EXPANDING IN THE RIGHT DIRECTION

Chris Drage compares six ROM expansion boards

THE criteria for choosing an expansion board were high-lighted in my article in the April 1985 issue, and new readers may find the comments there useful.

As most ROM expansion boards are quite reliable choosing one is a case of deciding what facilities you want and estimating those you might need in the future—this may save you a considerable sum, as some ROM boards are designed to accommodate other systems, eg, the Romram-15 and Exprom boards reviewed in April. Other boards quite definitely do not. The ROM boards currently on the market aim to give the user the maximum amount of flexibility in their configurations — this may be important if you want to develop your own 'sideways' firmware. The inclusion of RAM sockets on the boards will be an important consideration now CMOS Ram chips are falling in price.

ATPL Sidewise Board

The Sidewise Board from Advanced Technology Products is a strong and well-designed internally mounted board supporting a total of 16 ROMs, 12 of which are on board, the other four remain in the Beeb. It may also be fitted
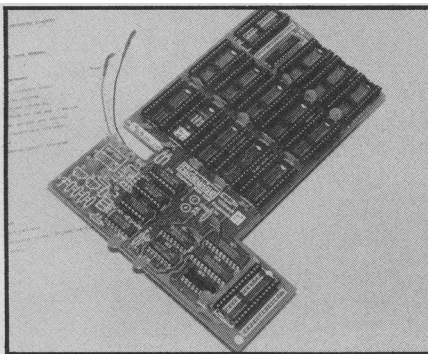

ATPL Sidewise Board

with 16k of sideways RAM as two 8k 6264 CMOS chips. In this configuration a total of 15 ROMs are available, the sideways RAM taking the position of socket 15 (15a and 15b to be exact). Provision is made to fit a rechargeable battery to the board.

Installation is quite straightforward, with Sidewise occupying the OS1.2 socket (IC52) and the A/D socket (IC73) . Placing it correctly into the vacated

sockets is rather tricky and another problem encountered concerns a pair of power leads to the main board, which must be bent flat to accommodate the Sidewise. However, care is rewarded with a very stable and well-
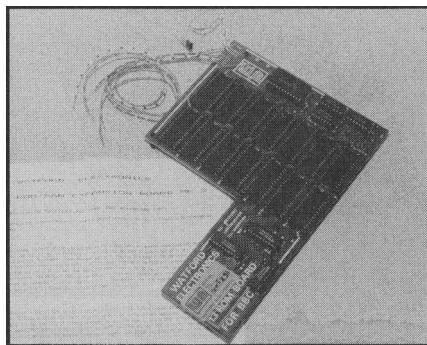
Watford Electronics Mk2 ROM Board

balanced board. The two ICs are re-placed at corresponding positions on the board, then you just connect two flying leads to link S21 on the BBC micro board.

The board is properly buffered and ROM insertion and removal is quite simple. For anyone wanting a simple extension of the sideways ROM/RAM in their computer then I can recommend the Sidewise board. However, if an Aries B-20 video memory board is required at the same time then you should look at other boards.

Watford Mk2 ROM Board

The Watford Electronics Mk2 ROM expansion board is an improvement on the Mk1 version. The PCB is now stronger, is properly buffered, and doesn't crash alarmingly. The Mk2 car-ries 13 sockets, enabling a total of 16 ROMs to be fitted. It may also be confi-gured to accept one or two CMOS RAM chips in sockets 15a and/or 15b. Thus 2, 4, 8 or 16k options are possible by sol-dering various links. However, sensible default link settings are available. Like the Sidewise board, 16k of RAM will allow a total of 15 ROMs to be used. It can add battery backup as an extra.

Installation is far from straightforward as Watford Electronics has not improved the header plug which still has oversized, square pins guaranteed to enlarge your Beeb's ROM socket, and two of the legs on the review board

were 1mm shorter than the others! The A4 instruction sheet states that the board will buckle slightly but 'not to worry'. To fit this board you must be prepared to do some very fine solder-ing. Five wires must be soldered to the legs of chips, then a flying lead plugs into link S21. Fitting this board is not for the inexperienced.

The board is fitted with supports to bear the stress when inserting or removing ROMs. In situ it straddles the BBC micro's RAM and video areas, which could lead to overheating in some machines. An Aries B-20 board will not physically fit into the micro with a Watford Electronics board in place. Watford's own 32k expansion board will fit, though I can't comment on the
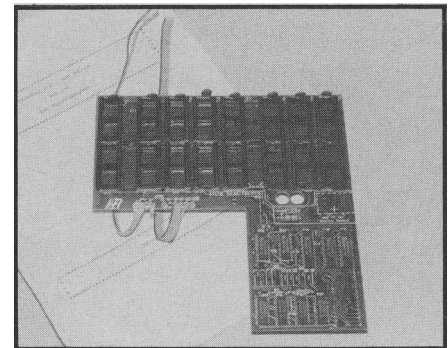
HCR Internal ROM Expansion Board

performance of this configuration.

My overall view of the board is not one of confidence nor admiration. It appears to have been designed and produced in a rush with little thought given to the needs of users.

