If you survive, the game gets faster. Program 4K, graphics 6K.
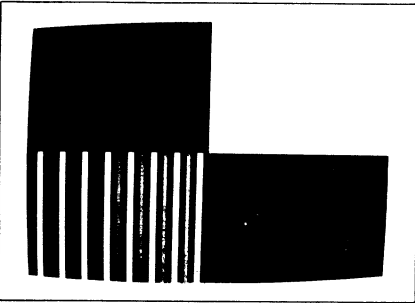
SIMON

Test your ability to remember a progressively longer sequence of lights and tones. With adjustable skill level. Program 2K, graphics 3K.

AMOEBA

Try and create the shapes devised by the computer; for up to 4 players. Program 3K, graphics 3K.

GAMES PACK 7
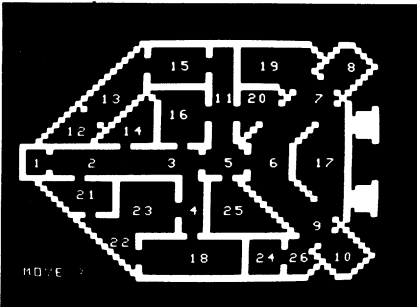
GREEN THINGS

Your computer has just informed you that an alien life-form has invaded your spacecraft; your only hope of survival is to discover a way of destroying the green things with the weapons available on the ship. Program 5K, graphics 2K.

BALLISTICS

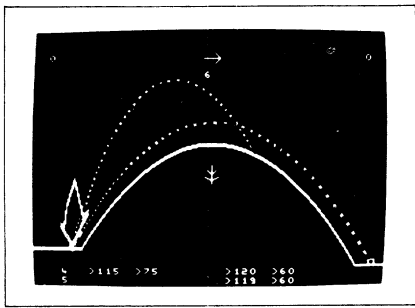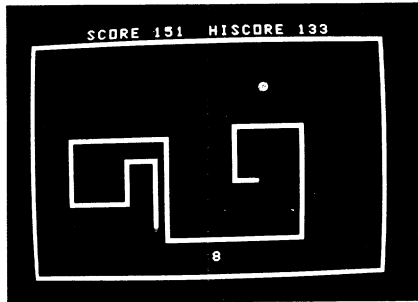A two-player game in which you take turns in firing shells at the other player, taking into account the wind and shape of the hill. Program 3K, graphics 6K, needs floating-point.

SNAKE

Grow yourself a snake by guiding it towards digits which it eats; but don't let it eat the walls, or itself. Program 2K, graphics ½K.

GAMES PACK 8

STARGATE

Protect your missile base against the waves of invading aliens who attack by warping through stargates, and aim for the highest score. A high-speed game with astonishing sound effects. Program 5K, graphics 2K.
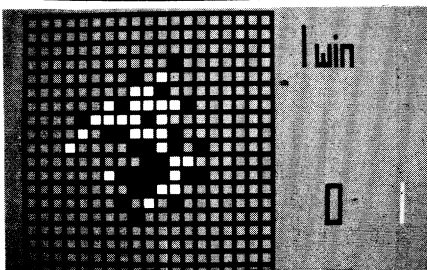
GO-MOKU

Play against the computer to get five counters in a line in this traditional Japanese game; with convenient cursor-entry of moves. Program 4K, graphics 6K.
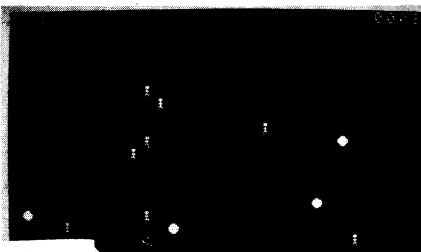
ROBOTS

Robots are following your car. Lure them into potholes, or be converted into scrap metal! Program 4K, graphics 6K.

P 5.8

GAMES PACK 9

SNAPPER

Guide the Snapper through the maze eating dots and avoiding the creatures from the cave. Before you can eat them you must eat a cross to become invulnerable. Later screenfuls have different mazes and faster creatures. Program 5K, graphics 3K
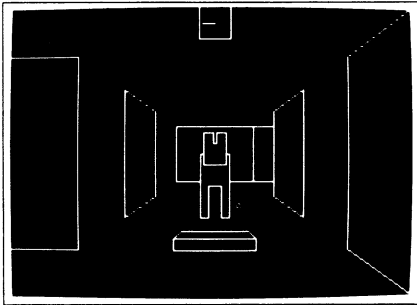
MINOTAUR

Wander in a three-dimensional labyrinth, and move the five gold bars from their treasure chests to the safe without being eaten by the hungry Minotaur. The audio minotaur detector warns you when he is nearby, and a map, compass, and marker crosses help you find your way through the passages of the labyrinth. Program 5K, graphics 6K
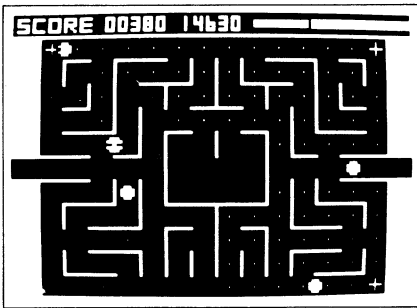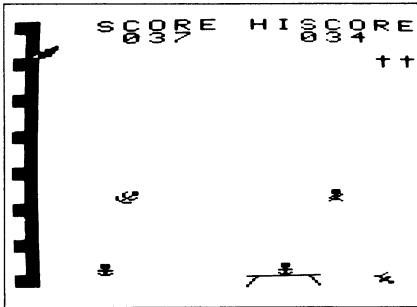
BABIES

Use the trampoline to rescue babies that are falling from a burning building, by bouncing them to the safety of the right-hand side of the screen. Program, 5K, graphics 3K.

GAMES PACK 10
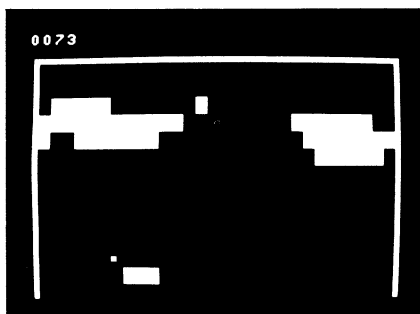
BREAKOUT

Ten Games for the Minimum ATOM

This pack includes video games such as Breakout and Squash, games of deduction such as Mastermind, and simulations such as Ski-Run and Track, all of which will run on an 8+2K ATOM.

BREAKOUT — Knock bricks from a wall and beat the high score.

HECTIC — Catch the blocks falling from the sky before they block your way.

MASTERMIND — Guess the computer's code in less than ten attempts.

MINICALC

TYPER
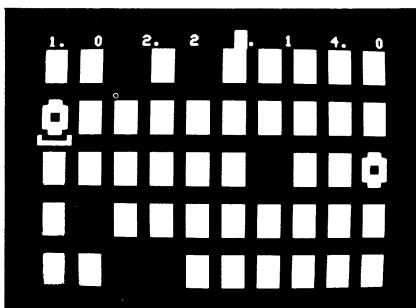
MEMORY

Cassette 2 — Financial Planning

The MINICALC program will introduce you to the concepts of financial modelling that are widely used in business, and will prove invaluable for household budgeting.

SALES uses graphical techniques to chart sales over a 12-month period, with cumulative and 3-monthly averages.

Cassette 3 — Household

Programs for use in the home.

TBOOK is a computerised telephone-book, which can hold 95 names and telephone numbers for quick and easy access; these can be stored on cassette.

Learn to touch-type with TYPER, which gives you a carefully graded series of exercises which get harder as you improve; it includes a diagram of the keyboard so you do not have to look down at your hands.

Timing a series of actions is difficult, even with a stopwatch; TIMER will automatically organise the timing of a series of events, such as the stages in preparing a meal, display the current time and a countdown, and ring an alarm when each one is due.

Cassette 4 — Games

ATTACK — defend yourself from attack with a laser gun.

CONNECT4 — Play against the computer, or another player, to get 4 counters in a row.

BREAKOUT — Knock bricks from a wall with a bat and ball, and try to beat the high score.

MEMORY — For 1 to 4 players; the computer lays out 25 pairs of cards face-down, and you must remember where the pairs are.

MASTERMIND — Crack the computer's code in less than ten attempts.

ATOM SYNTHESISER
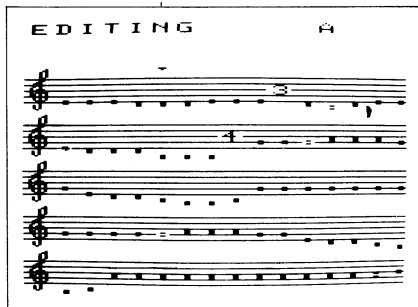
The ATOM Synthesiser turns the ATOM into a programmable synthesiser, using the keyboard as a piano keyboard, with the ability to record, and edit four separate tunes, and play them through the internal speaker. As well as altering the tempo, the notes can be played in four different voices which can be selected at any point in a tune. While a tune is being recorded, played or edited, the notes are displayed on musical staves.

Commands: Manual, Record, Play, Edit, Tempo, Save, Load.

ATOM Synthesiser comes complete with some demonstration tunes on cassette, including Variations on Bach's Toccata and Fugue, and "The Teddy-Bear's Picnic".
Program 5K, graphics 6K.

ATOM LIFE PACKAGE
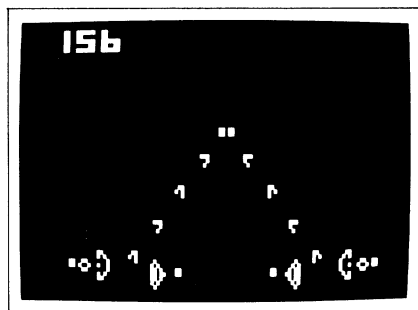
The ATOM LIFE package is one of the fastest versions of Life available on any microcomputer, and will process a full 256 x 192 screen in less than 2 seconds, or an 128 x 64 screen in under ½ second. It uses the standard set of rules for survival and reproduction. These rules, though simple, give rise to a very complicated and fascinating selection of patterns. Some patterns are stable, others die out, some oscillate between different states, and some (such as the glider and the spaceship) move with successive generations.

A cursor-drawing system allows any shape to be drawn on the screen. The program comes complete with 7 programmed shapes, which can be called up in any part of the screen in any orientation. These shapes are:

Glider, small spaceship, flying machines, glider gun, queen bee, 15 cycle, and eater.

Complex patterns can be saved to cassette and reloaded, and 5 interesting patterns are provided with the program:

Newgun, two oscillators, a poisoned cell, and a grid pattern.

MATHS PACK 1
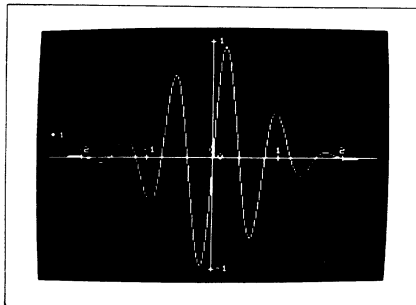
PLOT

A versatile graph-plotting package for use in research, accounting, schools, and mathematics, or simply for amusement. Will draw a graph of a specified function, with automatic scaling if required, or a plot of coordinate data, connected by line segments or a smooth curve; a regression line can be fitted to data. Annotated axes are drawn if required. Program 5K, graphics 6K.

SIMULTANEOUS

Solves a set of simultaneous equations, with integer or real coefficients, by the rapid Gaussian-elimination technique. Program 2K, graphics ½K.

REGRESSION

Calculates the best-fitting straight line to a specified set of data points, gives the equation of the line, and the correlation coefficient of the fit. Program 2K, graphics 1/2K.

MATHS PACK 2: Picomath Algebraic Manipulation Package

The Picomath suite of programs will perform a wide range of algebraic manipulations, and expressions can be symbolically differentiated or integrated.

POLYNOM can expand and simplify, differentiate, or integrate, a polynomial expression such as:

$$(2x - y).(x + y)^2 - (28z - 1)^2$$

into the equivalent polynomial:

$$2x^3 + 3x^2y - y^3 - 784z^2 + 56z - 1$$

RATIONAL can expand and simplify an expression such as:

$$1 + \frac{1}{x-1} - \frac{1}{x-1} + \frac{2x}{x^2-1}$$

into the equivalent ratio of two polynomials, reduced to lowest terms:

$$\frac{x + 1}{x - 1}$$

TRIGONOM can expand and simplify, differentiate, or integrate, a trigonometric expression such as:

$$\frac{1 + \tan^2 x}{1 + \cot^2 x}$$

into the equivalent standard form:

$$\sec^2 x - 1$$

FOURIER can perform trigonometric transformations into a linear combination of sines and cosines of integer multiples of x. For example:

$$64 \sin^4 x \cos^3 x$$

will be transformed into:

$$3 \cos x - 3 \cos (3x) - \cos (5x) + \cos (7x)$$

Memory requirements: Programs 5K, graphics 1/2K, need floating-point.

ATOM WORD TUTOR
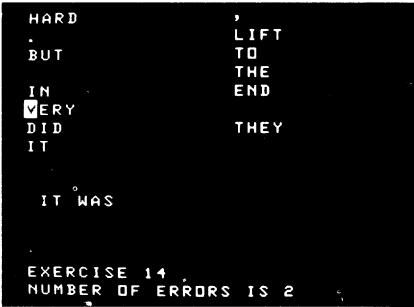
```
HARD            ,
.               LIFT
BUT             TO
                THE
IN              END
▓ERY
DID             THEY
IT

IT °WAS


.
EXERCISE 14 .
NUMBER OF ERRORS IS 2
```
SENTENCES

ATOM WORD TUTOR consists of three versatile programs designed to aid the development of language abilities in children of primary school age. Each program is supplied with a sample database that provides the material for a full set of exercises, and the supervisor can enter further teaching material and build up libraries of databases on cassette. A simple, clear cursor method allows the pupil to answer the problems without typing. The names and scores of up to 16 pupils are recorded and can be viewed by the supervisor. Programs 5K, graphics 6K.

PAIRS

Words are presented with pairs of letters replaced by blanks. The pupil can choose from up to four possible pairs, only one of which completes each word.

RELATIONS

One of each pair of related words is displayed along with a linking phrase. The phrase is completed by adding the second word of the pair, selected from the list on the screen.

SENTENCES

Each exercise shows a sentence with the words and punctuation marks randomly rearranged. The pupil must reconstruct the original sentence by selecting the items in the correct order.

