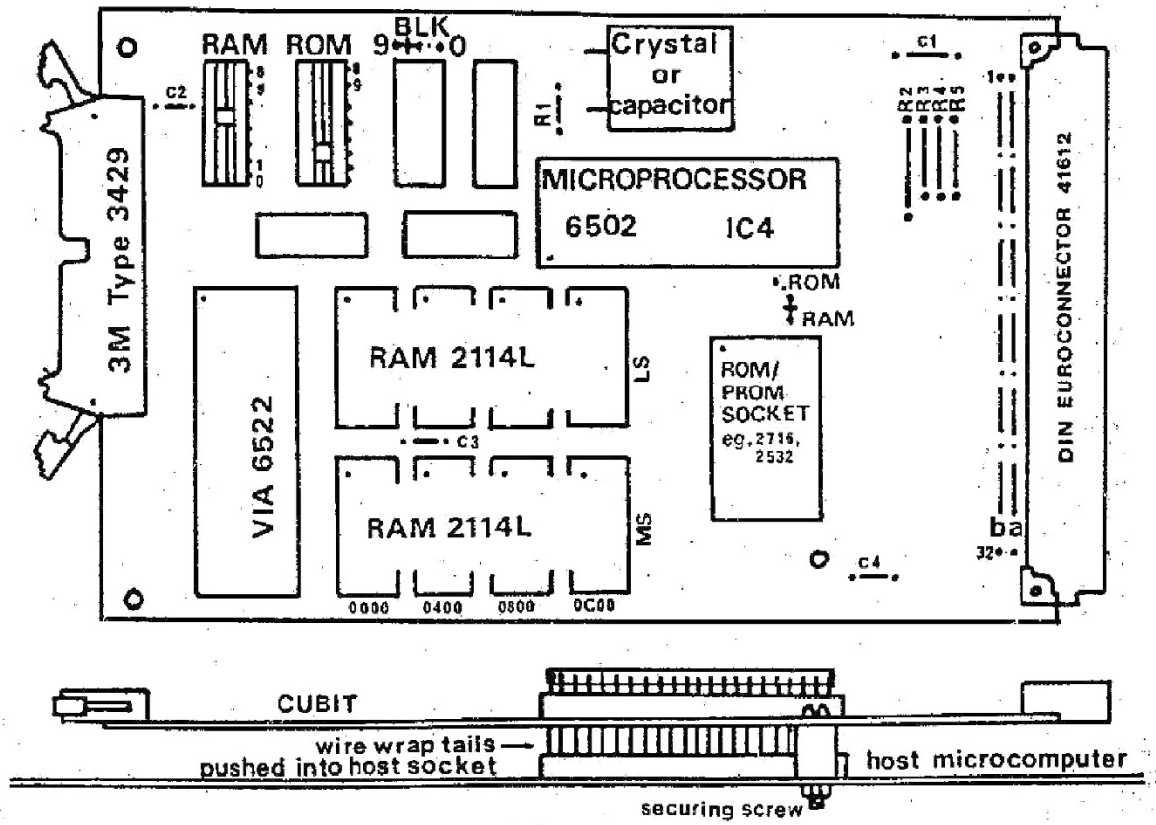
CONTROL UNIVERSAL LTD

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CUBIT



May 1981

SUMMARY

CUBIT is a Eurocard sized (100mm X160mm) microprocessor module with four main functions.

-1 As an extension card to 6502 - based microcomputers, particularly the Rockwell AIM 65, adds 4K bytes of RAM memory plus a socket which can take 4K bytes of ROM/EPROM or a further 2k bytes of RAM to make 6K bytes of RAM altogether, plus a VIA (6522) input/output chip, giving 16 i/o lines, with a ribbon cable external connector.

-2. As an interface between a 6502 based microcomputer, especally the AIM 65, and the Acorn range of Eurocard sized 8-bit peripheral cards, eg. floppy disk controller, VDU card, RAM memory, PROM programmer, etc.

-3. As a stand-alone single board computer having a specification of 4K bytes RAM, 4K bytes ROM/EPROM, and a VIA, with connectors giving access to the Acorn peripherals, and to input/ouput facilities with the VIA i/o chip.

