

## CONTROL UNIVERSAL LIMITED

Unit 2 Andersons Court  
Newnham Road  
Cambridge  
CB3 9EZ

telephone Cambridge (0223) 358757  
(six lines)

telex 817233 (answerback ROICIAL)

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.

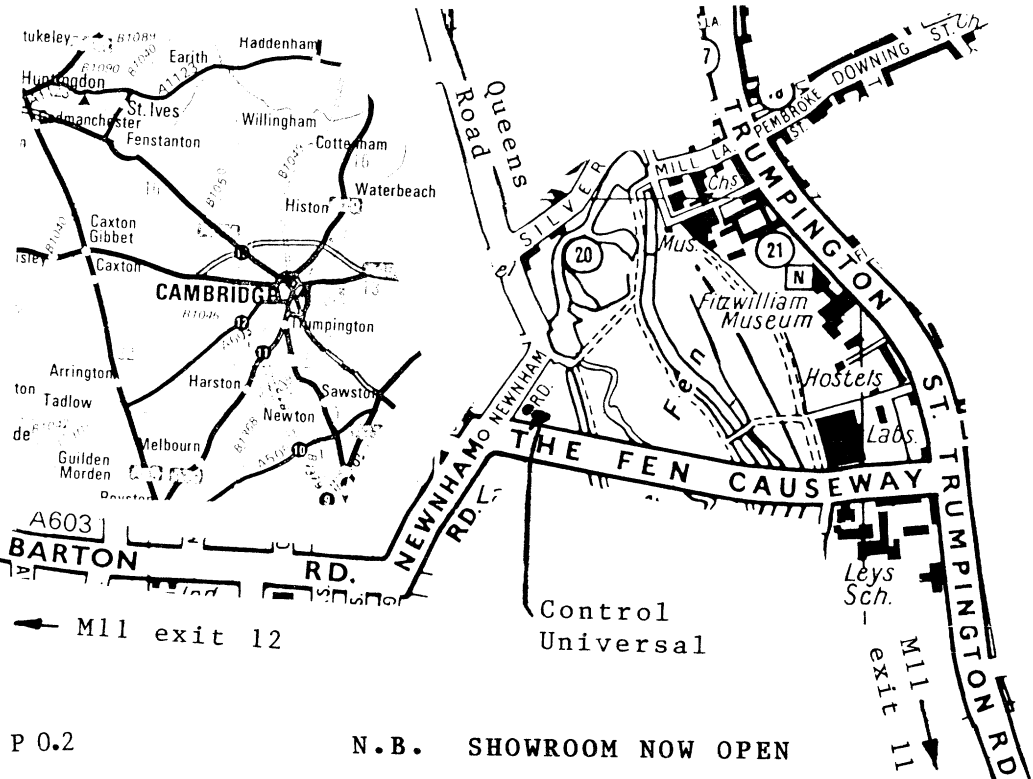
In 1981 the Company moved from Harlow into much larger premises in Cambridge. In addition to appreciating Cambridge as one of the country's most attractive towns, the Directors recognised the advantage of being located close to both the advanced research taking place at the University and to other leading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



## CONTENTS

section	
0	Introduction
1	Control Universal Eurorack Computer Systems
2	Control Universal Computer Systems and Power Supplies
3	Acorn Eurocard Computer Units
4	Acorn Complete Eurocard Based Computer Systems
5	Acorn Atom, Hardware and Software
6	Documentation for Acorn and Rockwell Computers
7	Rockwell AIM 65
8	Extending the Rockwell AIM 65
9	Rockwell Microflex Modules
10	Video Display Units
11	Printers
12	Racking Systems and Enclosures
13	Connectors, switches, crystals
14	Integrated Circuits
15	EPROM Programming and Erasure Equipment
16	Media - Computer Stationery, Disks, Binders, Disk Boxes
17	The Odd Spot - Miscellaneous Accessories, Bargain Basement
18	Local Area Networks - Piconet
19	Product Design Service
20	Compatibility Products
21	BBC Computer and Accessories
97	Order Form
98	Invitation to Join Mailing List
99	Index