INTRODUCTORY PACKAGE

A set of 4 cassettes containing programs designed to introduce you to the world of personal computing. Complete with a booklet giving full instructions on loading and running the programs — all you need is an Atom with at least 3K text-space.

Cassette 1 — Interactive Teaching

Step by step this tape teaches you to 'talk' to the Atom — no manuals or experience necessary. The display on the TV screen will tell you what the computer is doing, what you should do next, and even what you have done wrong.

Word Processor

The processor commands can be inserted into the text to give great flexibility in how it is printed. Pages can be printed in any format, with optional page numbers, and sections can be justified as required. The processor caters for most makes of printer, and for single-sheet printing the processor can be made to wait for a keypress after each page.

Processor Commands:

Allow lines to be on the same page, allow new page, centre line, double-space lines, equal-position line numbers, indent, justify lines, keypress for new page, set lines per page, line one of document, margin, no justification, output character to printer, set page number, no page numbers, right margin, single-space, temporary indent, width of page, exchange control character, comment line.

ATOM DATABASE

The ATOM DATABASE is a very versatile and efficient cassette or disk based database system. Possible applications include:

Keeping a personal telephone directory
Recording the stock of a wine cellar
Storing data on the chemical elements
Organising census data

The information can be typed in and edited just like a BASIC program, making it very easy to create and edit databases. The format of the database is chosen by the user, and consists of any number of named fields of specified width. The program includes commands to list subsets of the database, and output the database to a printer with full control over the output format. Subsets of the database are selected with a versatile testing command, allowing searches for equality, substrings, and alphabetical inequalities. The data can be sorted into alphabetical order of any field, and will sort 100 records in under 20 seconds.

The ATOM DATABASE comes complete with a 16-page booklet giving full instructions, and a sample application.

Database Commands:

Give all values taken by field, edit database, leave program, list fieldnames, execute search, specify fields to be printed, switch printer on/off, renumber database, reset, specify search, sort database on any field, print current test, discard sort.

Test options:

AND, OR, $\rangle$, $\langle$, $\rangle=$, $\langle=$, $\langle\rangle$, $=$, SUB, NSUB

Program 5K, graphics 1K.

ATOM CHESS

ATOM CHESS is a complete chess-playing program, with the following features:

- 6 levels of play, giving novice to professional standards.
- Computer moves in 2 seconds at the lowest level.
- Board display with coordinate entry of moves, and rejection of illegal moves.
- Computer and human castling (0-0 and 0-0-0).
- En-passant captures allowed, and played by computer.
- Up to 127 moves each side are stored, and can be replayed from any point in the game.
- A game can be restarted at any earlier point.

Program 5K, graphics 6K.

ATOM DESK DIARY
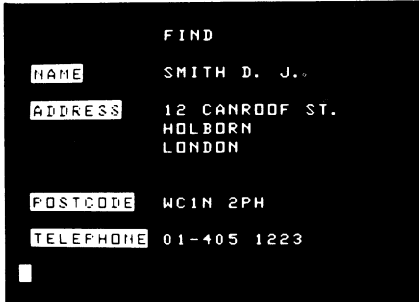
ADDRESS BOOK

Allows a file of up to 100 names, addresses, post codes, and telephone numbers to be built up and searched in a fast and convenient way. Options are selected from menus displayed by the program, and it allows all the entries to be printed out for mailing lists, etc.
Program 5K, graphics 6K.
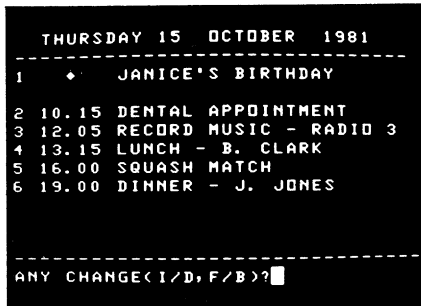
PLANNER

Works just like a written diary with many automatic features, and space for up to 300 entries. Three types of entries can be made: appointments, at a specified time-of-day; permanent entries, such as birthdays and holidays, which automatically get carried through to subsequent years; and exclusive entries, for trips and holidays, which prevent further appointments to be made on that day. Program 5K, graphics 6K.

SOFT VDU
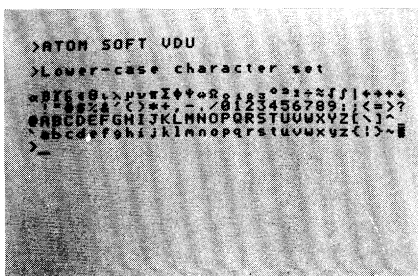
SOFT VDU

The soft VDU replaces the normal ATOM VDU, but provides 128 characters including upper and lower-case letters, and mathematical symbols. The characters can be mixed with high-resolution graphics, and the DESIGN program allows new characters, such as foreign letters, to be designed and added to the character set. Program 1.5K, graphics 6K.

P 5.15

A T O M   S O F T W A R E   A N D   B O O K S

Code	Description	Price
1320	Games Tape 1. "Asteroids", "subhunt", "breakout"	10.00
1325	Games Tape 2. "Dog fight", "Mastermind", "Zombie"	10.00
1330	Games Tape 3. "Rat trap", "Lunar Lander", "Black Box"	10.00
1335	Games Tape 4. "Star Trek", "Four row", "Space attack"	10.00
1336	Games Tape 5. "Invaders", "Wumpus", "Reversi"	10.00
1337	Games Tape 6. "Dodgems", "Simon", "Amoeba"	10.00
1338	Games Tape 7. "Green Things", "Ballistics", "Snake"	10.00
1339	Games Tape 8. "Star Gate", "Gomoku", "Robots"	10.00
1343	Games Tape 9. "Snapper", "Minotaur", "Babies"	10.00
1347	Games Tape 10."Breakout", "Hectic", "Mastermind" "Ski-run", "Snake", "Track", "Simon", "Squash", "Moon", "Bombs-away"	10.00
1348	Games Tape Adventures.	10.00
1349	Games Tape Life Package.	10.00
1353	Word Tutor Tape	10.00
1354	Chess Pack Tape	10.00
1355	Introductory Pack (4 Tapes)	20.00
1356	Desk Diary	10.00
1342	Utility pack 1	10.00
1341	Maths Pack 1	10.00
1344	Maths Pack 2	10.00
1340	Soft VDU	10.00
1357	Data Base	10.00
1358	Business Tape	10.00
1359	Business Book	10.00
1346	Peeko Pack	8.00
1350	Word Pack in ROM	30.00
1351	Word Pack for use with Econet (PROM)	50.00
1360	Forth Tape	10.00
1361	Forth Book	7.00

UTILITY PACK 1

```
┌─────────────────────────────────┐
│ ·TOM  DISASSEMBLER              │
│                                 │
│ HEX START ADDRESS?#835F         │
│ END ADDRESS?#8400               │
│ BRK/RTS OPTION?Y                │
│ CODE STORAGE TEXT SPACE:        │
│ (EG. #29)?N                     │
│  835F  24 91      BIT #91       │
│  8361  10 11      BPL #8374     │
│  8363  A9 00      LDA @#00      │
│  8365  85 89      STA #89       │
│  8367  85 8D      STA #8D       │
│  8369  85 8C      STA #8C       │
│  836B  A9 0A      LDA @#0A      │
│  836D  85 8B      STA #8B       │
│ >█                              │
└─────────────────────────────────┘
```

DISASSEMBLER

A versatile disassembler which can list machine code in standard ATOM assembler form, or store the assembler text into memory so that it can be edited and re-assembled with any starting address. Graphics 2K.
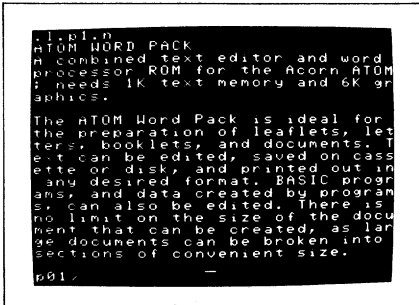
FAST COS

Speeds up program saving by modifying the ATOM's standard cassette-interface routines to operate at 1200 baud, or 4 times the standard speed. Program 1K.

RENUMBER

A fast renumber for BASIC or assembler programs, which gives a display of the line numbers for labelled lines. Program 1K.

WORD PACK ROM

```
┌─────────────────────────────────┐
│ ·l·pl·n                         │
│ ATOM WORD PACK                  │
│ A combined text editor and word │
│ processor ROM for the Acorn ATOM│
│ ; needs 1K text memory and 6K gr│
│ aphics.                         │
│ The ATOM Word Pack is ideal for │
│ the preparation of leaflets, let│
│ ters, booklets, and documents. T│
│ e·t can be edited, saved on cass│
│ ette or disk, and printed out in│
│ any desired format. BASIC progr │
│ ams, and data created by program│
│ s can also be edited. There is  │
│ no limit on the size of the docu│
│ ment that can be created, as lar│
│ ge documents can be broken into │
│ sections of convenient size.    │
│                                 │
│ p01/        ─                   │
└─────────────────────────────────┘
```

A combined text editor and word processor ROM for the Acorn ATOM; needs 1K text memory and 6K graphics.

The ATOM Word Pack is ideal for the preparation of leaflets, letters, booklets, and documents. Text can be edited, saved on cassette or disk, and printed out in any desired format. BASIC programs, and data created by programs, can also be edited. There is no limit to the size of document that can be created, as large documents can be broken into sections of convenient size.

The Word Pack is supplied in a 4K ROM which simply plugs in to the ATOM's utility ROM socket. The ROM adds the commands EDIT and TEXT to the ATOM's command set, and these commands can be inserted in programs. The EDIT command enters the text editor/word processor. The TEXT command stores text to the editor's text area, so that output generated by programs, or by the LIST command, can subsequently be edited.

The Word Pack comes complete with a 16-page booklet giving full instructions, and examples of use.

Text Editor

The Text editor uses the ATOM's high-resolution screen to display the text, with full upper and lower case. Editing commands are all single keystrokes; they allow text to be added anywhere in the document, deleted, or moved, using a cursor to specify the required position. Any part of the document can be viewed, and the editor includes a 'find' command which will search for a string, and replace all or selected occcurrences of it by another string; thus, for example, spelling mistakes can be corrected throughout the text with a single command.

Text-Editor Commands:

Insert after, insert before, copy text to buffer, end of text, delete, enter text, escape/delete mark, find (and replace), home cursor, insert character, next page, output to printer, previous page, quit to BASIC program, replace text, move to start, transfer text to buffer, where is end of text, exchange character, move to end, roll up one line, cursor to start of line, cursor to end of line, mark cursor position, load text file, save text file, execute COS/DOS command.

P 5.17

Word Processor

The processor commands can be inserted into the text to give great flexibility in how it is printed. Pages can be printed in any format, with optional page numbers, and sections can be justified as required. The processor caters for most makes of printer, and for single-sheet printing the processor can be made to wait for a keypress after each page.

Processor Commands:

Allow lines to be on the same page, allow new page, centre line, double-space lines, equal-position line numbers, indent, justify lines, keypress for new page, set lines per page, line one of document, margin, no justification, output character to printer, set page number, no page numbers, right margin, single-space, temporary indent, width of page, exchange control character, comment line.

ATOM DATABASE

```
#>?SET TYPE SUB R AND DRINK = NO

#>?PRINT NAME TYPE YEAR

#>?SORT NAME

#>?GO
NAME                    TYPE YEAR

BEAUNE                  RM3  1976
LA TOUR-HAUT-BRIO RM2   1976
VOLNAY                  RM3  1976

#>?
```

The ATOM DATABASE is a very versatile and efficient cassette or disk based database system. Possible applications include:

Keeping a personal telephone directory
Recording the stock of a wine cellar
Storing data on the chemical elements
Organising census data

The information can be typed in and edited just like a BASIC program, making it very easy to create and edit databases. The format of the database is chosen by the user, and consists of any number of named fields of specified width. The program includes commands to list subsets of the database, and output the database to a printer with full control over the output format. Subsets of the database are selected with a versatile testing command, allowing searches for equality, substrings, and alphabetical inequalities. The data can be sorted into alphabetical order of any field, and will sort 100 records in under 20 seconds.

The ATOM DATABASE comes complete with a 16-page booklet giving full instructions, and a sample application.

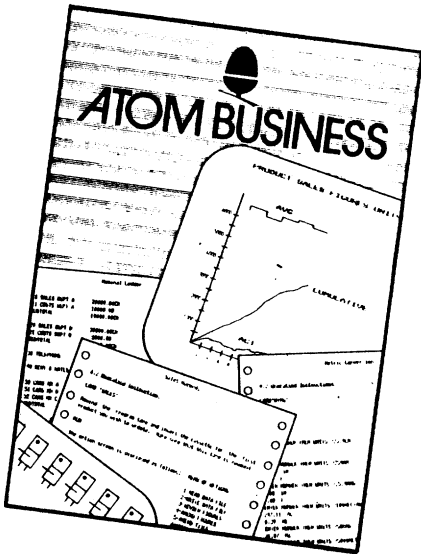**Database Commands:**

Give all values taken by field, edit database, leave program, list fieldnames, execute search, specify fields to be printed, switch printer on/off, renumber database, reset, specify search, sort database on any field, print current test, discard sort.

Test options:

AND, OR, $\rangle$, $\langle$, $\rangle=$, $\langle=$, $\langle\rangle$, $=$, SUB, NSUB

Program 5K, graphics 1K.

ATOM BUSINESS

The book "ATOM Business", and its accompanying cassette, describe eleven business programs covering a wide range of different business applications:

ADDUP tallies a column of totals, and provides verification facilities.

LABEL prints multiple copies of labels from a typed address.

WTMS is a general-purpose conversion program, between metric and imperial units, and can be extended to deal with any desired conversions.

DCF calculates whether the best option in a particular situation is to lease or buy equipment, based on the discounted cash flows involved.

SALES maintains a file of sales data on cassette, and provides commands to update and edit it.

GRAPH will print a 'Z' curve of the sales figures from the SALES program, showing cumulative sales for the year to date, actual sales week by week, and a plot of the 3-week moving average.

NOM maintains a nominal ledger, using a printer for an audit roll.

BUDG performs the calculations necessary to divide a financial budget into the correct portions over a year.

EXS calculates an expenses claim, keeping control of the VAT components of each expense.

STD gives the standard deviation for a set of data values.

QUE sets up a simulation of a queueing situation in a supermarket or shop, and gives a pictorial display of the state of the queues as a function of time.

The book and cassette are produced in conjunction with Phipps Associates.