-4. As a memory/i/o extension. Since CUBIT has the standard Acorn bus connector, it can be plugged directly into an Acorn rack to provide an extension of 4K RAM, plus a 4K PROM/ROM socket, plus 16 i/o lines using the VIA chip.

STANDARD CONFIGURATION

A number of standard configurations are stocked of which two are particularly popular. Assembled versions are fully tested before shipment.

The first consists of the printed circuit board with 4K bytes of RAM, wire-wrap 40 pin socket, Euroconnector and all necessary TTL and address switches for use in functions 1, 2 and 4 as defined in the summary above. The VIA chip has a 26 way latching 3M type ribbon cable connector for external connection.

The second standard configuration is for use in function 3, ie as a stand-alone single board computer. It consists of the printed cicuit board, 1K bytes of RAM, but with socket capacity for a total of 4K bytes, 6502 microprocessor, with the necessary crystal and other components to run it. The VIA and connector are as before, and additional RAM chips (type 2114L) are available if required.

Other configurations are available which includes the printed circuit on its own, and variants with additions to and subtractions from the two popular versions above. Full details can be found in the current price list.

1 AS AN EXTENSION TO 6502 BASED MICROCOMPUTERS

CUBIT was designed specifically for the Rockwell AIM 65, but the concept is valid for other 6502 microcomputers.. The 6502 chip is removed from the socket on the host computer, snd the wire-wrap tails of CUBIT's 40 pin socket are pushed into the empty socket. Care must be taken that pin 1 of the CUBIT socket lines up with pin 1 of the host computer socket. There is a spacer, nut and bolt provided for extra security when used with the AIM 65.

The block of 4K bytes of RAM can be selected to occupy the whole of any of the blocks 0, 1, 8, 9, A, B, C or D. Block 0 is needed for use as a stand-alone computer, block 1 is contiguous with the 4K bytes on the AIM 65, giving a total of 8K bytes of continuous RAM on the AIM/CUBIT combination. Acorn 8K byte RAM cards are selectable to have addresses in blocks of 8K bytes which can be any one of 0+1, 2+3, 4+5, 6+7, 8+9, A+B, C+D or E+F. These can thus provide further contiguous RAM extension after the AIM/CUBIT combination, and can in fact provide RAM to fill the whole of the addressable memory map.
Block A is not usable with the AIM 65, as the AIM's i/o chips occupy this block.
Blocks 8, 9, B, C and D are all useful, and B, C and D have particular relevance as they allow programs destined for residency in the AIM's ROM sockets to be tested in RAM at their eventual address, prior to committing to EPROM.

The 24 pin socket is designed to accept industry standard 8-bit wide 5V memories in 1K, 2K, and 4K byte capacities. These include ROM types 2316, 2332, EPROM types 2758, 2716, 2516, 2532 and CMOS RAM type 5516. Intel type 2732 and NMOS RAM types 4801 and 4802 require a small modification - see diagram. If user decides that this socket is to contain RAM, a small tracked link, clearly marked on the board, must be cut, and an alternative link marked "RAM" must be made. This socket can be switched to reside at any of blocks 8, 9, A, B, C, D, E or F.

The VIA is permanently decoded at 9000-93FF inclusive. The user can alter this decoding by following the instructions in section 4. The i/o lines, control lines are brought out to a 26 way 3M type latched ribbon cable connector. The pin-out of this connector is shown later.

2 AS AN INTERFACE TO THE ACORN RANGE OF PERIPHERAL CARDS

Acorn Computers Ltd manufacture a range of Eurocard sized (100mm X 160mm) peripheral cards, which complement the facilities of the AIM 65 in a most satisfactory way. These cards, all of which are distributed by Control Universal Ltd, include:-

VDU - black and white, and colour, upper and lower case, 40 or 80 columns
PROM programmer - programs all 5V EPROMS, and 74LS571 bipolar PROM
Floppy disk controller - controls four 128K byte 5.25" disks
8K bytes RAM memory card with 8K bytes ROM socket
Versatile Interface Board - with VIA (6522) 8255 i/o chips and UART (6850) with crystal oscillator
12-bit 8 channel A-D converter + two 12-bit D-A converters
Laboratory i/o card with 16 opto-isolated i/o channels, each capable of driving 3 A as outputs

Control Universal have added a memory carrier card which takes eight 24 pin or 28 pin memory devices, allowing up to 48K bytes ROM/EPROM or 16K bytes RAM, with an on-board battery back-up system for CMOS RAM devices. A liquid crystal display controller, a forty column printer controller and a miniature digital cassette recorder controller are further projected modules.

