# CONTROL UNIVERSAL LIMITED

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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.

P 0.1

# 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
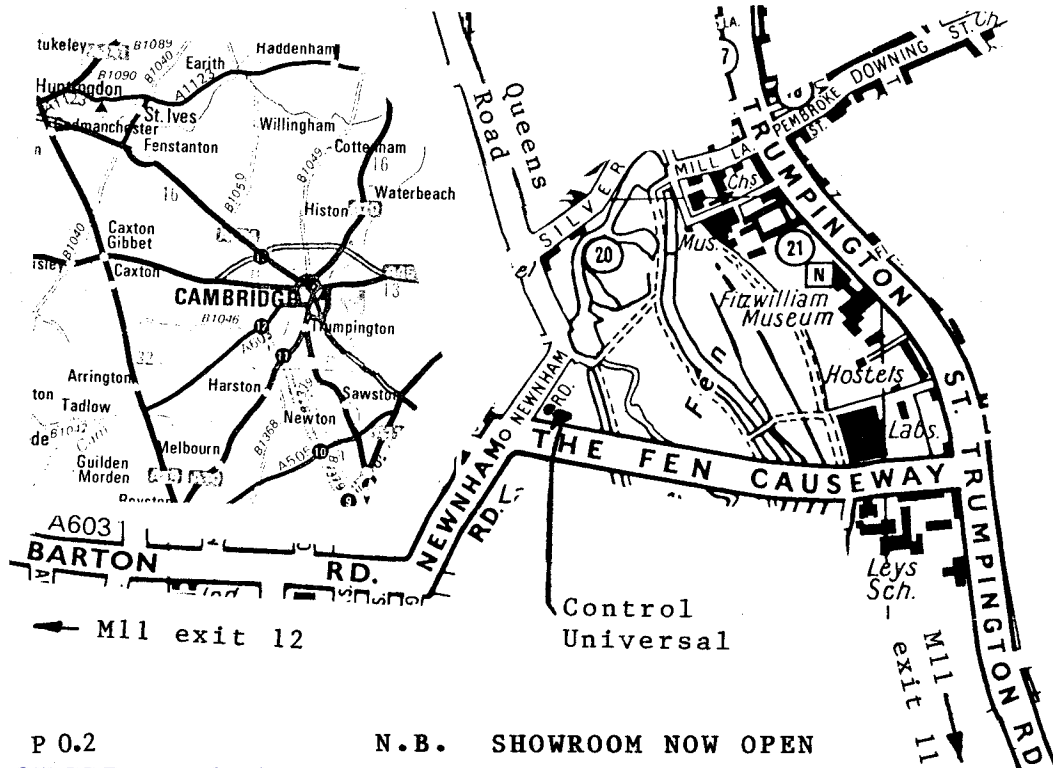                                       Lyn Miller

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

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## 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% |
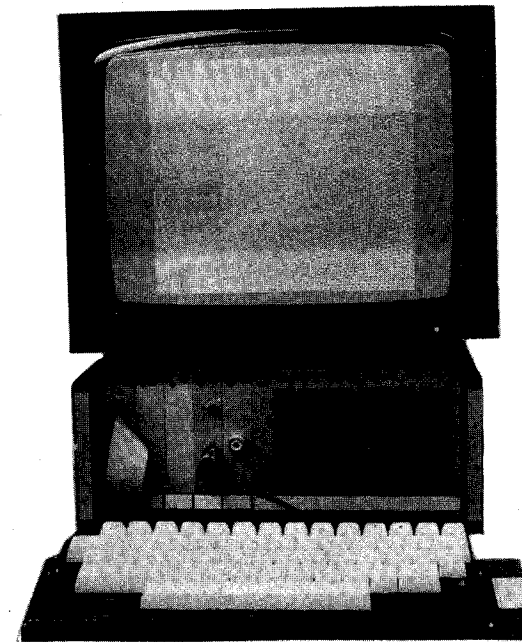
SYSTEM 10  1 DOUBLE SIDED DISK, MONOCHROME

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

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# 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 |