PEEKO – COMPUTER
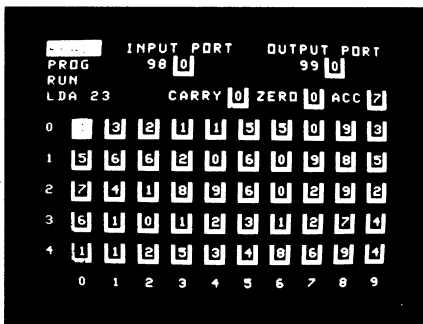
The PEEKO-Computer simulates the operation of a simplified microcomputer in order to teach the fundamentals of machine-code programming. The PEEKO-Computer has ten easily-learned instructions, and the display gives a visual analogy of the operation of a real microcomputer. Programs can be entered, single-stepped, or run, with the memory and register contents being displayed at every step. To aid comprehension each instruction mnemonic is displayed as it is encountered.

The PEEKO-Computer comes complete with a 16-page instruction manual which contains

Code	Description	Price
1320	Games Tape 1. "Asteroids", "subhunt", "breakout"	10.00
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1339	Games Tape 8. "Star Gate", "Gomoku", "Robots"	10.00
1343	Games Tape 9. "Snapper", "Minotaur", "Babies"	10.00
1347	Games Tape 10."Breakout", "Hectic", "Mastermind" "Ski-run", "Snake", "Track", "Simon", "Squash", "Moon", "Bombs-away"	10.00
1348	Games Tape Adventures.	10.00
1349	Games Tape Life Package.	10.00
1353	Word Tutor Tape	10.00
1354	Chess Pack Tape	10.00
1355	Introductory Pack (4 Tapes)	20.00
1356	Desk Diary	10.00
1342	Utility pack 1	10.00
1341	Maths Pack 1	10.00
1344	Maths Pack 2	10.00
1340	Soft VDU	10.00
1357	Data Base	10.00
1358	Business Tape	10.00
1359	Business Book	10.00
1346	Peeko Pack	8.00
1350	Word Pack in ROM	30.00
1351	Word Pack for use with Econet (PROM)	50.00
1360	Forth Tape	10.00
1361	Forth Book	7.00

ATOM HARDWARE AND SOFTWARE UPDATE

Even as this catalogue was being compiled, more news came in about hardware and software extensions to the Atom. LISP and BBC-type BASIC are now ready and deliveries will start soon. Pascal, although announced earlier, has been deferred, and will not be available for some time.

Control Universal are manufacturing a 17K bytes DRAM card, which fills in the awkward gap in the memory map from 3C00 to 3FFF, and then provides user RAM from 4000 to 7FFF, a continuous text space of 22527 bytes.

Atomsoft have added another games pack, no 11, with "Missile Base", "Snooker" and "Dominoes".

ATOMPLUS 17K BYTES DRAM CARD FOR ATOM

This new card is manufactured by Control Universal and offers a solution to the problem of adding memory to the Atom without leaving a gap. The 17K memory consists of 1k of static RAM from hex 3C00 to 3FFF and 16K of dynamic RAM from 4000 to 7FFF. This then provides continuous text space from hex 2800 to 7FFF (22527 bytes).

Power requirements are low - can be expected to be within 300 mA.

The recommended method of connection to the Atom bus is to fill the inner of the two bus connectors with vertical pins, and use a 64 way ribbon cable from those pins to the ATOMPLUS. (Both these items are on page 13.1). The ATOMPLUS is then bolted to the floor of the Atom case where it fits without interference with the Atom pcb.

ATOMPLUS is completely compatible with all CUBE and Acorn rack mounting systems, and can be used to provide 16k RAM memory from hex 4000 to hex 7FFF.

570 ATOMPLUS with 17k RAM memory, assembled and tested   69.00

578 ATOMPLUS pcb only with manual and circuit   25.00

WORDPACK 3000 - EXTENDED BUFFER SIZE VERSION

With the availability of the memory extensions for the Atom, it becomes interesting to enlarge the size of the change buffer. This has the advantage of allowing longer text entries without interruption, and much more convenient text manipulations, as blocks of 2048 characters can be handled, compared with 448 characters in the standard version. Disk files are then stored as starting from hex 3000, and become compatible with the the screen EDIT software offered for systems 3, 4, and 10. Note that some text processor commands differ between wordpack and Screen EDIT, and must be amended when changing systems.

1362 Atom Wordpack 3000   50.00

BBC - TYPE BASIC FOR ACORN ATOM
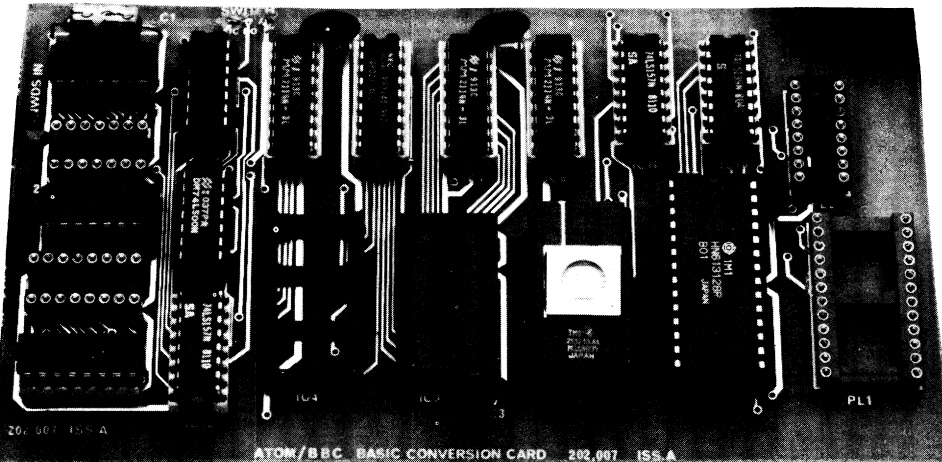
Available now , a 20K BBC ROM conversion module which can be added
inside an Atom. It will support the full set of BBC-type BASIC commands. The BASIC
syntax is identical so all programs that don't rely on the BBC hardware can be run on the
Atom without any modification.

The module is fitted in parallel with Atom BASIC and may be selected by a switch or from
the keyboard if certain modifications are made. It consists of 16K BASIC ROM, a 4K
operating system ROM and an additional 2K RAM that can be used by the Atom as well.

Complete with manual
A comprehensive BBC-type BASIC manual is supplied with every set giving full operating
and fitting instructions.

How it works:
The BBC-type BASIC conversion board uses
the same 16K BASIC ROM as used in the
BBC Microcomputer. The board includes a
4K MOS ROM to provide the correct
machine environment on the Atom. The
board also includes logic to alter the
memory map so that RAM is available from
0000 upwards, and so that the 16K BASIC
ROM can reside at 8000 to C000.

The BBC-BASIC TIME function is
implemented by means of interrupts,
generated by the Atom's 6522 timer (which
must therefore be fitted).

The BBC-type BASIC board is simply
fitted by removing four integrated circuits
from the Atom and inserting these in sockets
on the BBC-type BASIC board. The board is
then plugged into the empty sockets on the
Atom.

The BBC-type BASIC board includes the
following components:
16K BASIC ROM
4K MOS ROM
2K of additional RAM
Socket for utility ROM
Socket for MOS extension ROM
Decoding logic

The board can either be wired permanently
in BBC-type BASIC mode, or, with the
addition of two wires to the Atom
keyboard, you can select between Atom or
BBC-type BASIC by pressing CTRL-BREAK
or SHIFT-BREAK respectively.

1363 BBC-type BASIC for Atom on module, assembled and tested 44.00

ATOMCALC

```
C8      V   ATOMCALC
B8+.15
+
EXPENSE    @  COST      VAT      TOTAL
-------------------------------------
FOOD          63.39     0.00      63.39
GAS           12.00     1.80      13.80
ELECT.        33.20     4.98      38.18
PHONE          7.10     1.06       8.16
RENT          95.85    14.37     110.22
PETROL        47.10     7.06      54.16
INSURE.       23.11     3.46      26.57
-------------------------------------
EXPENSES                         314.50
INCOME                           325.00
SPENDING                          10.49
```

For: Planning, Projecting, Estimating, Scheduling, Calculating, Recalculating, Revising, Critical Path Analysis, Scientific tables, Teaching . . . .

What is it?
Atomcalc is an all-purpose planning and modelling program contained in a plug-in 4K ROM, which fits into the utility socket of a standard Atom. It is very easy to use; if you can use a calculator, you can use Atomcalc and no programming skill is needed.

Atomcalc creates a grid of up to 62 rows and up to 255 rows, like a ledger. Each position can contain a label, a number or a calculation.

What will it do?
You set up a series of automatic calculating functions like totalling or percentages. Then fill in the columns with your figures and the program produces the answers. If you want to change one figure in the calculation, it immediately changes the relationship of all the other figures involved. So, for example, you can see what effect on profit a 5% increase in sales might have or a 10% increase in production or a 3% drop in transport.

Applications can be stored on tape and printed out on an optional printer.

Users' Manual
Atomcalc comes complete with a 30-page Users' Guide, with financial and scientific examples.

1364   ATOMCALC on cassette with manual   34.00

ATOM LISP

The ATOM LISP interpreter consists of 5½ K of machine-code interpreter plus 3 K of initialised LISP workspace containing LISP utilities and constants, which can be deleted to make extra space if not required. It is supplied on cassette and is designed to run on a 8+12K ATOM.

ATOM LISP is intended for:

❋ Hobbyists who want to discover about the fundamental language of artificial-intelligence research.

❋ University and school students who are learning LISP or carrying out research.

❋ System designers who require more flexibility in data and control structures than is provided by traditional programming languages.

Also available is a 44-page guide to ATOM LISP, "LISP Theory and Practice".

Important features include:

❋ Fully interactive with explicit EVALUATE and VALUE IS messages.

❋ Automatic parenthesis count to help in typing complex expressions on the computer.

❋ Built-in superprinter to format the printing of large expressions.

❋ Editing by screen editing or built-in LISP editor.

❋ All errors trapped and optional full traceback printed.

ATOM LISP includes a number of extensions to basic LISP, including:

❋ PEEK, POKE, and CALL to control hardware and machine-code programs.

❋ Functions can have optional arguments with default values.

❋ Improved iterative control structures using LOOP, WHILE, and UNTIL functions.

❋ Automatic access to COS or DOS commands with "*".

❋ Cassette (or disk) input/output control functions.

The fast compacting garbage collector automatically finds space for numbers, lists, or character strings if there is any space at all remaining so that the programmer never need be concerned about the details of storage allocation.

LISP Functions

AND, APPLY, ATOM, BLANK, CALL, CAR, CDR, CAAR, CADR, CDAR, CDDR, CHARP, CHARS, CLOSE, COND, CONS, CR, DEFUN, DIFFERENCE, DOLLAR, EDIT, EQ, ERROR, ERRORSET, EVAL, F, FSUBRP, GET, GETCHAR, GREATERP, LAMBDA, LESSP, LIST, LISTP, LOAD, LOOP, LPAR, MESSOFF, MESSON, MINUS, NIL, NOT, NULL, NUMBERP, OBLIST, OPEN, OR, ORDINAL, PEEK, PERIOD, PLIST, PLUS, POKE, PRINO, PRINT, PROGN, PUT, QUOTE, QUOTIENT, READ, READLINE, RECLAIM, REMAINDER, REMPROP, RPAR, RPLACA, RPLACD, SAVE, SET, SETQ, SUBRP, SPRINT, T, TIMES, UNDEFINED, UNTIL, WHILE, WRITE, WRITEO, ZEROP.

1365   1365   ATOM LISP on cassette with manual   15.00

P 5.24

ACORN DOCUMENTATION

355	System 1 User manual (Includes 6502 CPU technical manual)	5.00
356	Acorn System 2 and Cassette Operating System manual	5.00
357	Acorn Disk Manual for Drive, DOS & controller card	3.50
358	Acorn 6502 Assembler/Disassembler/Editor user manual	5.00
359	Acorn 6809 user manual	5.00
360	Acorn BASIC manual	17.50
361	Acorn Atom manual	8.00
362	Technical manual on Acorn 8K RAM card	1.00
363	Technical manual on Acorn VDU card	1.00
364	Technical manual on Acorn FDC card (Section out of DOS manual)	1.00
365	Technical manual on Acorn VIB card	1.00
366	Technical manual on Acorn Eprom programmer card	1.00
367	Technical manual on Acorn Analog card	1.00
368	Technical manual on Acorn Laboratory Interface	1.00
369	Acorn Atom PAL encoder board manual	1.00
370	ONLI extension to BASIC user manual	3.00
371	Econet User Manual	3.00
372	Econet Technical Manual	3.00
373	FLEX user manual	30.00
374	Acorn 32K DRAM card technical manual	1.00
375	Acorn In-circuit Emulator technical manual	1.00
376	Atom disk manual	5.00

ROCKWELL DOCUMENTATION

300	R6500 Programming manual	4.00
305	R6500 Hardware manual	4.00
310	AIM 65 User handbook	11.00
315	AIM 65 Circuit diagram	1.00
316	AIM 65 Monitor listing	3.00
320	Items 300-316 together	19.50
325	AIM 65 BASIC manual	6.00
326	Items 320,325 together	25.00

Items 300, 305 and 325 include the appropiate quick reference card.

330	Terminal Interface Monitor manual	2.50
335	Micropower Data Catalogue	9.00
340	Microprocessor Systems Engineering	12.00
345	6502 Software Design Manual	8.00
350	AIM 65 PL/65 User manual	9.00
352	AIM 65 Laboratory Practice Leo J Scanlon. First class teaching aid for AIM 65	9.00
327	AIM 65 Forth Manual	11.00
328	AIM 65 Pascal Manual	11.00

ROCKWELL AIM 65
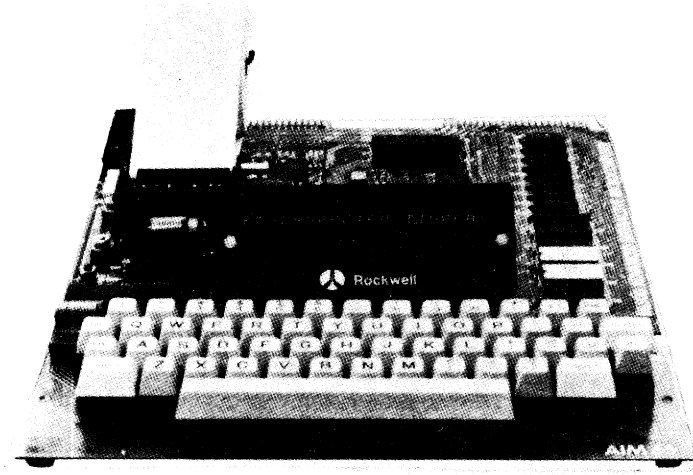
Since its introduction in 1978, the Rockwell AIM 65 "Advanced Interactive Microcomputer" has remained successful and unchallenged in its particular niche in the micro spectrum. Its unique combination of full size keyboard, built-in single line display and built-in printer have earned it many friends, especially in Education and Industry. Educationalists like the relatively low cost of providing a complete computer to a student, including permanent print-out copy for notes, and avoiding the need for a bulky tv monitor. The well written documentation and the built-in machine code features have also proved factors in the choice of AIM 65 for computer laboratories. Industrial users comment favourably on the compact solution to those computing problems where user guidance, keyboard entries and hard copy have to be provided on desk or bench.