SOFTWARE

Note that the VDU, the PROM programmer and the floppy disk controller require special software to drive them. In the case of the first two, a listing of the necessary software is included in the price, or provided on disk or EPROM for the same price as the blank disk or EPROM. The disk operating system (with User Manual) is sold separately on EPROM.

The disk operating system software is organised to be located at 8000-8FFF, and to reside in the ROM socket of CUBIT. A second PROM replaces the AIM 65 ROM Z22, which resides in memory from F000 to FFFF. Upon switch-on the power-up vectors of the AIM 65 have had added to them those necessary for the function of the DOS. It also initiallises with the printer switched off, so nothing is printed upon initiallisation. Many users find this a convenience. The AIM 65 then behaves exactly as normal until the F3 key is pressed whereupon the disk operating system is entered and the normal AIM 65 prompt of < is replaced by the DOS prompt of *. DOS commands can then be performed; after execution the system returns to the DOS prompt. To return to the AIM prompt ESC is pressed.

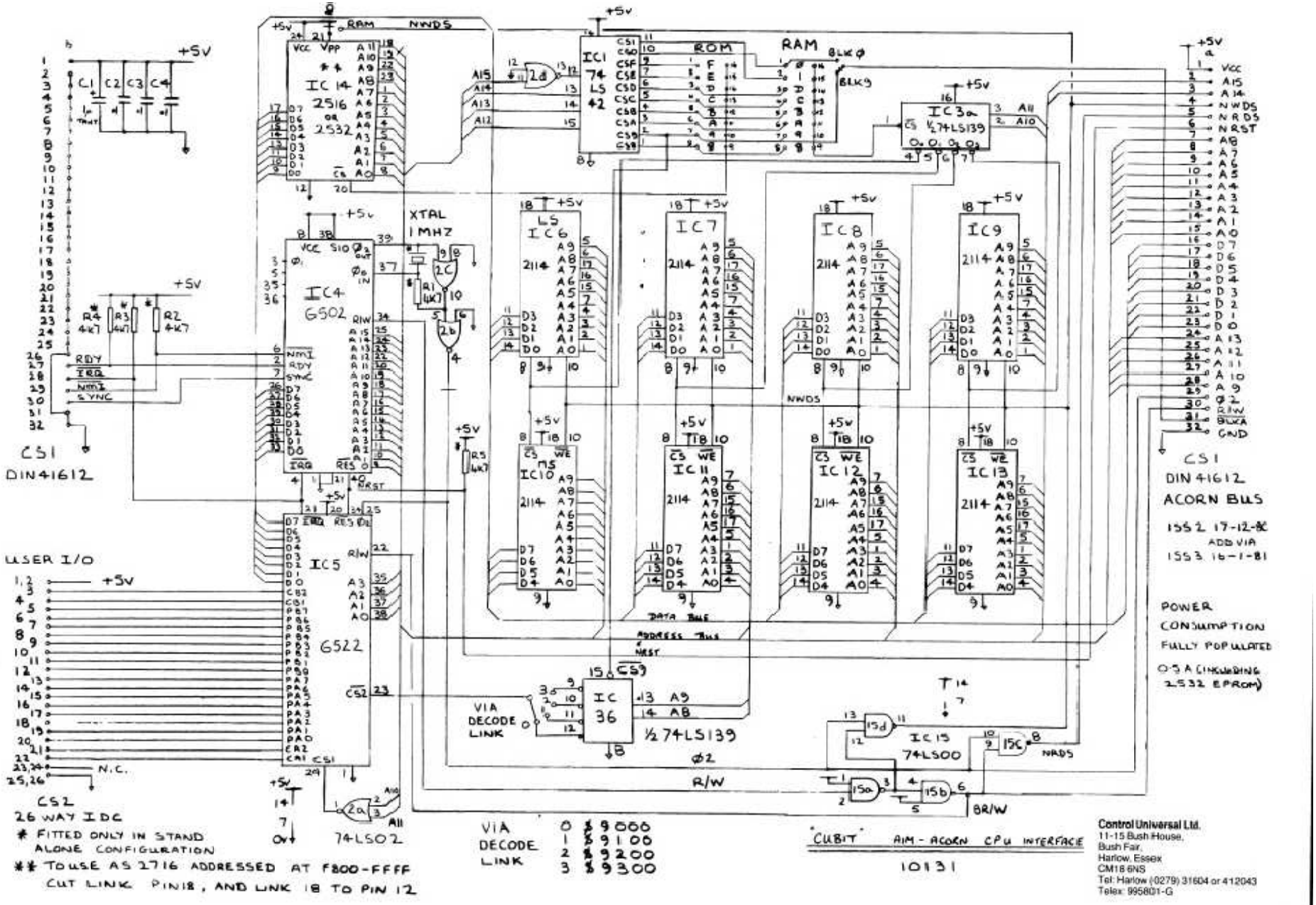
DOS command examples

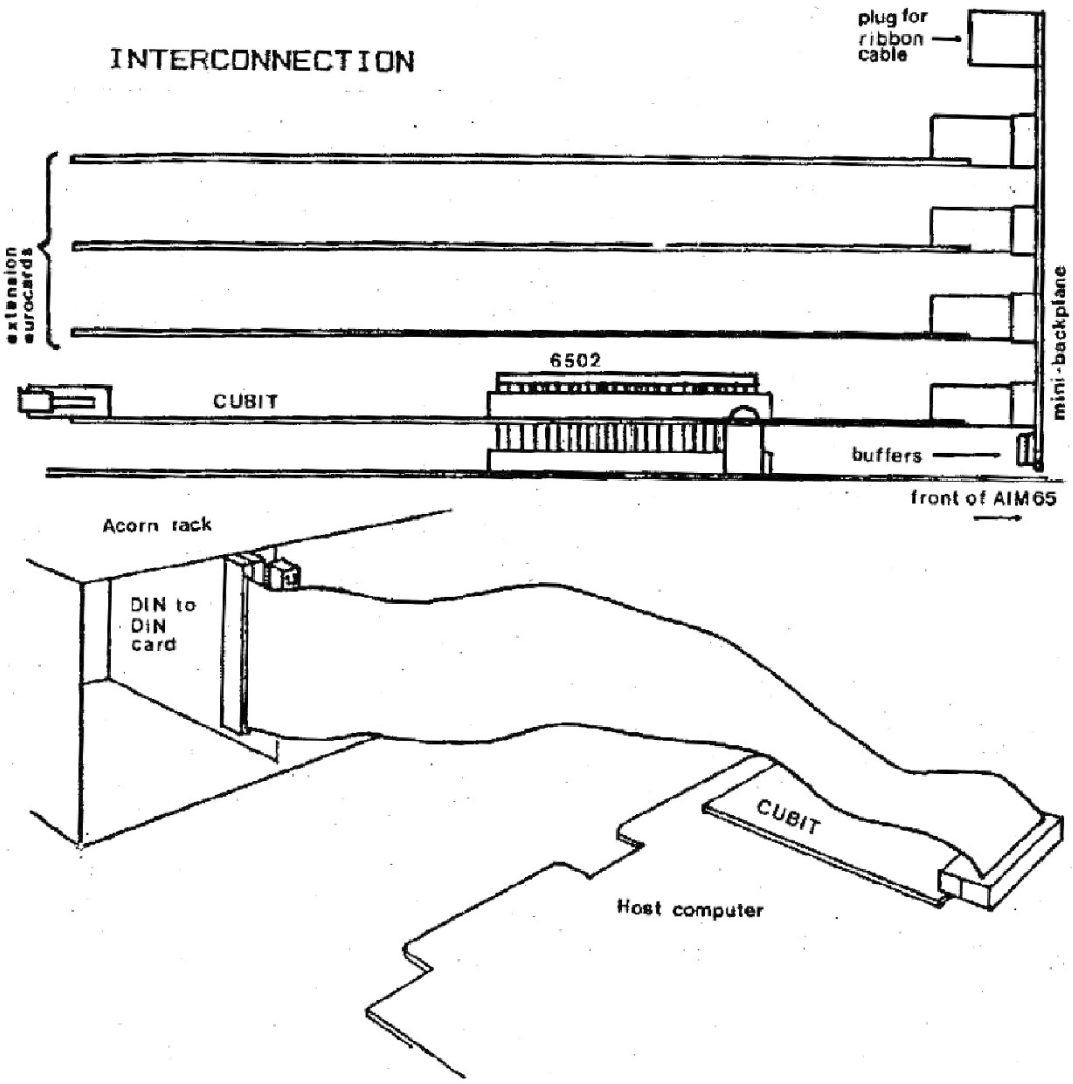
CAT causes a print-out of the catalog of the current disk
CAT1, CAT2 cause a print-out of the catalog of the specified disk.
DELETE (FILENAME) causes deletion of the named file
TITLE used to specify the title of a disk
INFO (FILENAME) used to discover the extent, start address, entry point and sector location of a named file
RUN (FILENAME) causes the named file to be loaded from disk into memory and operated
LOCK/UNLOCK (FILENAME) causes the named file on disk to be software write protected/released from write protection.
EXECUTE (FILENAME) causes the individual bytes in the named file to be treated by the operating system as if they were entries from the keyboard.