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# CUBIT

## MULTI-PURPOSE 6502 CARD
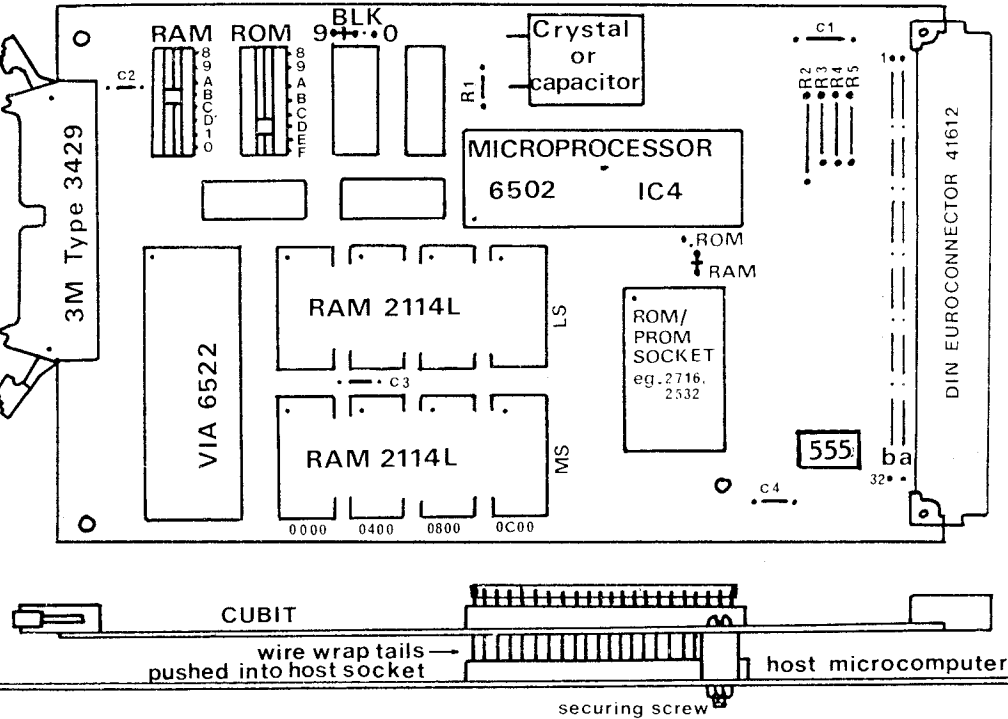


CUBIT is a Eurocard sized (100mm x 160mm) microprocessor module with four main functions.

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.

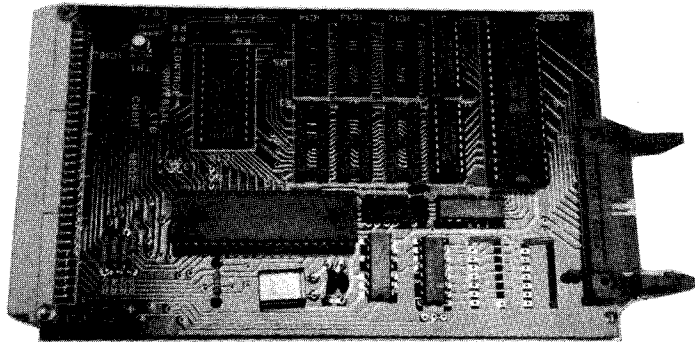| code | description | price |
|------|-------------|-------|
| 600A | COMPLETE ASSEMBLED & TESTED WITH 4K RAM | 70.00 |
| 600K | COMPLETE WITH 4K RAM IN KIT FORM | 55.00 |
| 600D | COMPLETE ASSEMBLED & TESTED WITH OK RAM | 59.00 |
| 600K | KIT OF PARTS WITHOUT RAM OR 6522 (i/o CHIP) | 44.00 |

### 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 |

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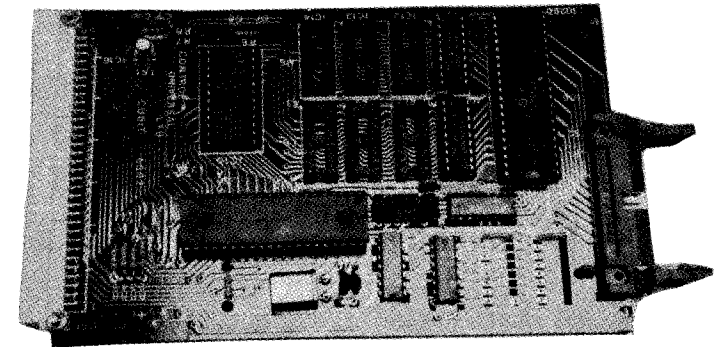
Fuller details in the user manual on CUNINE, available without charge from Control Universal or your CUBIT dealer.

| 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 |
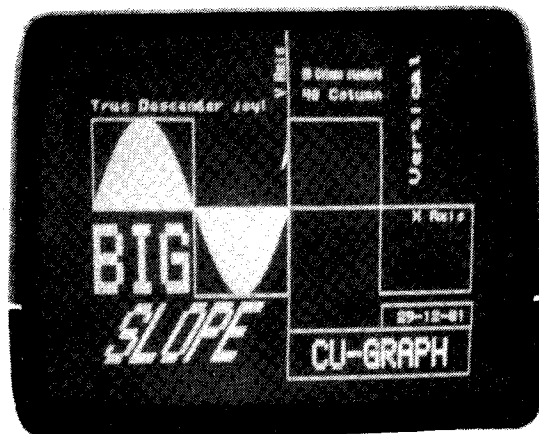
Cubit and Acorn compatible graphics card, 8 colours in 512 x 256 pixels.

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.