Control Universal have had several interesting special purpose projects based on AIM 65s, including foreign exchange calculators for a bank, automatic hearing testers and scorers for exhibition dart matches.

The general specification of the Rockwell AIM 65 is as follows:-

6502 - based microcomputer, crystal controlled at 1MHz.

On-board sockets provide space for 4K NMOS RAM in 2114 type ICs, plus five sockets for 4k 24 pin ROMs. As supplied, the E and F sockets are fitted with the 8k monitor. The D socket is used for the two pass assembler ROM, or for a PROM version of a BASIC user program, or any other convenient use. BASIC, Forth or PL/65 are designed to occupy the B and C sockets, while Pascal requires these sockets plus three off-board sockets in an extension board such as CU-MEM.

The facilities offered by the 8k monitor include initialisation at power-on to provide a prompt in the display awaiting a command from

the keyboard. At this point the user may enter BASIC or Assembler by
pressing 5 or N, or may examine memory (M), enter the text editor (E), dump
or load memory to or from tape or other defined medium (D, L), examine cpu
registers (R), change A, X, Y registers, stack pointer or address pointer
(A, X, Y, S, *).

A dual interface to cassette tape with motor control allows tape to tape
assembly. The hardware designer can benefit from the use made of 6502,
6520, 6532, and 6522 devices, and can use the spare 6522 exactly as
required. All the connections from the tape interface, the spare 6522 and
the cpu itself are brought out to 44 way connectors at the rear of the
board.

The printer is fully controlled under software, and prints 20 columns wide
onto thermal paper. The display is made up of "starburst" 16 segment red
LED displays to give a 20 character single line display which scrolls in
use for convenient viewing.

code	description	price
100	AIM 65 with 1k RAM	289.00
105	AIM 65 with 4k RAM	307.00
110	AIM 65 with 4k RAM, BASIC and two pass Assembler	328.00
120	AIM 65 two pass assembler ROM	24.00
125	AIM 65 BASIC in two ROMs with manual	43.00
155	AIM 65 PL/65 high level machine code programming language in two ROMs, with manual	57.00
160	AIM 65 Forth in two ROMs with manual	43.00
161	AIM 65 Pascal in five ROMs – needs extension card, eg CU-MEM, with manual	66.00
140	AIM 65 spare printer	35.00
141	AIM 65 spare display chip (4 characters)	10.00
145	AIM 65 spare keyboard with connector	30.00
150	AIM 65 spare red display filter	4.00
500	AIM 65 connector for expansion and application, 44 way	5.00
505	Box of 10 x 250ft thermal paper rolls, blue print	23.00
510	Box of 20 x 250ft thermal paper rolls, blue print	43.00
511	Box of 20 x 66ft thermal paper rolls, black print	16.00

See under "Documentation" for prices of Rockwell manuals bought separately.

See under "Expanding the AIM 65" for details of Control Universal boards
and disk systems for providing extensions to the AIM 65 such as video, PROM
programming, more i/o channels, analog, disk storage, etc.

See under "Microflex Modules" for details of Rockwell's own range of AIM 65
extension cards.

See under "Enclosures" for the choice of cabinets for AIM 65.

See under "Power supplies" for the choice of power supplies for AIM 65.

The virtues of the AIM 65 are detailed in the previous section, and indeed it does fulfil many roles extremely well. However, in some circumstances, more features are required than are provided in the standard unit. We offer two ranges of extensions to the AIM 65, namely the CUBIT range made by Control Universal, and the Microflex range made by Rockwell themselves. Microflex has the advantage of being made by the same manufacturer as the AIM 65, but the British made CUBIT system of extension offers good value for money, and a wider range as a result of being compatible throughout both the CUBIT and Acorn ranges of units.

The CUBIT range is described below, in this section. Microflex has the whole of the next section to itself.

1.CUBIT   See Page 2.1

CUBIT is an interface unit which extends the AIM 65 in four ways:-

4k RAM memory extension, which can be mapped at 0, 1, 8, 9, A, B, C, or D. As an AIM 65 extension it would normally be mapped at 1, ie from hex 1000 to 1FFF. This provides a contiguous memory expansion from the 4k RAM on board the AIM 65, and makes the system ready for further memory extensions, which are usually in 8k blocks.

4k ROM/PROM extension. A socket is provided for a 4k or 2k ROM or PROM, which can be mapped at 8, 9, A, B, C, D, E or F. This is particularly convenient for mounting the DOS (disk operating system) PROM, in which case it is mapped at 8, ie hex 8000 to 8FFF.

Additional VIA 6522 chip. This provides a further 20 i/o lines and two timers. It can be mapped at 9000, 9400, 9800 or 9C00.

Data Highway Connector. The AIM 65 does have an expansion connector, but the configuration of the CUBIT Data Highway Connector is to the Acorn bus standard. This makes it compatible with the entire range of Acorn and Control Universal products, and also allows ribbon cable connection, which is not possible with the 44 way AIM connector.

2. MORE MEMORY

Using the Acorn Eurocard data bus extension on the CUBIT, further memory can be added by plugging directly onto the 64 way ribbon cable. The choice of memory cards includes the following:

Acorn 8k RAM + 8k ROM card. Code 730. £87 with 8k RAM memory. Uses 2114L RAM chips. Can take two 4k ROMs. Decoded in 8k blocks. See page 3.5

Acorn 32k DRAM card. Code 680. £149. No ROM slots. Decoded in 8k blocks. Uses sixteen 16k bit 5v only DRAM chips type 4816. See page 3.6

CU-MEM Universal Memory Carrier. Code 535. £70 without memory devices. £104 with 16k NMOS RAM (code 536). £132 with 16k CMOS memory (code 537). Arranged in two banks of four 28 pin sockets, which can accept NMOS or CMOS RAM, ROM or PROM, in 2k, 4k or 8k devices, as 24 or 28 pin packages. Complete with self charging battery back-up circuit for non-volatile RAM. See page 2.7

CUDRAM 64k Dynamic RAM Card. Code 670. £99. 4K ROM slot. Decoded in 4k blocks. See page 2.9

P 8.1

3. RACK EXTENSION

A 64 way ribbon cable can be plugged into the Data Highway Connector of the CUBIT. The other end can be plugged on the back of a standard Control Universal backplane, modified for AIM 65 use. See page 2.13. Note that the AIM version carries a suffix A, eg. 954A is a 14 way buffered backplane modified for AIM 65 use. Racks and subracks can be found on page 2.14, and enclosures in their own section.

4. DISK EXTENSION

A disk facility is probably the greatest increase in convenience that can be achieved with any computer. Loading a 4k bytes disk file takes only about a second, and disk based two pass machine code assembly becomes very straightforward and quick. All of the AIM 65 facilities remain valid with the Control Universal disk extension, but in addition, the user gains access to the range of Acorn software, including their assembler, BASIC, Word Processor, and many others.

The minimum items required to add a disk facility to an AIM 65 are as follows:

1209	Replacement PROM for AIM65 ROM Z22, which adds DOS vectors	£10
1216	Disk Operating System (DOS) in EPROM, at hex 8000, mounted in the ROM socket on CUBIT, with documentation and utilities disk	£45
600	CUBIT 4k Interface unit	£70
615	CUBIT 64 way interface cable	£25
765	Floppy disk controller	£134
770	Floppy disk drive (approx 100 KBytes storage)	£165
775	Floppy disk connection cable	£15
	TOTAL	£464

1140 SINGLE DISK ENCLOSED MINIMUM SYSTEM D1
Includes parts shown above, mounted in a 245mm (8" internal capacity) caseframe with 12v 1.5a power supply. It relies on the availability of 750mA at 5v from the user's AIM power supply. One further card, eg memory, video etc, can be accommodated in the rack.   £550

1141 As 1140 above, but without the provision of the CUBIT card   £480

1150 SINGLE DISK ENCLOSED 19" RACK SYSTEM WITH POWER SUPPLY RD1
This is similar to the D1 system above, but has a full 19" caseframe with 16.8" internal capacity, and provided with 8 Eurosockets and associated card guides, and a disk module mounted on module guides. Of the eigth sockets, one is used for the floppy disk card, and the other seven are completely free for user determination. The power supply is 3a at 5v, plus 1.5a at 12v.   £679

1151 As 1150 above but without CUBIT   £609

1160 DOUBLE DISK DOUBLE HEIGHT 19" RACK SYSTEM WITH POWER SUPPLY RD2
This is similar to the RD1 system above, but the power supply is increased to 5a, 5a plus 1.5a 12v, the lower half of the rack is provided with 14 Eurosockets and associated card guides, and the upper half is provided with two disk drives.   £999

1161 As 1160, but without CUBIT   £929

ROCKWELL MICROFLEX MODULES
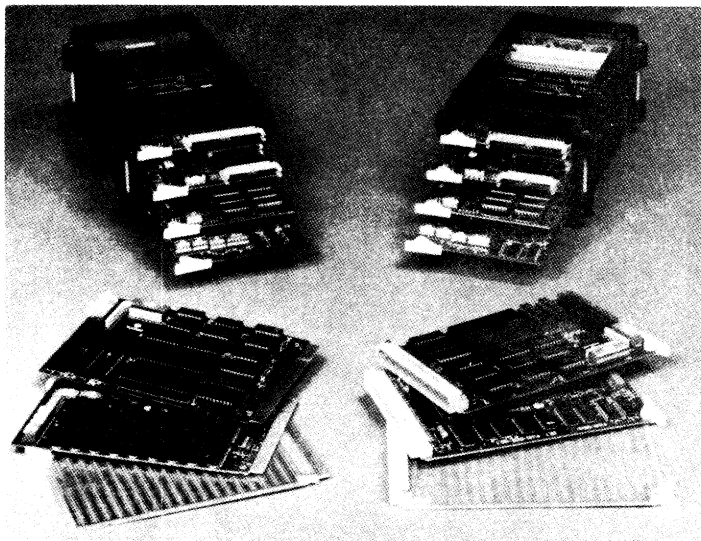
Microflex 65 is the name given to the range of Eurocard modules made by Rockwell to be both an extension to the AIM 65 and a stand alone modular Eurocard rack mounted computer. The 64 line bus offers memory addressing up to 128k bytes, and allows any card in any slot. A range of cages (4, 8 and 16 way) permit a variety of packaging configurations.

166 RM65-1000E Microflex single board computer   £121

Integrates a 6502 CPU, 2k bytes of static RAM, 16K bytes ROM capacity, 6522 VIA onto a Eurocard. Selectable memory map compatibility with AIM 65 allows programs developed on AIM 65 to be installed on this SBC.

165 RM65-3108E Microflex 8k static RAM card   £171
Carries 8k bytes RAM in 2114 devices, in two 4k blocks. Starting addresses of each block is selectable by switch, and a further switch allocates the block to one of two 64k banks, allowing the CPU to select from 128k bytes.

171 RM65-3132E Microflex 32k bytes dynamic RAM   £171
Arranged in eight 4k blocks which can be selected in 4k blocks, and assigned to one of two 64k banks. The entire module can be write protected by a switch. Refreshing is automatic and transparent to the CPU

170 RM65-3216 Microflex 16k PROM/ROM module   £58
Eight 24 pin sockets each allowing a ROM or PROM of up to 8k bytes. Switches allow independent setting of the start addresses of 4k memory blocks. Choice of 2, 4 or 8k byte memory device is by jumper.

167 RM65-5101 Microflex Floppy Disk Controller   £246
Controls up to four 8" or 5.25" drives, single or double sided, soft sectored. Single or double density may be selected under software control. Price includes ROM firmware for Disk, File and Directory functions.

168 RM65-5102E Microflex CRT controller (VDU card)   £118
Monochrome output to monitor or tv (via on board RF modulator). 5x7
matrix in a 7x10 field provides alphanumerics and symbols from
on-board character generator.

172 RM65-5222E Microflex General Purpose I/O and Timer (GPIO)   £118
Provides two 6522 VIA devices offering a total of 40 i/o lines plus 4
timers. Can be assigned to one or both of the two 64k memory banks

200 RM65-5451E Asynchronous Communications Interface Adaptor (ACIA)   £136
Interfaces two independent asynchronous serial i/o channels onto the
bus, eac of which may operate as a data terminal or data set,
selectable by jumpers. Both RS232C and 20mA TTY current loop are
provided on channel 1; RS232C on channel 2. Uses 6551 ACIA device.

185 RM65-7004E Microflex 4 slot card cage   £86
182 RM65-7004NE Microflex 4 slot pcb only   £12
186 RM65-7008E Microflex 8 slot card cage   £142
183 RM65-7008NE Microflex 8 slot pcb only   £19
187 RM65-7016E Microflex 16 slot card cage   £216
184 RM65-7016NE Microflex 16 slot pcb only   £34
Cages have integral card guides. Allows extension to AIM 65 through a
buffer module (code 180). May be mounted in a variety of orientations.
Accepts axial module cooling fan. Screw terminals provided for power
connection.

175 RM65-7101 Single Card Adaptor for AIM 65 to one Microflex module   £36
One end plugs directly onto the AIM 65 expansion connctor, and the
other onto the Microflex module to be used.

173 RM65-7102E IEEE 488 Bus Controller Module   £177
ROM resident firmware implements all the bus functions specified in
the IEEE 488, 1978. A TI TMS 9914 GPIB adaptor intefaces the 16 bit
GPIB to the 8 bit Microflex bus. Address, data and control lines are
buffered.

180 RM65-7104E Adaptor/Buffer Module for AIM 65 to multiple modules   £52
Consists of an adaptor, two cables and buffer module that connects an
AIM 65 to the expansion cages. The adaptor plugs onto the AIM
expansion connector.