When in the DOS the user may also type a filename and pressing (RETURN) will cause that file to be loaded into memory from disk and be operated. This applies to any file, but importantly to other disk management facilities that are not held in ROM, but are instead held on disk. eg:

FORMAT to initialise a disk to the Acorn format
COMPACT to condense the used parts of a disk together, thus leaving more space for new files.
INFALL as INFO, but for all files on disk.

The DOS also allows the AIM 65 owner to use all the AIM facilities with,disk, eg. BASIC, Editor, Assembler etc., and to use Acorn software such as BASIC, Assembler/disassembler/ editor (ADE) and word processor (upon which this brochure was produced).


+5V
C1 C2 C3 C4
R4 4K7
R3 4K7
R2 4K7
RDY
IRQ
NMI
SYNC
CS1
DIN41612
IC 14
2516
OR
2532
RAM
NWDS
IC1
74 LS 42
ROM
RAM
BLK Ø
BLK 9
IC3a
½74LS139
A11
A10
XTAL
1MHZ
IC4
6502
R1 4K7
R5 4K7
IC5
6522
IC6
IC7
IC8
IC9
2114
IC10
IC11
IC12
IC13
NWDS
DATA BUS
ADDRESS BUS
NRST
CS2
26 WAY IDC
N.C.
USER I/O
VIA
DECODE
LINK
IC
36
½74LS139
Ø2
R/W
IC15
74LS00
NRDS
BR/W
A11
74LS02
VIA
DECODE
LINK
0 $9000
1 $9100
2 $9200
3 $9300
CS1
DIN41612
ACORN BUS
1552 17-12-82
ADD VIA
1553 16-1-81
POWER
CONSUMPTION
FULLY POPULATED
0·5A (INCLUDING
2532 EPROM)
* FITTED ONLY IN STAND
ALONE CONFIGURATION
** TOUSE AS 2716 ADDRESSED AT F800-FFFF
CUT LINK PIN18, AND LINK 18 TO PIN 12
CUBIT AIM - ACORN CPU INTERFACE
10131
Control Universal Ltd.
11-15 Bush House,
Bush Fair,
Harlow, Essex
CM18 6NS
Tel: Harlow (0279) 31604 or 412043
Telex: 995801-G



INTERCONNECTION

Connection from CUBIT to the peripheral cards can be achieved using the Mini-backplane, which has four connectors providing a convenient mounting above CUBIT for three peripheral cards plus a male connector to take the ribbon cable off to the rack or externally connected peripheral cards. The Mini-rack supports the peripheral cards. Alternatively, a 64 way ribbon cable can be run directly from the Euroconnector on CUBIT to the Acorn rack or peripheral cards connected directly on the ribbon cable. Noise protection is provided by every other conductor on the ribbon cable being connected to ground at the CUBIT end. If no more than 2 peripheral cards are to be driven from CUBIT, buffers are not required. Greater numbers of cards will require the use of buffers. This can be provided either by the Mini-backplane, in which case the take-off from the male plug will require no further buffering, or by connecting into the Acorn rack via the built-in buffers on the backplane.