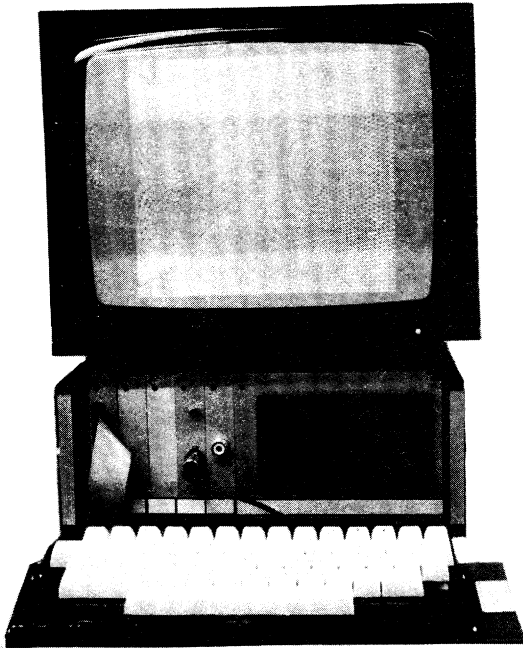
## TERMS OF BUSINESS

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 appropriate 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

CUBE SYSTEM 10 15 20 25

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

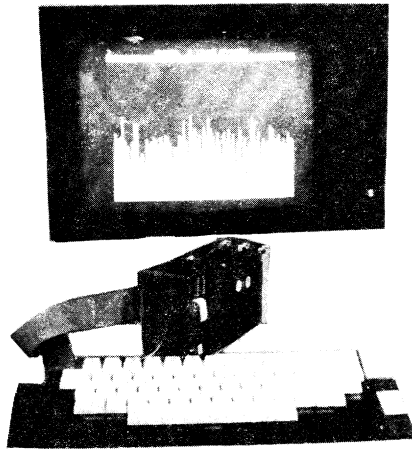
1218CG CUBOS operating system on PROM for CU-GRAPH 25.00  
 1218FC CUBOS operating system on PROM for Acorn 40 column vdu 25.00  
 1218EC CUBOS operating system on PROM for Acorn 80 column vdu 25.00