190 RM65-7201E Design Prototyping module   £25
Plain card with pre-routed power and return lines, and connector
pattern, with holes for wire-wrapping prototype circuits.

195 RM65-7211E Extender Module   £27
Allows a module to be accessible by an engineer while remaining
plugged in to the bus.

191 RM65-7116E Microflex Cable Driver Module   £68
As code 180, allows AIM 65 to be connected to multiple Microflex
modules, but in this case the cage may be up to 6 feet away, where the
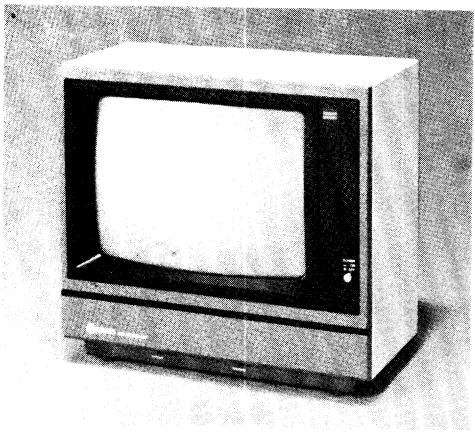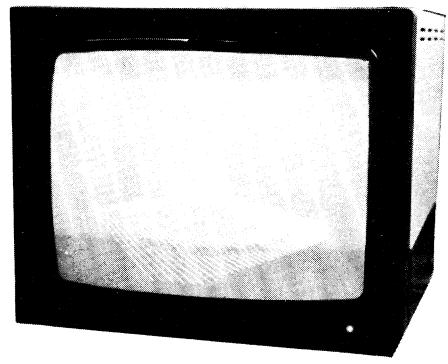standard unit is limited to 16 inches.

P 9.2

VIDEO DISPLAY UNITS

755
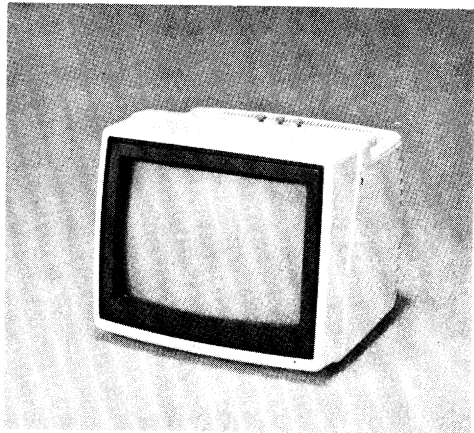
757

755   12" medium resolution low cost green screen monitor   £99
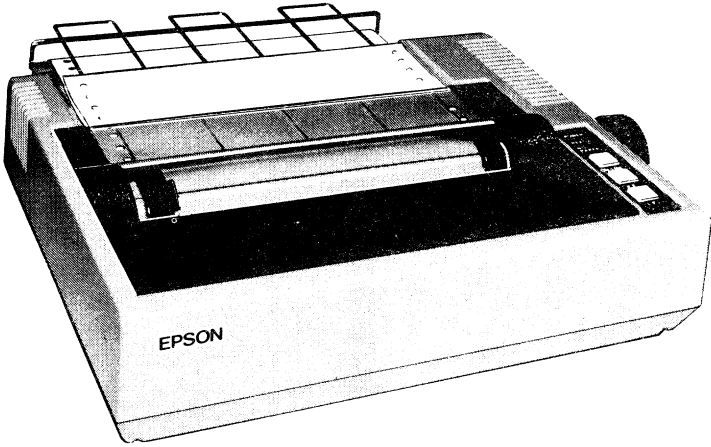757   12" high resolution green screen with anti-glare filter 18MHz   £139

760

761/762

760   Standard resolution colour monitor – 400 dots/line, TTL input   £295
761   Medium resolution colour monitor – 600 dots/line, TTL input   £395
762   High resolution colour monitor – 800 dots/line, TTL input   £495

P   10.1

E P S O N   M X   R A N G E   O F   M A T R I X   P R I N T E R S

This is claimed to be the worlds most successful range of computer printers, and certainly its adoption with only a change of badge as the printer for the IBM, Sharp, PET and HP microcomputers lends weight to the idea.

482	Epson MX 80 F/T type I	£395

This version has a 9x9 dot matrix which allows true descenders, operates at 80 ch/s, programmable font variation to give 40, 66, 80 and 132 characters per line, plus emphasised and enlarged characters. The unit comes with a tractor feed mechanism which be easily detached and then cut sheets of paper used as in an ordinary typewriter. The rubber plattern helps to reduce the printing noise, and improves the standard of printing. "Chunky" graphics are also standard on this version.

480	Epson MX 80 F/T type II	£425

This is broadly similar to the MX 80 F/T model I, but has high resolution graphics capability with individual dot addressablity.

245	Epson MX 82	£415

Again similar to MX 80 types above, but with true 1:1 ratio screen dump. ie a circle is printed as a true circle. The high resolution graphics give 1152 dots to the line. This version does not have friction feed.

246	Epson MX 82 F/T	£455

As the Epson MX 82 above but with the choice of demountable tractor drive or friction feed.

483	RS232 interface for MX 80 range	£45
484	Universal IEEE to Centronics interface	£69
250	RS232 interface with 2k FIFO (required for hi-res graphics)	£79
251	RS232 interface with2k FIFO and "x" on "x" off	£105
487	Spare cartridge ribbon for MX 80 series	£9
488	Printer cable Acorn to Centronics	£15

EPSON MX 100 PRINTER

NEW TYPE III
**CHEAPER AND BETTER!**
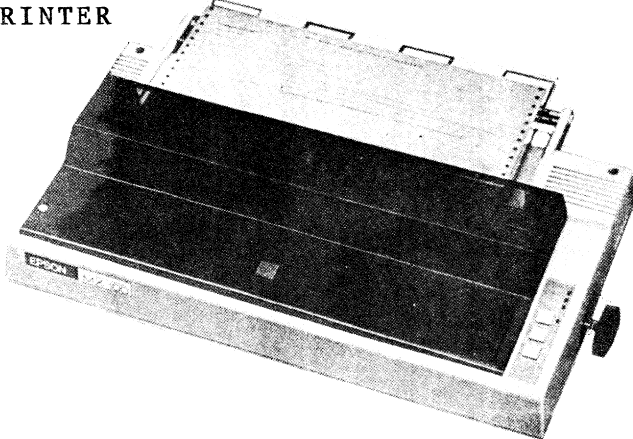
What could be better than increased performance coupled with lower price? MX 100/3 is upgraded from 80 to 100 characters/sec, and has had more programmable features added that includes subscripts and superscripts, improved graphics, auto underlining and enhanced aesthetics. At the same time the price has been decreased from £575 to £495, to what must be one of the best buys around in matrix printers.

100 ch/s	15" wide carriage	Bit Image Printing
32 Print Fonts	96 ascii Characters	8 international character sets
Correspondance Quality Printing		True descenders on lower case

247	Epson MX 100/3	£495
248	Epson MX 100 spare cartridge ribbon	£11

INTEGREX CX 80 COLOUR PRINTER
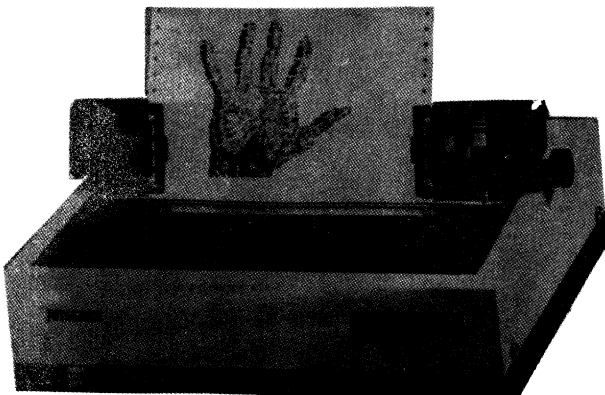
This printer produces text and graphics in 7 colours by single, double and treble printing using a three colour ribbon (magenta, yellow and cyan). Each printer dot is individually addressable for high resolution colour graphics. The text format is 5x7 matrix for the 96 standard ASCII characters, 6x7 matrix for 64 PET graphics characters, plus 15 user programmable characters.

240	Integrex colour printer	£875
241	Integrex spare colour ribbon	£15

P 11.2
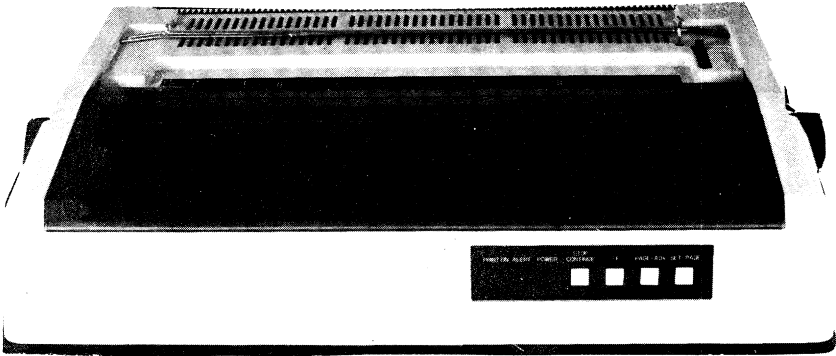
This one of the most competitively priced daisy wheel printers on the market, and yet offers a wide range of sophisticated features. It is provided with a standard 2K print buffer, and internal software which achieves compatibility with word processing and wordstar programs.

Facilities include:-

shadow overprinting
bold overprinting
automatic underlining
proportional spacing
half line feed for superscripts and subscripts
variable character pitch and variable line feed pitch
vertical and horizontal tabs
programmable form length
software controlled red/black ribbon (model 55 only)
high-resolution graphics
bi-directional printing with high speed vertical and horizontal movement when not printing, and short line logic seeking

The standard models have a rubber platter and are designed to be used with single sheets of paper like an ordinary typewriter, although motorised paper advance makes paper loading exceptionally quick and easy. Alternatively, a tractor option is available which handles standard computer paper with holes along the edge. There is also an automatic loader for single sheets of cut paper, called a sheet feeder.

493	TEC Starwriter model 40 (40 c/s) parallel Centronics interface			£1199
494	TEC Starwriter model 40 (40 c/s) serial RS232 interface			£1199
256	TEC Starwriter model 55 (55 c/s) serial RS232 interface			£1499
255	TEC Starwriter model 55 (55 c/s) parallel Centronics interface			£1499
497	Tractor feed mechanism for standard computer paper			£140
498	BDT cut sheet automatic feeder			£750
499	Multistrike carbon ribbon for all TEC models above		each	£4
503	Multistrike carbon ribbon for all TEC models above		box of six	£18
504	Spare daisy wheel — 12 character per inch printing			£10
506	Spare daisy wheel — 10 character per inch printing			£10

RACKING SYSTEMS AND ENCLOSURES

CUBE and Acorn systems are standardised on the Eurocard arrangement of printed circuit cards, and on the Vero KM6 rack system in particular, using a 1" pitch between cards. In this section, the parts that make up racking systems are described and listed. Note that front panels appear on page 3.15.

Cards are accommodated by identical top and bottom card guides which snap into the rails of the subrack. Disk modules use four identical module guides (two top and two bottom). The same arrangement using the same guides is true both of the subrack unit which fits into the Eurorack enclosures, and of the caseframe unit.

SUBRACKS
FOR EUROCARDS
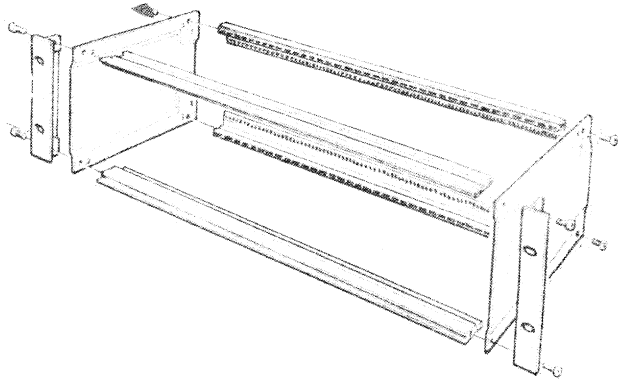
2960	Eurorack - metal work only, packed flat	24.00
700	Eurorack with buffered backplane and eight sockets, guides for eight cards and one disk module assembled and tested	72.00
705	Eurorack with buffered backplane and 14 sockets, with card guides, assembled and tested	98.00
710	Rack assembled, with module guides for two disk units	30.00

ENCLOSURES FOR EURORACKS
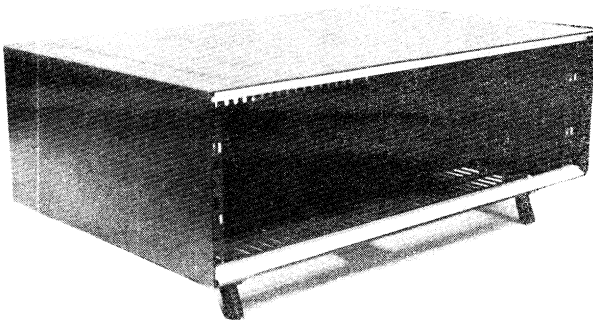
These enclosures are designed to take subracks as shown on Page 2.14

415	Enclosure for one Eurorack. 15cm high x 37cm deep x 49cm wide	42.00
420	Enclosure for two Euroracks (total height 6U, ie 30cm. 32cm deep, 49cm wide)	60.00

CASEFRAME

(Supplied in flat
pack without
backplane or card
or module guides)
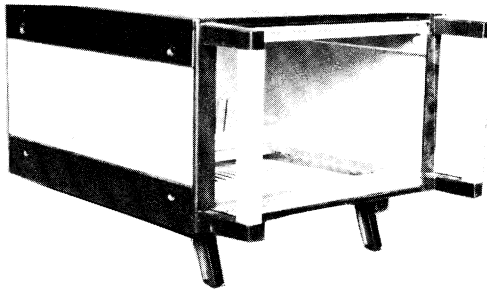
Integrated card frame and enclosure used by us for Eurocard systems.
They are constructed from aluminium and black vinyl covered steel.
Our backplanes are on a 1" pitch, so the maximum number of cards that
can be accomodated in the three sizes are 8, 12 and 16, but the
maximum number of slots on a backplane is 14. There is space
available for other equipment (eg. a power supply) behind the
backplane. This space is shown below as the usable depth, less the
200 mm approx required by the Eurocards and backplane.