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# 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
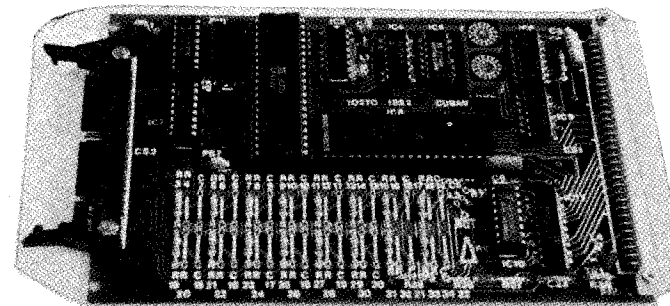


CUBAN was developed jointly between Control Universal and MEDC, Paisley College, and appeared in a series of articles written by Peter Williams, John Ferguson and Jake Stewart in Wireless World, under the series title of "Interfacing Microcomputers".

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 |

- 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
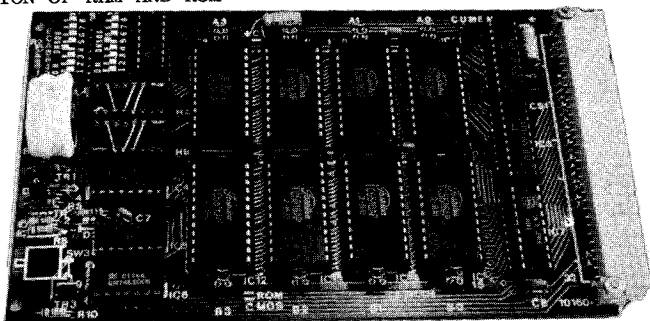


CU-MEM is a Euro-card using the standard Acorn bus, with eight 28 pin sockets, each of which can take the industry standard range of 24 and 28 pin memory devices, offering RAM, ROM and PROM options. The sockets are arranged in two banks, which can be individually selected for their position in memory (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 |
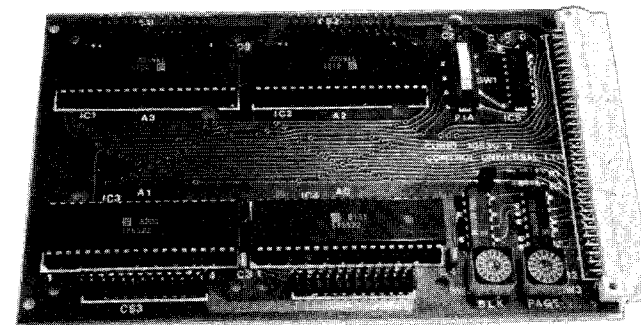
CUBIO carries four 40 pin sockets and is an exceptionally versatile unit that allows the use of either the cheaper Peripheral Interface Adaptor (PIA), which is sold as either the Rockwell 6520 or the Motorola 6821, or the more expensive but higher performance Versatile Interface Adaptor (VIA), which 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 |

1300 continued: 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.

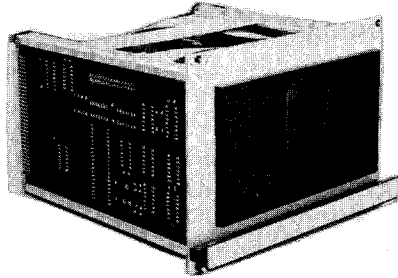| CODE | DESCRIPTION | PRICE |
|------|-------------|-------|
| 660 | CU-KEY 53 KEY QWERTY KEYBOARD | 40.00 |
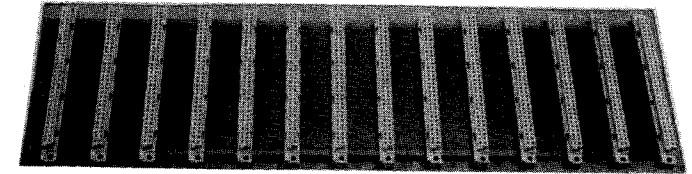
Control Universal backplanes are designed for mounting standard Eurocard DIN sockets on 1" spacing. The DIN type code is 41612, and the version is 64 way using rows a and b.

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.

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 (suitable for single density operation with Acorn controller; double density requires controller based on 8272 chip, or similar) | 250.00 |
| | **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.
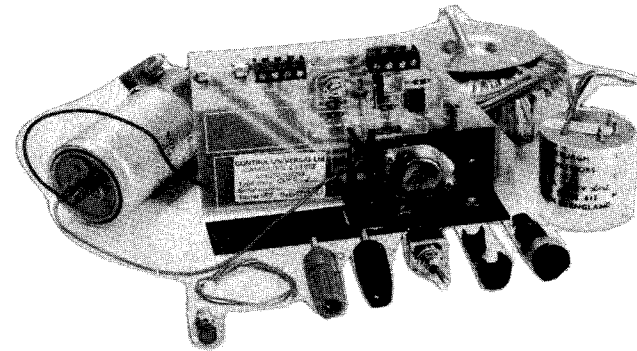
All power supplies are sold as open frame unenclosed units, fully assembled and tested. A toroidal transformer is used in all cases and a heat transfer bracket is provided. However, it is up to the customer to provide any additional heat sinking mass (eg. the chassis of the system) that may be necessary 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.

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 |