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

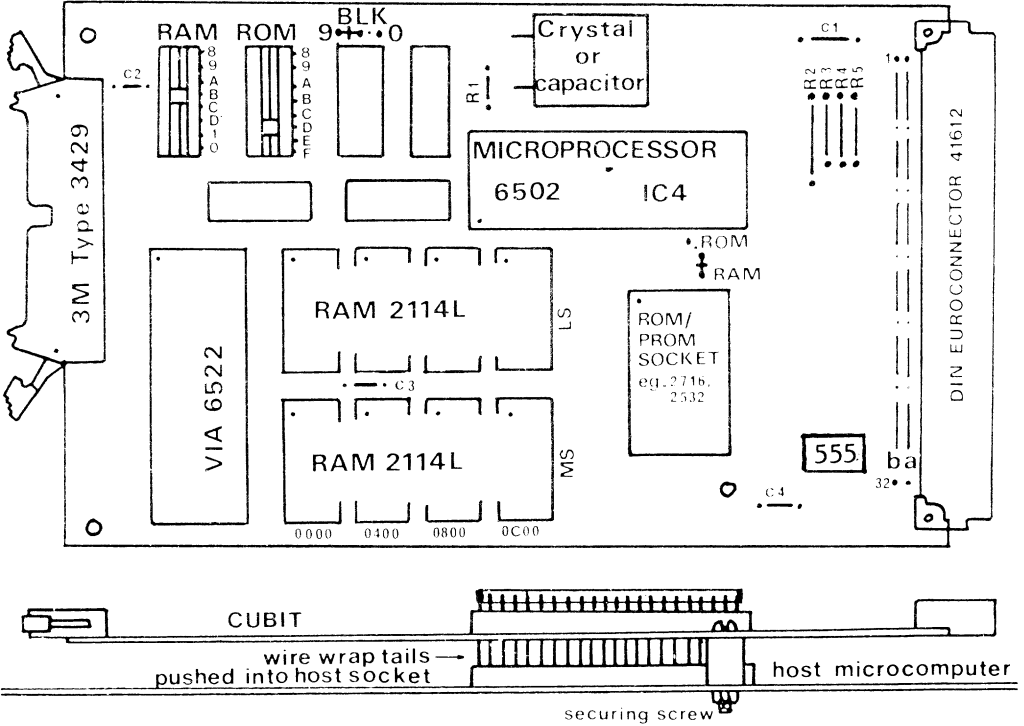


This two or three card system consists of the CUBIT 6502-based single board computer and a choice of video cards, bolted together and connected with a three way backplane. It comes complete with a CUBOS operating system, and can accept the CU-KEY qwerty keyboard. A popular addition is the Acorn Atom 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 1MHz, 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 0K RAM	59.00
600K	KIT OF PARTS WITHOUT RAM OR 6522 (i/o CHIP)	44.00

### SINGLE BOARD COMPUTER VERSION

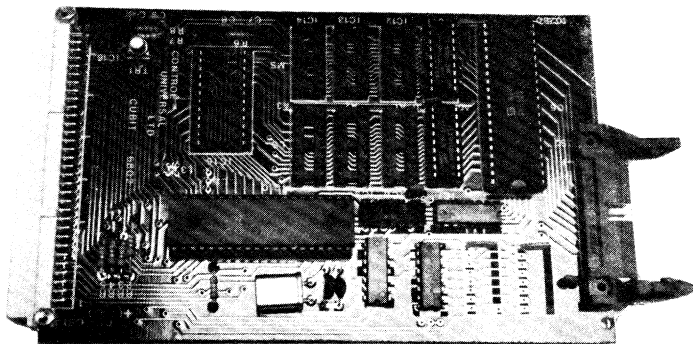
- WITH CRYSTAL AND 6502 MICROPROCESSOR

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

# CUNINE

## 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.



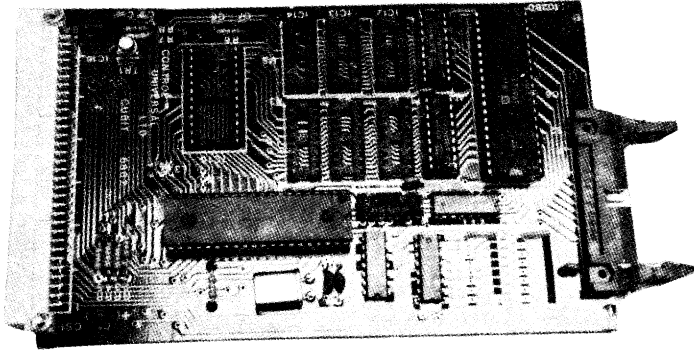
Fuller details in the user manual on CUNINE, available without charge from Control Universal or your CUBIT dealer.

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

# CUMOT

## 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.

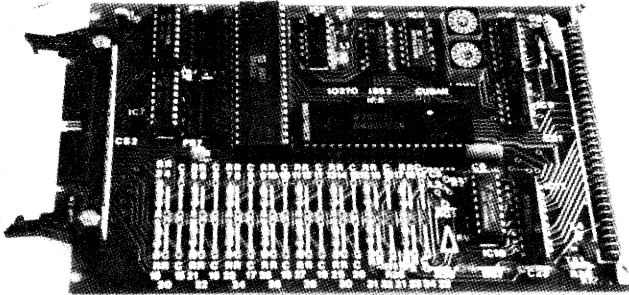
Driver software for use on Acorn and Cubit systems is available now, together with a high resolution graphics version of Acorn Atom BASIC.

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.