2260 Small 8.4" usable width, 240mm usable depth   43.00
2262 Medium 12" usable width, 240mm usable depth   46.00
2261 Large (std 19"). 16.8" width, 360mm depth   49.00

2380 Card guide (use two per card)   each   0.30
2600 Module guide (use 4 for disk module)   each   0.30

CASEFRAMES WITH BACKPLANES

Fully assembled and tested with card guides fitted, plus module
guides where appropiate.

417 19" caseframe, 8 skt backplane, space for disk unit   99.00
418 19" caseframe, 14 socket backplane.   129.00
419 12" caseframe, 6 card slots, one disk module slot   80.00
    (This is the case used on System 10)

CASEFRAMES WITH BACKPLANE AND POWER SUPPLY

380 19" caseframe, 8 skt backplane, space for disk unit with CUPS-3
    power supply (5v, 5A; 25v, 0.5A; 12v, 2A) fitted & tested 187.00
381 19" caseframe, 14 socket backplane with CUPS-3
    power supply (5v, 5A; 25v, 0.5A; 12v, 2A) fitted & tested 217.00
382 12" caseframe, 6 card slots, one disk module slot with CUPS-3
    power supply (5v, 5A; 25v, 0.5A; 12v, 2A) fitted & tested 168.00
   (Same unit as supplied with the System 10)
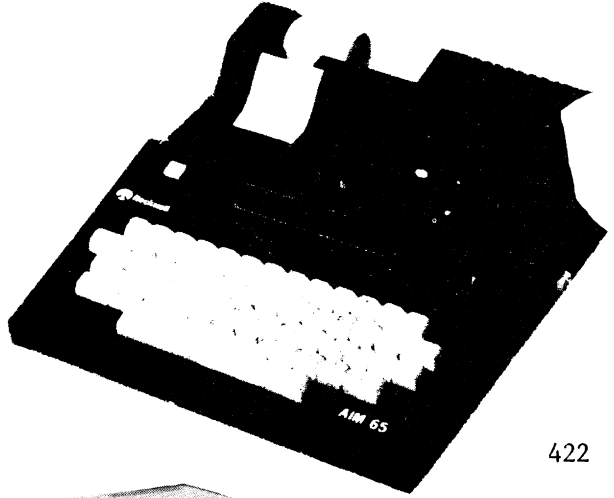
422

427

422 Injection moulded enclosure with aluminium chassis, very dark brown in colour, 33cm wide, 40cm deep, 10cm high. Designed to take a purpose built power supply (code 439), but without space for CUBIT   80.00

427 Foam moulded enclosure with steel chassis. 47cm wide, 46 cm deep, 12cm high. Room for CUPS-2 power supply. CUBIT can be accommodated with a the removal of a small amount of the material under the paper tray (invisible from outside) or by using the AIM 65 COMPATIBILITY module (section 20). Chocolate/cream.   65.00

P 12.3

latching plug pcb right
angle male for ribbon
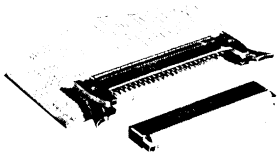
DIN 41612 right angle
male pcb mounting
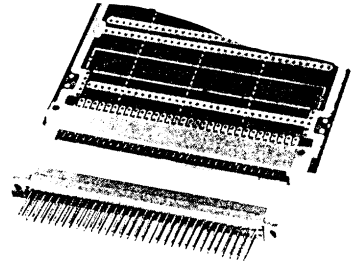
ribbon cable socket with
strain relief clip

DIN 41612 wire wrap tail
socket
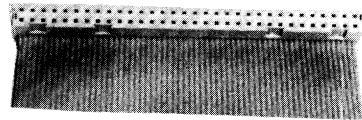
pcb pin side and end butting
0.1" spacing gold plated

16 position
rotary switch

DIN 41612 socket for ribbon

2324	DIN plug right angle male pcb mounting	1.50
2325	DIN plug right angle male pcb mounting 64 way (rows a + b)	2.50
3370	DIN socket 64 way straight pcb tails	3.30
3371	DIN socket 64 way straight wire wrap tails	3.60
3350	DIN socket for ribbon cable 64 way idc	4.50
2362	Plug right angle male pcb mounting for ribbon sockets 20 way	2.40
2363	Plug right angle male pcb mounting for ribbon sockets 26 way	2.60
2364	Plug right angle male pcb mounting for ribbon sockets 40 way	3.60
3342	Socket for ribbon cable, with strain relief, 20 way	2.00
3343	Socket for ribbon cable, with strain relief, 26 way	2.60
3344	Socket for ribbon cable, with strain relief, 34 way	3.40
3345	Socket for ribbon cable, with strain relief, 40 way	3.70
2913	PCB pin for 0.1" spacing, side & end buttable, 50 way strip	1.60
3408	Rotary switch, 16 position binary encoded	3.00
2220	Crystal 1 MHz	2.50
2221	Crystal 4 MHz	2.20
2222	Crystal 6 MHz	2.10
2223	Crystal 14 MHz	2.10

INTEGRATED CIRCUITS
NOTE — SAME SERVICE AS RS, BUT CHEAPER!
PRICES OF MANY IC's ARE FALLING. PLEASE RING US FOR THE LATEST PRICE.

Code	Device	Type	1 — 4	5 — 9	10 — 24	25 — 99	100 up
1000	Microprocessor 1MHz	6502	3.90	3.75	3.50	3.30	3.10
1001	Microprocessor 6502 1MHz		4.90	4.75	4.40	4.20	3.90
1005	P.I.A. 16 ch i/o	6520/6821	2.00	1.80	1.60	1.40	1.20
1010	V.I.A. i/o + timers	6522	3.40	3.20	3.00	2.90	2.80
1015	R.I.O.T ram:i/o:timer	6532	4.50	4.25	4.00	3.90	3.80
1020	RAM low power 450ns	2114L	1.60	1.50	1.40	1.30	1.10
1025	EPROM 4k x 8	2716	3.00	2.90	2.75	2.55	2.35
1030	EPROM 4k x 8	2532	5.00	4.50	4.00	3.50	3.25
1031	EPROM 4k x 8	2732	5.00	4.50	4.00	3.50	3.25
1036	Dynamic RAM 5v only	4816	4.20	3.80	3.30	2.90	2.40
1037	Dynamic RAM 5v 64Kbit	4864	7.00	6.00	5.50	4.90	4.40
1040	RAM 2k x 8 450ns	4802/2016	6.00	5.50	5.00	4.75	4.50
1045	CMOS RAM 2k x 8 450ns	5516	10.00	9.00	8.00	7.50	7.00
1055	Microprocessor 1 MHz	6809	17.00	14.00	12.00	10.50	9.50
1060	Microprocessor 1 MHz	6802	8.00	7.00	6.00	5.40	4.50
2478	CRT Controller chip	6845	15.00	13.00	11.50	10.00	9.00
2477	Buffer 8304/8208		3.00	2.80	2.50	2.30	2.10
2479	Buffer	81LS95	4.00	3.80	3.50	3.20	3.00
2480	Timer chip	555	0.50	0.45	0.38	0.33	0.27
2482	Analog/digital	ADC0816CCN	40.00	35.00	30.00	25.00	20.00
2481	Analog/digital	ADC0817CCN	20.00	17.00	15.00	13.00	12.50
2483	Digital/analog	ZN425E	6.00	5.00	4.25	3.75	3.50
2489	Floppy Disk Controller	8271	38.00	35.00	33.00	31.50	30.75
2490	Graphics Processor	EF9366C	70.00	62.00	56.00	50.00	44.00
4000	TTL	74LS00	0.50	0.40	0.35	0.30	0.25
4002	TTL	74LS02	0.50	0.40	0.35	0.30	0.25
4003	TTL	74LS03	0.50	0.40	0.35	0.30	0.25
4004	TTL	74LS04	0.50	0.40	0.35	0.30	0.25
4005	TTL	74LS05	0.50	0.40	0.35	0.30	0.25
4014	TTL	74LS14	1.00	0.90	0.70	0.60	0.50
4032	TTL	74LS32	0.50	0.45	0.35	0.30	0.25
4042	TTL	74LS42	1.00	0.90	0.70	0.60	0.50
4074	TTL	74LS74	0.50	0.45	0.35	0.30	0.25
4130	TTL	74LS30	0.50	0.45	0.35	0.30	0.25
4133	TTL	74LS133	1.00	0.90	0.70	0.60	0.50
4136	TTL	74LS136	1.00	0.90	0.70	0.60	0.50
4139	TTL	74LS139	1.00	0.90	0.70	0.60	0.50
4156	TTL	74LS156	1.50	1.20	1.00	0.80	0.60
4166	TTL	74LS166	2.70	2.40	2.10	1.80	1.50
4244	TTL	74LS244	1.50	1.20	1.00	0.80	0.60
4245	TTL	74LS245	2.70	2.40	2.10	1.80	1.50
4373	TTL	74LS373	2.70	2.40	2.10	1.80	1.50
4374	TTL	74LS374	2.70	2.40	2.10	1.80	1.50

P 14.1

EPROM PROGRAMMING AND ERASURE EQUIPMENT

EP4000 EMULATING PROGRAMMER

FEATURES:

PROGRAMS TRIPLE RAIL PROMS — 2704, 2708, 2716
PROGRAMS SINGLE RAIL PROMS — 2508, 2758, 2516, 2716, 2532, 2732
PROGRAMS BIPOLAR PROMS VIA BP4 SLAVE UNIT
PROGRAM SEQUENCE — SELF CHECK / BLANK CHECK / PROGRAM / VERIFY
NO PERSONALITY MODULES REQUIRED TO SELECT PROM TYPE — JUST SET SWITCH
SAFE TO LOAD AND REMOVE EPROMS WHILE SYSTEM SWITCHED ON BUT NOT PROGRAMMING
4K INTERNAL RAM EMULATION OF PROM VIA INTERFACE CABLE
CONNECT TO YOUR COMPUTER VIA TTL OR RS232 SERIAL PORT, 20mA CURRENT LOOP,
BIDIRETIONAL HANDSHAKE STROBED OR PARALLEL PORT.
OUTPUT TO TV MONITOR (1v STANDARD) OR TO TV VIA BUILT-IN UHF MODULATOR
DIRECT CASSETTE INTERFACE TO STANDARD AUDIO CASSETTE
BUILT-IN LED DISPLAY OF HEX STATUS ADDRESS AND DATA
EXTRA 1K RAM FOR BLOCK MOVING
SPARE INTERNAL 4K EPROM SOCKET FOR CUSTOMER PROGRAMS
BUILT-IN FIRMWARE FOR COMPREHENSIVE RANGE OF DATA MANIPULATION

1210 EP4000 EPROM Emulator/Programmer   £545

P4000 PRODUCTION PROGRAMMER
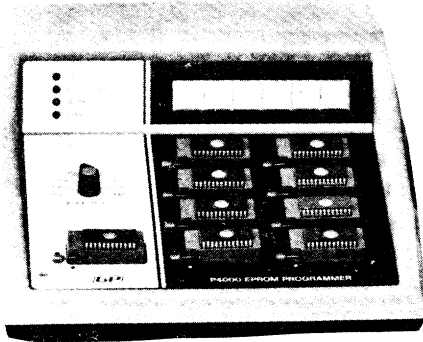
FEATURES:

PROGRAMS UP TO EIGHT EPROMS SIMULTANEOUSLY FROM MASTER COPY
PROGRAMS TRIPLE RAIL PROMS — 2704, 2708, 2716
PROGRAMS SINGLE RAIL PROMS — 2508, 2758, 2516, 2716, 2532, 2732
PROGRAM SEQUENCE — SELF CHECK / BLANK CHECK / PROGRAM / VERIFY
NO PERSONALITY MODULES REQUIRED TO SELECT PROM TYPE — JUST SET SWITCH
SAFE TO LOAD AND REMOVE EPROMS WHILE SYSTEM SWITCHED ON BUT NOT PROGRAMMING
MASTER SOCKET COMPLETELY ISOLATED FROM PROGRAMMING VOLTAGES
INDEPENDENT BLANK AND VERIFY CHECKS OF ALL EIGHT SOCKETS
STATUS INDICATIONS FOR ALL FUNCTIONS
SOUNDER INDICATES CORRECT KEY ENTRIES AND END OF PROGRAMMING RUN

1201 P4000 EPROM Production Programmer   545.00

EPROM ERASERS
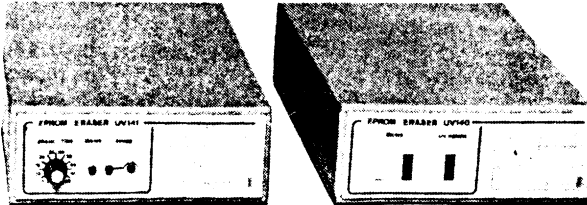
1220 EPROM Eraser with timer, takes fourteen EPROMs   78.00
1230 EPROM Eraser without timer, takes fourteen EPROMs   68.00

P 15.2

MEDIA

DISKETTES AND DISKETTE ACCESSORIES

515	Box of 10 single sided 5.25",35/40 tracks, reinforced centre	22.00
520	Individual single sided disk, same spec as 515.	3.00
516	Box of 10 double sided 5.25" disks, 4 track, reinforced centre	33.00
521	Individual double sided disk, same specification as 516	4.00
519	Head cleaning disk, 5.25" single sided	16.00
521	Head cleaning disk, 5.25" double sided	16.00
508	Head alignment disk, 5.25"	27.00
509	Disk mailing packs — corrugated paper post protection — 10 pcs	12.00
516	Locking storage case for 40 5.25" diskettes	21.00
517	Locking storage case for 80 5.25" diskettes	32.00
518	Mini disk file — stores 50 5.25" disks — hinge lid — patent lift device permits labels on five adjacent disks to be seen at once	52.00

COMPUTER STATIONERY AND STATIONERY ACCESSORIES

260	Plain single part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 2000 sheets boxed	25.00
261	Music ruled single part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 2000 sheets boxed	25.00
262	Plain double part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 1000 sheets boxed. Uses one-time carbon	25.00
263	Music ruled double part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 1000 sheets boxed. Uses one-time carbon	25.00
264	Plain triple part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 700 sheets boxed. Uses one-time carbon	25.00
265	Music ruled triple part fanfold stationery, 11" x 8.5" wide (approx A4) 60 gsm. 700 sheets boxed. Uses one-time carbon	25.00

SELF ADHESIVE COMPUTER LABELS 3 1/2" X 1 7/16", 12" PAGE THROW, 1 1/2" VERTICAL PITCH, 1/4" HORIZONTAL GAP BETWEEM LABELS, BROWN SHINEY KRAFT BACKING — EASY PEEL.