3 AS A STAND - ALONE SINGLE BOARD COMPUTER

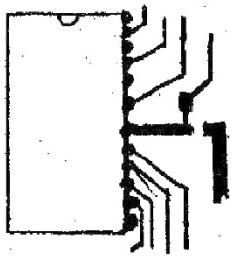
CUBIT, as a stand-alone single board microcomputer offers a capacity of up to 4K bytes of RAM, 4K bytes of ROM/EPROM, and 16 i/o lines, plus control lines, with a crystal controlled 6502 microprocessor. No development aids exist or are planned, as the AIM 65 or the Acorn range of computers, with their existing development software, will be ideal for realising the program to be held in CUBIT's ROM socket.

For the purpose of driving certain peripherals such as the floppy disk controller and the VDU card, a chip select output from the computer is required.
CUBIT provides a usual output of chip select 9, on pin A31, which is required when driving Acorn peripherals from the AIM 65. A link marked "BLK" may be cut, and a new link to "0" made, which will cause chip select 0 to be output on pin A 31.

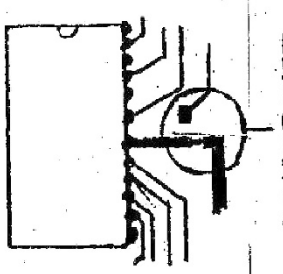
4 AS A MEMORY/INPUT/OUTPUT EXTENSION CARD ON THE ACORN BUS

CUBIT will exist on the Acorn bus, providing a 4K RAM extension, a 4K PROM/ROM socket and a further 20 i/o lines using the VIA. To use CUBIT in this mode IC 15 must be removed from its socket, the link "BLK" must be disconnected from both the 0 and the 9 option and the track from pin 11 of IC 15 to pin 4 of IC 2 must be cut. If there is another CUBIT on the same bus, the user will probably want to decode the VIA on the second CUBIT at a different address. This is done on the underside of the board beneath IC 6. The link that exists when supplied decodes the VIA in the range 9000 to 90FF. If this link is cut and the cicular pad linked to one of the other three adjacent points, coding will change to start at 9100, 9200 or 9300 working anticlockwise from the original link.

TRACK CUTS ROUND 24 PIN SOCKET



As supplied



Make this cut and link arrangement to cause socket to be decoded from F800 FFFF, so that a 2716 EPROM can be used in the stand-alone computer mode

Make these cuts and links to reverse pin 18 and 20 to use NMO RAM in this socket

PIN OUT DETAILS

CUBIT connector to Acorn bus

SIDE A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+5V	A15	A14	NWDS	NRDS	NRST	A8	A7	A6	A5	A4	A3	A2	A1	A0	D7
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
D6	D5	D4	D3	D2	D1	D0	A13	A12	A11	A10	A9	PHI2	R/W	BLK9	GND

SIDE B

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	RDY	IRQ	NMI	SYNC	GND	GND

INPUT/OUTPUT CONNECTOR (View from track side)

1	3	5	7	9	11	13	15	17	19	21	23	25
5V	CB2	PB7	PB5	PB3	PB1	PA7	PA5	PA3	PA1	CA2	N/C	GND
2	4	6	8	10	12	14	16	18	20	22	24	26
5V	CB1	PB6	PB4	PB2	PB0	PA6	PA4	PA2	PA0	CA1	N/C	GND

The two unconnected pins, nos 23 and 24 can usefully be employed for connecting RST, NMI, IRQ or any other line desired on this connector, by making a wire link from a point on the board where the desired signal exists.

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