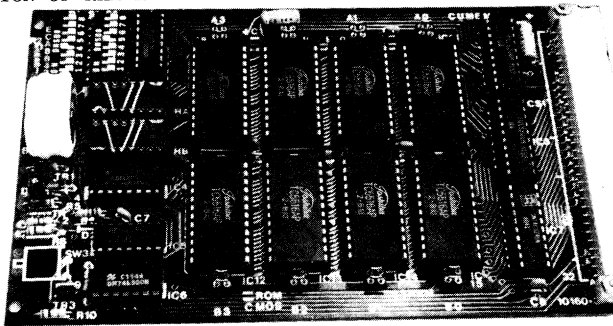
There is provision for fitting an LM317T regulator on board, which allows the user to regulate the board supply of 5v to exactly 2.55v, thus arranging for each bit to represent 0.01v.

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.

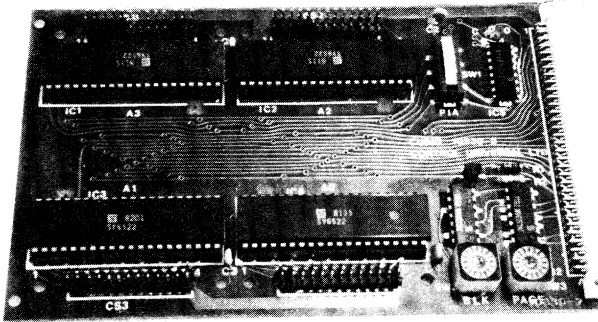
- |        |  |
|--------|--|
| RAM    | Mostek 4802 (2k bytes)   |
|        | Toshiba 2016 (2k bytes),                                       |
|        | 5516 (CMOS 2k bytes, suitable for battery back-up)             |
|        | Hitachi 6116 (CMOS 2k bytes, not suitable for battery back-up) |
|        | 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 64/80 CHANNEL i/o CARD



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 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

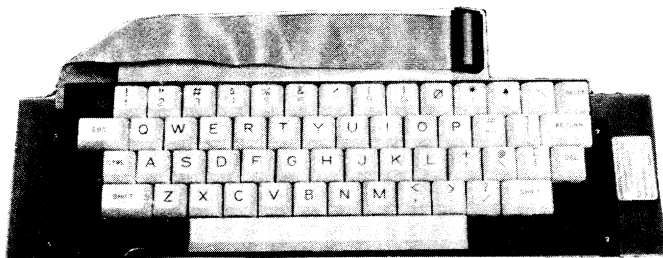
CU-PRINT is a new development by Control Universal scheduled for deliveries in August 1982. It employs a 6522 i/o chip (VIA) with two 16 position rotary switches to provide decoding down to page. (256 bytes). It can be used with all CUBE/Acorn bus systems to provide connection between the processor and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

# CU-KEY 53 KEY QWERTY KEYBOARD



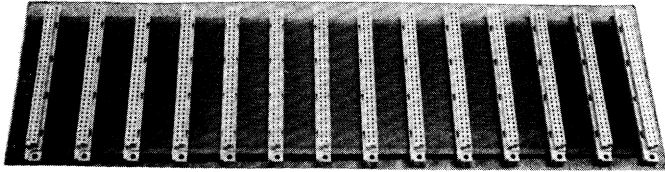
53 key non encoded keyboard (keys are decoded by polling from the operating system, each key has a place on the cross matrix) designed to plug into CUBIT, CUNINE or CUMOT single board computers. The new CUBOS operating system for the 6502-based CUBIT supports this keyboard, which, together with CU-MEM, 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



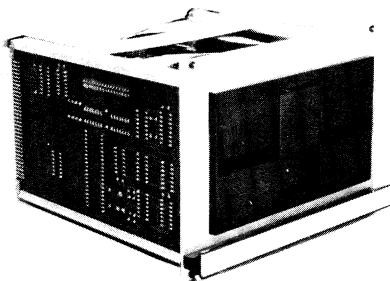
Control Universal backplanes are designed for mounting standard Eurocard DIN sockets on 1" spacing. The DIN type code is 41612, and the version is 64 way using rows a and b.