271	Labels as above one wide, 8000 labels in a box	44.00
272	Labels as above two wide, 8000 labels in a box	44.00
273	Labels as above three wide, 12000 labels in a box	50.00
270	Thermal paper roll, blue print 8.5" x 300ft, 3/8" dia hole ea	8.00

PAPER FOR ROCKWELL AIM 65

605	Box of 10 x 250ft thermal paper rolls, blue print	23.00
510	Box of 20 x 250ft thermal paper rolls, blue print	43.00
511	Box of 20 x 66ft thermal paper rolls, black print	16.00

BINDERS

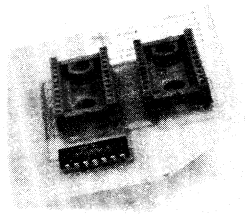|		
276	Binder for unburst fanfold stationery up to approx 1/2" pad	5.00
277	Ring binder for burst stationery up to approx 2 1/2" pad	5.00

MISCELLANEOUS ACCESSORIES
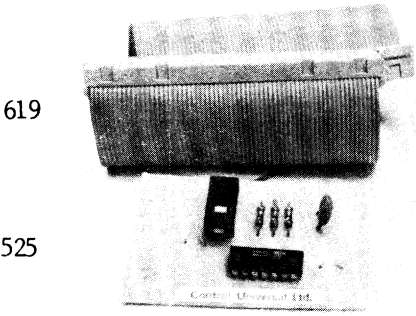
619

525

530

|		
615	64 Way interface cable, DIN socket at each end, 50 cm long	£19
619	64 Way interface cable, DIN socket at each end, 10 cm long	£17
614	64 Way interface cable, DIN socket at one end, 50 cm long	£12
617	64 Way interface cable, one DIN socket at one end, two DIN sockets 3cm apart at the other end, total length 50 cm	£26
620	Spare DIN socket for 64 way ribbon cable	£7

525	Vector-start module – redirects power-on vector to a variety of optional changed addresses. Board 1" x 1.5", solders to data bus	£10
530	PROM daughter module – wire wrap tails plug into 4k socket to allow the use of two 2k devices in two 24 pin sockets. Board 2" x 3"	£10

BARGAINS
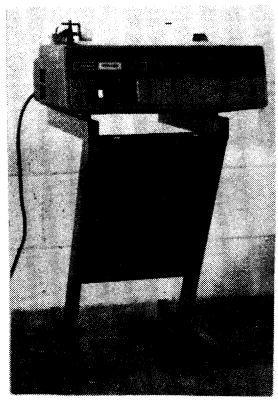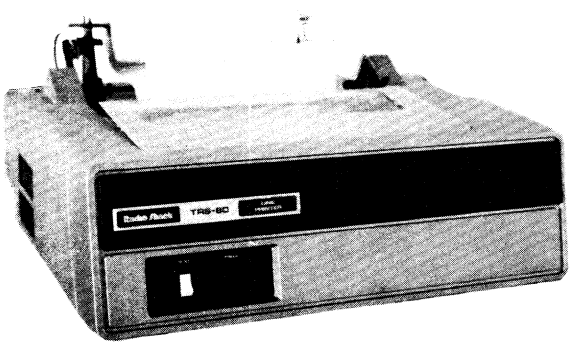
491 TANDY LINEPRINTER 1   £199

Special purchase of six of these extremely robust units. Use teletype paper
on roll with friction feed. Upper case only, complete with floor stand.

MORE BARGAINS

COMPAS DISK SYSTEM FOR AIM 65

Complete system with one disk drive, 16k RAM, Exorcisor type motherboard with 3 vacant slots, power supply and software for linked file assembly.

Cost over 1200.00 new, now offered in guaranteed working condition for 450.00

USED AIM 65 SYSTEMS

1K NMOS RAM + 1K BATTERY BACKED CMOS RAM
Plastic enclosure
Built-in power supply
Has non-standard keyboard fitted, but standard keyboard supplied for purchaser to fit.

Compare new price of AIM 65 and accessories:-

AIM 65	289.00
Enclosure	65.00
Power supply	50.00
total	404.00

Offered for 185.00 each

AIM 65 KEYBOARDS

Some are the old type, some are the new type but with scratched keys, although new. All are offered at 15.00 instead of the price for new units at 30.00

COMPUTERIST MEMORY PLUS

AIM 65 compatible memory extension, complete with connection cable to AIM 65 expansion connector. Has 8K RAM, VIA and on-board EPROM programmer. Was a total price of 220.00 with connctor; now this last one is offered at 50.00

CHEAP VIDEO

Not terribly good black and white monitor, American standard, 12" screen, picture a bit wobbly, but very cheap at 35.00

LOCAL AREA NETWORKS

Control Universal are now setting up plans and completing designs to treat local area networks as a speciality. The general concept of the product range will be to offer an extremely low cost network system which is compatible with ALL computers. Arrangements already exist for linking ZX81, AIM 65, Atom, and BBC computers on to the same network. The data transmission rate will be deliberately slow – 9600 baud, which transfers approximately 1k bytes/sec. This is about one quarter of the speed of usual mini-floppy disk transfers, but in practice the 4 sec transfer time for the typical 4k file is of no consequence. The vital advantage of this relatively slow transmission rate is the avoidance of bandwidth problems, junction reflections and other negative aspects of high speed transmission.

Physically, the Piconet module will be like a standard CUBE/Acorn Eurocard, with the same connector, but shorter to allow its accommodation inside the enclosures of the host systems. It will therefore plug directly into a CUBE/Acorn rack, and will connect conveniently to an Atom. A range of COMPATIBILITY products (see section 20) wil be available soon to allow other computers such as those mentioned above to be connected onto Piconet.

In addition, the development is in hand for a range of input/output modules capable of detecting both high voltage and low voltage signals, and switching currents of several amps both dc and ac, which will operate on the network so avoiding expensive wiring costs.

The master unit is intended to have the feature of offering disk storage to all computer in the network, and a printer interface with a 48k byte buffer, allowing the dumping of printer data at 1000 ch/s and then returning control to the computer while the printer works away at its own speed, usually in the range 40 – 100 ch/s

CUSTOM DESIGN SERVICE

Control Universal have devoted part of their business to a product design and manufacture service. This can take the form of designing a product unique to a customer, or agreeing with a customer with a quantity requirement the specification of a product which will fit the Control Universal sales range. In this case the design fee may be waived in consideration of a quantity order. An example of this kind of co-operation is the CUBAN analog interface, which is part of the CU range, but was produced at the instigation of MEDC, Paisley College.

In the case of products produced specifically for a client, the service can be for just an unenclosed computer unit, or for a full service of enclosure, software and packaging, in addition to the computer board. In cases requiring styling of an enclosure we rely on the co-operation with our industrial designers, Morgan Odell Partnership, London.

Project	Quantity	Computer	Software	Enclosure	Packaging
Dartmaster	200	*	*		
Log-on box	100	*	*	*	*
Foreign Exchange Calculator	24	*		*	
Audiometer	80	*		*	
Pharmacists Label Printer	600	*			

We welcome suggestions about special purpose projects from our prospective clients, and would suggest that our strengths are in speed of execution and economic performance, in addition to a breadth of services rarely found under one roof.

COMPATIBILITY PRODUCTS

COMPATIBILITY products are interface connection modules designed to
allow all computers to gain the benefit of using a standard range of
extensions and accessories. This concept is based on the generally
used arrangement of 16 address lines and 8 data lines being valid
for the majority of 8 bit microprocessors. By this means those CUBE
and Acorn extensions which are memory mapped can be used with almost
any computer.

Each COMPATIBILITY product connects in some way to the host
computer's data bus, and presents a DIN 41612 two row plug to the
CUBE/Acorn extension. A 64 way ribbon cable (see page 13.1) is the
used to connect from the COMPATIBILITY unit to the extension, which
can then be mechanically mounted in a way suitable to the particular
situation

1440	COMPATIBILITY unit for Rockwell AIM 65	20.00
1441	COMPATIBILITY unit for Apple	20.00
1442	COMPATIBILITY unit for PET 40 column	20.00
1443	COMPATIBILITY unit for PET 80 column	20.00
1444	COMPATIBILITY unit for Sinclair ZX81	40.00
1445	COMPATIBILITY unit for Acorn Atom	20.00
1446	COMPATIBILITY unit for BBC Computer (1MHx connection)	20.00
1445	COMPATIBILITY unit for Acorn Atom	20.00

THE BBC COMPUTER

The BBC Computer was developed by Acorn Computers to a BBC specification, and is a remarkable machine, both in performance and in value for money.

It is interesting to note that the Sinclair Spectrum is being promoted as a "direct rival to the BBC Computer, but at half the price." Our view at Control Universal is that the Spectrum certainly does represent very high performance for the money, and we would be pleased to sell it, should we be invited to do so. However, the BBC Computer is clearly superior, and well worth the higher price. The following short comparison indicates this.

	Spectrum	BBC
UHF output to standard tv	yes	yes
Output to standard tv monitor	no	yes
keyboard	40 key miniature	73 key full size
bus expansion connector	yes (1)	yes (2MHz + 1MHz)
printer interface	extra	built-in
cassette interface	1500 baud	300 baud + 1200 baud
graphics memory	6.5k	20k
text display	32 ch x 24 lines	80 ch x 32 lines

There are many more points of difference, and our comparison is based only on literature checks, but we summarise both computers as excellent value for money, and the Sinclair as a first class introductory machine for the hobbyist, and the BBC Computer as a first class serious computer capable of almost limitless expansion.

BBC Microcomputer System Plan

*Options requiring additional
hardware within BBC Microcomputer

*Language Processor
8 or 16 bit C.P.U.
Unassigned DRAM (64K or more)
Small 'bootstrap' ROM
I O processor interface

BBC Microcomputer

Keyboard

Power Supply

Speaker

Input/Output Processor
2MHz
6502 32K DRAM
8 graphics modes (up to 640X256)
48K ROM (or more)
includes: Operating System
          New BASIC
          PASCAL option etc.

3 voice music generation (standard)
and speech synthesis (optional)

Domestic Television Receiver
(colour or B/W)

Video Monitor
1 volt composite
or RGB feed

TV Aerial

*Teletext Acquisition

*Prestel Acquisition

*Eurocard Extensions

Expansion Bus

RS423 Serial Interface

Analogue Interface & User I/O

*Econet Interface

Audio Cassette Recorder

*Printer

*Floppy Disc Drive(s)

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MAIN FEATURES

■ Processor 2 MHz 6502A

■ Memory 16K ROM BASIC
16K ROM Machine Operating System
32K RAM (16K on Model A)

■ Keyboard 73 key full QWERTY layout, including 10 user definable
function keys, 4 cursor control keys, two key rollover
and auto repeat.

■ Display Mixed high resolution graphics and upper and lower
case text.
Full colour on all 8 display modes:
0 640×256 2 colour graphics and 80×32 text ⎫ ⎫
1 320×256 4 colour graphics and 40×32 text ⎪ Model B
2 160×256 16 colour graphics and 20×32 text ⎬ Only
3 80×25   2 colour text ⎭
4 320×256 2 colour graphics and 40×32 text
5 160×256 4 colour graphics and 20×32 text
6 40×25   2 colour text
7 40×25   Teletext display
UHF, composite video and separate RGB and Sync
outputs.

■ External Storage 300 baud and 1200 baud interface (with motor control)
for standard cassette recorders.

■ Tone Generation Three-voice music synthesis with full envelope control
feeding internal loudspeaker.

■ Printer Interfaces 1 8 bit plus full two-line handshake "Centronics" port.
(Model B Only) 2 75 baud to 9600 baud software selectable serial
port to drive RS232 devices with full two-line
handshake.

■ User Input/Output 8 bit parallel input/output port.
(Model B Only)

■ Analogue Inputs Four analogue inputs for games, paddles or control
(Model B Only) applications.

■ Expansion Within the computer (at extra cost)
Capabilities Floppy Disk Interface
Econet Interface
Speech Synthesis
Cartridge ROM Pack Interface
"Tube" connector for second processor option.

■ Second Processor The Computer is designed so that it can be expanded
Option to run with a second processor and considerably
expanded memory.
Planned expansion units which are connected via the
"tube" include:
3 MHz 6502 with 60K RAM
Z80 with 60K RAM running CP/M
16 bit processor with 128K RAM.

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Model A BBC Microcomputer System

A fast, powerful self-contained computer system generating high resolution colour graphics and capable of synthesising 3 part music. The computer is contained in a rigid injection moulded thermoplastic case. The following are contained within the computer thus ensuring the minimum of connecting wires.

■ 73 key full travel QWERTY keyboard with 10 user definable function keys. The keyboard has two key rollover and auto repeat.

■ Internal 240/115V power supply is fully encased and made to BS Class 1.

■ The internal loudspeaker is driven from a 3-voice music synthesis circuit with full ADSR envelope control.

■ A fully modulated PAL colour television signal, for connection to a normal domestic television aerial socket, is available through a phono connector.

■ A BNC connector supplies a composite video output to drive a black and white or PAL colour monitor.

■ A standard audio cassette recorder can be used to record computer programs at 300 or 1200 baud using the CUTS standard tones. The cassette recorder is under full automatic motor control and is connected to the computer via a 7 pin DIN connector.

■ An interrupt driven elapsed time clock enables real time control and timing of user responses.

■ The unit uses a 2 MHz 6502 and includes 16K of Random Access Memory.

■ A 16K Read Only Memory (ROM) integrated circuit contains an extensive and powerful Machine Operating System designed to interface easily to high level languages.

■ A further 16K "Language ROM" contains an extremely powerful and fast BASIC interpreter. The interpreter includes a 6502 assembler which enables BASIC statements to be freely mixed with 6502 assembly language.

■ Up to four 16K Language ROMs may be plugged into the machine at any time. These four ROMs are "paged" and may include Pascal, Word Processing, computer aided design software, Disk and Econet routines or Teletext acquisition software.

■ The standard television output is 625 line 50 Hz, interlaced, fully encoded PAL, modulated on UHF channel 36. Other standards are available.

■ The full-colour Teletext display of 40 characters by 25 lines has full character rounding with double height, flashing, coloured background and text – all to the Teletext standard.