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

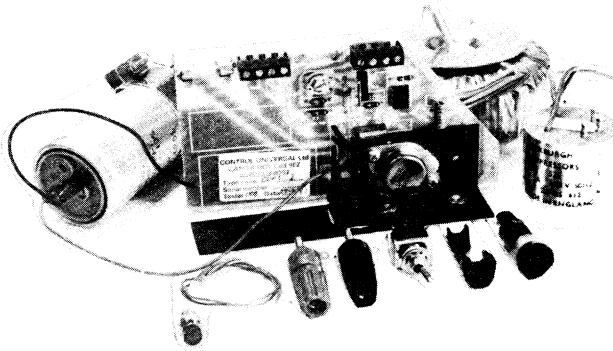


The module illustrated fits a standard 5.25" mini-floppy disk drive into a Eurorack. See the sections on Acorn System 3 and 4 for illustrations of fitting one drive into a single height rack, and two drives into a double height rack.

CODE	DESCRIPTION	PRICE
<b>DRIVES</b>		
770	Disk drive, single side, single density (128kb unformatted)	195.00
771	Disk drive, double side, double density, 512kbytes unformatted (suitable for single density operation with Acorn controller; double density requires controller based on 8272 chip, or similar)	250.00
<b>DISKETTES</b>		
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
<b>ACCESSORIES</b>		
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
<b>CONTROLLERS</b>		
765	Floppy disk controller assembled and tested.	134.00
766	Floppy disk controller in kit form	129.00
<b>DISK OPERATING SYSTEMS</b>		
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		
<b>UTILITIES DISKS (appropriate disk supplied free with each DOS)</b>		
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.

POWER SUPPLIES



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.					

# OBSOLETE CONTROL UNIVERSAL PRODUCTS

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 Universal 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 output vector so that the output stream goes to the video and to the expansion connector for the external printer as well as to the built-in 20 column led display and thermal printer.

PROMER is the program for using an Acorn EPROM programmer 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

## CONTROL UNIVERSAL SOFTWARE FOR AIM 65 SYSTEMS

There are four sets of firmware required with an AIM 65 disk system.

1. Code 1209 AIM 65 Z22 ROM replacement, which sets up vectors for the Acorn environment used in this system.

There is no alternative for this item. 10.00

2. AIMDOS EPROM. 4k PROM at hex 8000 to 8FFF. Price includes documentation and utilities disk.

1216SH AIMDOS EPROM as above, for Shugart drives 45.00

1216TA AIMDOS EPROM as above, for Tandon drives 45.00

1216TO AIMDOS EPROM as above, for Toshiba drives 45.00

3. Video and printer driver with PROMER. RAM from hex 7000 to 7FFF

1208R4 Video and printer driver for AIMDOS and 40  
column vdu, for use in RAM, supplied on disk, free with AIMDOS.

1208R8 As 1208R4 above, for 80 column vdu, free with AIMDOS.

1208P4 Video and printer driver for AIMDOS and 40  
column vdu, supplied on EPROM, 10.00

1208P8 As 1208P8 above, for 80 column vdu 10.00

4. Code 811. Utilities disk free with AIMDOS, otherwise 10.00

There is no alternative for this item. Includes the following:-

FORM40 COPY SEDIT LEDIT SBAS LBAS INFALL

COMPACT UIO PROMER

all of which are read in from disk to memory in the region hex 0400 to 06FF, except PROMER, which is from hex 7000 to 7340.

## EDIT (TEXT PROCESSOR) SOFTWARE FOR 80 COLUMN DISPLAYS

Control Universal offer two types of 80 column display - the Acorn 80 column VDU card (P 3.9), and the CU-GRAPH (P 2.5). Only one version of EDIT is required to operate on these two systems, as shown below

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

See page 4.6 for other version of EDIT (text processor) and Wordpack, and also under BBC for Wordwise.