■ The non Teletext display modes provide user definable characters in addition to the standard upper and lower case alpha-numeric font. In these modes, graphics may be freely mixed with text. Text characters can be positioned not only on, for example, a 40×32 grid, but at any intermediate position.

■ Separate or overlapping text and graphic windows can be easily user-defined over any area of the display. Each of these windows may be filled and scrolled separately.

■ The Model A is able to support the following modes:
    4 320×256 2 colour graphics and 40×32 text
    5 160×256 4 colour graphics and 20×32 text
    6 40× 25 2 colour text
    7 40× 25 Teletext display

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- All graphics access is "transparent" resulting in a fast snow-free display.
- Extensive support is provided in the Machine Operating System for the graphics facilities, and this is fully reflected in the BASIC interpreter. These facilities include the ability to rapidly draw lines and to fill large areas of colour. In addition, very rapid changes of areas of colour can be effected.
- The Model A BBC Microcomputer System can be expanded at any time to the Model B System. In addition, or as an alternative, other facilities such as the Econet, may be fitted within the computer systems.

Model B BBC Microcomputer System

The Model B BBC Microcomputer System is an enhanced version of the Model A Microcomputer but with the following differences:

- 32K Random Access Memory (RAM). This enables all the graphics modes to be used

0	640×256 2 colour graphics and 80×32 text	(20K)
1	320×256 4 colour graphics and 40×32 text	(20K)
2	160×256 16 colour graphics and 20×32 text	(20K)
3	80× 25 2 colour text	(16K)
4	320×256 2 colour graphics and 40×32 text	(10K)
5	160×256 4 colour graphics and 20×32 text	(10K)
6	40× 25 2 colour text	(8K)
7	40× 25 Teletext display	(1K)

- The installed RAM is divided between the high resolution graphics display, the user's program and Machine Operating System variables. The Machine Operating System requires about 3¼K of RAM in the Model A. If higher resolutions are required with large programmes then the second processor option may be fitted.
- Serial interface to RS423 standard. The new standard has been designed to be inter-operable with RS232C equipment but offers a considerably enhanced specification – for example in maximum length of cable and maximum data transfer rates. Baud rates are software selectable between 75 baud and 9600 baud. The interface provides not only two-way data transfer, but also two way hand-shaking using RTS and CTS lines. Connection to the machine is made via a 5 way "diamond" DIN connector and various interconnecting plugs are available for the various standard 25 way D type circuits.
- An 8 bit "Centronics type" parallel printer port is provided with "Strobe" and "Acknowledge" lines.
- An 8 bit input/output port is also provided.
- 4 12 bit analogue input channels are provided. Each channel has an input voltage range of 0-2.5V and the internal converter provides a number in the range 0 to 4095. The conversion time for each channel is 10 milliseconds and when the conversion is complete, the processor is interrupted and the value stored in a memory location for later access. These analogue inputs can be used not only in laboratory control situations, but also as inputs for games–paddles or joysticks.
- A 1 MHz buffered extension bus is provided for connection to PRESTEL, Teletext or various other expansion units.
- All interface sockets to external peripherals, are fitted to the Model B. These include R/G/B/Sync for colour monitors, Econet, serial interface, parallel printer, disk and tube. Having the interface sockets fitted enables the internal expansions mentioned above to be fitted without further soldering.

EXPANSION

Both **Model A** and **Model B** may have the following expansion options fitted internally at purchase, or by Dealers at a later date.

- Floppy disk interface
- Econet network interface (separate leaflet available)
- Voice synthesis circuits
- Cartridge ROM pack interface
- Various alternative high-level languages in ROM

External options which plug directly into the machine include:

- Paddles
- Cassette Recorder
- Black and White and colour monitors and televisions
- 5¼" single-sided disk drive (100K)
- 5¼" dual double-sided double track density disk drives (800K)
- 80 column dot-matrix printer
- Daisy Wheel Printer
- Teletext acquisition unit ⎫ both of these enable Telesoftware to be
- Prestel acquisition unit ⎭ downloaded into the BBC Computer as well as providing access to the normal Teletext/Prestel services. Pages may be "grabbed" and stored for later use
- 3MHz 6502 second processor with 60K of RAM
- Z80 second processor with 60K of RAM and a fully CP/M-compatible operating system

SOFTWARE

Considerable attention has been paid to the overall design of the system and application software. A modular approach has been adopted specifically to ease the interfacing of various high-level languages (such as BASIC and Pascal) to the operating system.

■ Machine Operating System (MOS)

A 16K ROM is used for the MOS. This software controls all input/output devices using a well defined interface. The MOS supports the following interrupts:

- ☐ Event-Timer (used as elapsed time clock)
- ☐ 4 channel analogue to digital converter
- ☐ Vertical sync
- ☐ Keyboard and keyboard buffer
- ☐ Tube byte transfer
- ☐ Music tone generation and buffer
- ☐ Serial interface, input and output, and buffers
- ☐ Parallel input/output port

and "hooks" are provided to support other devices such as:

- ☐ Teletext
- ☐ Prestel
- ☐ Econet file system
- ☐ Disk file system

Many of the operating system calls are vectored to enable the user to change them if required at a future date.

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BBC VERSION OF BASIC

The BASIC interpreter is an exremely fast implementation, very close
to the Mirosoft standard, but with numerous powerful extensions.

* Long Variables
* Integer, floating point and string variables
* Multi-dimension integer, floating point and string arrays
* Extensive support for string handling
* IF ... THEN .... ELSE
* REPEAT ... UNTIL
* Multi-line integer, floating point and string functions
* Procedures
* Local variables
* Full recursion on all functions and procedures
* Effective error trapping and and handling
* Cassette loading and saving of programs and data
* Full support for for the extensive colour graphics
* Easy control of the built-in music generation circuits
* Built-in 6502 mnemonic assembler enabling BASIC and assembler to
be mixed, or pure assembly language programs to be produced.
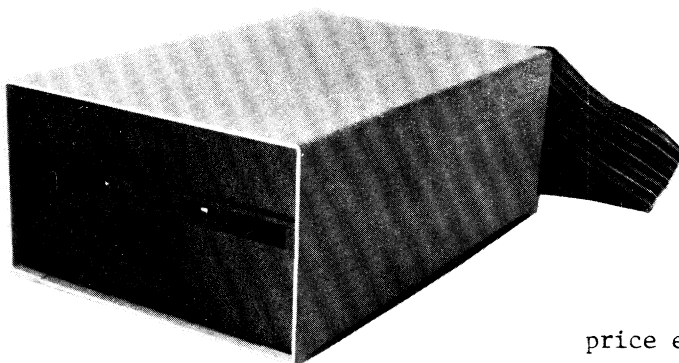
AND 01
Single Disk
Extension

price excl VAT

ANA 01 BBC Computer Model A		309.00
ANA 02 Model A + Econet interface		369.00
ANB 01 BBC Computer Model B		348.00
ANB 02 BBC Computer Model B + Econet interface		389.00
ANB 03 Model B + disk interface		409.00
ANB 04 Model B + Disk + Econet interfaces		450.00
(all the above include a User's Manual)		
AND 01 Single disk drive extension 100k bytes capacity		230.00
ANE 01 Teletext receiver		144.00
ANE 02 Prestel receiver		90.00
TV monitors - see page 10.1		
ANF 03 Cassette recorder		26.00
ANG 01 5 way DIN to 25 way D type serial cable		8.50
489 Printer interface cable, Centronics type, 1m long		15.00
ANH 01 Games paddles, per pair		11.50
ANJ 01 Extra copies of user's guide		10.00

SOFTWARE FOR BBC COMPUTERS

DESK DIARY

This package consists of two programs for the Model B.

ADDRESS BOOK allows you to build up a file of several hundred names, addresses and telephone numbers which can be retrieved by name, or by matching with other information specified in the entry. Applications include mailing lists and customer records

PLANNER works just like a written diary, but with a real-time alarm and many automatic features. There is space for 3000 entries, which may be one of three kinds: appointments at a specified time of day; regular events, such as birthdays and bill payments which automatically get carried forward; and exclusive entries for trips and holidays, which prevent appointments being made over a specified period

1366 BBC Desk Diary   9.00

ALGEBRAIC MANIPULATION PACKAGE

This suite of four programs for the BBC Computer Model A or B will perform a wide range of algebraic manipulations, and expressions can be symbolically differentiated or integrated. The package is intended for use in Mathematics teaching or research.

POLYNOM can expand and simplify a polynomial expression into the equivalent polynomial.

RATIONAL can expand and simplify an expression of rational terms into the equivalent ratio of two polynomials, reduced to lowest terms.

TRIGONOM can expand, simplify, differentiate or integrate a trigonometric expression, including ratios of trigonometric terms, into the equivalent standard form.

FOURIER can perform trigonometric transformations into a linear combination of sines and cosines of integer multiples of x.

1367   BBC Computer Algebraic Manipulation Package   9.00

BBC PEEKO COMPUTER

The Peeko-Computer simulates the operation of a simplified microcomputer in order to teach the fndamentals of machine code programming; it is suitable for either the Model A or the Model B. The Peeko-Computer has ten easily learned instructions, and the display gives a visual analogy of the operation of a real microcomputer. Programs can be entered, single-stepped or run with the memory and register contents being displayed at every step. To aid comprehension each instruction mnemonic is displayed as it is encountered.

The Peeko-Computer comes complete with a 16 page instruction manual including exercises and examples, and the cassette includes five demonstration Peeko-Computer programs.

1367   BBC Computer Peeko-Computer   9.00

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ALTERNATIVE LANGUAGES FOR THE BBC COMPUTER

FORTH

Acornsoft FORTH is a complete implementation of the FORTH language, to the 1979 standard specification, for the BBC Computer Model B. FORTH is a compiled language so programs run very fast (typically 5 times faster than BASIC).

The cassette includes:
> The FORTH dictionary and compiler
> The tape interface and screen editor
> The graphics package
> A high resolution graphics demonstration

In addition to a comprehensive set of arithmetic and and stack operators, control transfer words and defining words, Acornsoft FORTH includes more advanced features for defining the actions of defining words themselves. This opens the door to "metaFORTH" and user defined FORTH-based languages.

1369	BBC Computer FORTH language cassette	14.50
1370	"FORTH on the BBC Computer" book by R de Grandis Harrison	7.50

LISP

Acornsoft LISP for the BBC Computer Model A or B consists of 5.5k of machine code interpreter, plus 3k of initiallised LISP workspace containing utilities and constants, which can be deleted to make extra space if not required. It is intended for students, researchers and hobbyists who want to find out about the fundamental language of artificial intelligence research, and system designers who require more flexibility in data and control structures than is provided by traditional programming languages.

The system contains a number of extensions to basic LISP, including PEEK, POKE, CALL and VDU to provide easy interface with the BBC Computer MOS (machine operating system), improved interactive control structures using LOOP, WHILE and UNTIL funtions and disk input/output control functions.

1371	BBC LISP language cassette	14.50
1372	BBC LISP book "LISP on the BBC Microcomputer"	7.50

WORD PROCESSING

This package is supplied in ROMs to fit inside the BBC Computer. It therefore uses none of the user RAM leaving about 27k bytes free for text - about 4000 words.

It uses text mode 3 during text entry, with the top line continuously displaying the exact number of words in the document, and the number of bytes left free. When printing out, if there is more than 16k bytes of free RAM, then the screen can show the exact format of the printed output without actually printing it.

There are an impressive array of formatting commands, which appear in a different colour (darker shade in monochrome) to avoid confusion, including justification, lines per page, line spacing, centring, etc., and the usual set of text manipulation commands.

1373	BBC Computer Word Processing Package	65.00

BOOKS AND GAMES FOR THE BBC COMPUTER
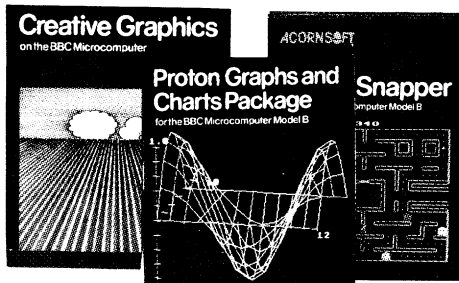
1374   PHILOSOPHERS QUEST   model B only   8.50

An advanced Adventure in which you tell the computer what you want
to do, and it describes in plain English your progress through a
fascinating world full of fiendish puzzles to be solved. To complete
your quest you have to think hard about everything you do!

1375 DEFENDER   model B only   8.50

No compromises have been made in this amazing fast action graphics
game. Save the humanoids from the landers, using the ship's laser
missiles, smart bombs and hyperspace jump. Complete with mutants,
bombers, pods, swarmers and baiters to attack you.

1376 MONSTERS   model B only   8.50

You control an animated figure pursued by monsters who chase him up
ladders and along walls; the only hope of survival is to dig holes
in the walls and trap the monsters by filling them in. Score more by
dropping the monsters through several levels, but watch your oxygen.
With sound effects and high score.

1377 SNAPPER   model B only   8.50

A superbly authentic version of the currently most popular arcade
game. Guide the Snapper through the maze eating dots and avoiding
the creatures that chase you. Complete with full sound effects,
score, and a ladder of high scores.

1378   "CREATIVE GRAPHICS ON THE BBC MICROCOMPUTER" book   7.50
1380   "CREATIVE GRAPHICS ON THE BBC MICROCOMPUTER" cassette   8.50

This book describes how to exploit the excellent graphics facilities
provided by the BBC Computer. It includes 40 programs which will run
on either the model A or the model B to produce a spectacular range
of pictures and patterns in full colour, including animated
pictures, recusively defined curves, and rotating three dimensionl
shapes.

1379 "GRAPHS AND CHARTS ON THE BBC MICROCOMPUTER" book   7.50
1381 "GRAPHS AND CHARTS ON THE BBC MICROCOMPUTER" cassette   8.50

The book describes a set oof graphics routines which can be
incorporated into programs to presnet data graphically in a wide
range of applications. The graphs include automatic scaling,
labelling of axes and use of colours.

Routines are included to draw two and three dimensional graphs,
stereo pairs, two and three dimensional contour maps, bar charts and
pie charts.

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Newnham Road
CAMBRIDGE
CB3 9EZ

ORDER FORM

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....	....
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NAME OF PERSON PLACING ORDER   TELEPHONE NO OF THIS PERSON

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ORDER NO (ESSENTIAL   HAVE YOU ALREADY GOT A
FOR CREDIT ORDERS)...............   CREDIT ACCOUNT WITH US?..........
IF NO A/C,
METHOD OF PAYMENT...........VISA/ACCESS NO...........................

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