HCR Internal ROM Board

Somewhat similar in shape and design is the ROM expansion board from HCR Electronic Services. In common with the previous boards, the aim is to expand the computer's ROM capacity to a maximum of 16. All these reside on the HCR Board in an 8 x 2 matrix. Two pairs of sockets may be configured to take two 8k ROMs to simulate one 16k ROM. Up to 16k of CMOS RAM may be fitted using either 2k devices (6116) or 8k devices (6264), but the former option limits the number of ROM sockets to eight. The five possible configurations of ROMs and RAMs are achieved by selecting the correct links. The board is

fully buffered and you can fit a re-chargeable battery for RAM backup.

Installation involves the use of a soldering iron as six wires must be attached – four soldered to the legs of IC76, one to be gripped by the jumper on link S21 and a single read/write lead to be soldered to IC72 (if sideways RAM is to be used).

Power supply leads to the main board are reconnected to the HCR Board. A pair of power leads from the expansion board connect to the vacated power tags on the Beeb, which allows the board to take its power directly from the host micro, getting round the need to pick up the power from the header socket. This eliminates possible crashes that may occur when trying to draw up to 650mA from a sideways ROM socket. HCR has provided a high-quality, header plug for connection, and three mounting pillars and adhesive pads. Both the soldering and the removal of the Beeb's power leads are beyond the scope of beginners.

The HCR board proved reliable, very stable, and ROMs are easily inserted or removed. My only gripe with this other-wise excellent board is the installation

procedure and the fact that it lies over the Beeb's hot RAM area. Although this did not seem to bother my computer, it may prove a problem with older ver-sions. An Aries B-20 would not fit with the HCR in place. The HCR Board rep-resents value for money for the hobbyist who is confident with a solder- ing iron.
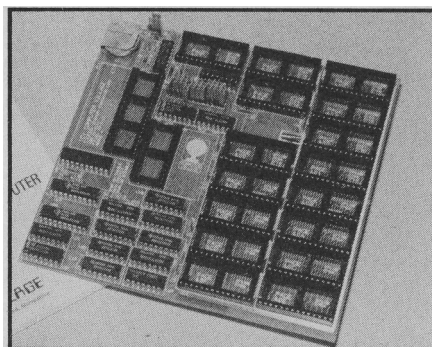
Computer Village CVx16-2

Based on the Mk1 CVx16, this new ver-sion offers some improvements over its predecessor. The quality and construc-tion of the CVx16-2's double-sided PCB is excellent. It features 18 buffering and

Computer Village CVx16-2

decoding chips, and can handle up to 16 ROMs and 16k of paged RAM. The Mk1 board could only handle 2k (6116) RAMs, but the new model now permits the use of 2 x 8k (6264) devices. This board is so versatile that no less than nine configurations are possible. The elements from which the various com-binations can be made are: 16 paged ROMs; Software switching between ROMs 8 and 9; 16k RAM as 8 x 2k devices *or* 16k RAM as 2 x 8k devices; Software switching between ROM 9 and 6116 RAM *or* Software switching between ROM 9 and 6264 RAM.

Battery backup for the RAM is pro-vided as standard. The primary lithium cell on board can be exchanged for a rechargeable NICad cell at the time of purchase – as fitted, the battery has a life of about five years.

Installation comprises the removal of both the 6502 CPU and ULA (IC6) chip and fitting them in the corresponding sockets on the CVx16-2 board. Trying to align the very fine, turned-pin legs of the board into the two sockets proved quite difficult– the pins bend easily and are too fragile for the task. A pair of power leads on the BBC board must

WHAT THEY OFFER

Board	ATPL	WATFORD Mk2	HCR 16	CVx16-2	ROM BOX	RAM/ROM BOX
RAM or ROM	RAM/ROM	RAM/ROM	RAM/ROM	RAM/ROM (nine configurations)	ROM	RAM/ROM board inc. own PSU
ROM sockets available	12 OR 11 + 1 RAM position (Plus 4 on BBC board)	13 + 3 on BBC board 2716 and 2732 EPROMs may be used	12 + 4 on BBC board	16 (8 sockets can carry 2716 EPROMs)	8 (1 is a ZIF socket)	12 + 4 in BBC. Optional 2nd board enables possible 28 resident ROMs
RAM available	16k as 2 × 8k CMOS (6264) static RAMs. Battery backup option	16k as 2 × 8k CMOS (6264) static RAMs. Battery backup option. (Also 6116 RAM chips)	16k as 2 × 8k CMOS (6264) static RAMs. (Also 6116 RAMs)	16 possible CMOS (6264) static RAMs. (Also 6116 RAMs). Battery backup as standard	n/a	16k possible as 2 × 8k CMOS (6264) static RAMs. Also 6116 RAM chips may be used. 2nd board provides another possible 16k
Installation	Plug in (internal)	Plug in + 5 wires to solder (internal)	Plug in + 6 wires to solder (internal)	Plug in (internal)	Plug in	Plug in
Price	£44.85	£38	£36.80	£52.24	£57.44	£86.25 £32.20 for second card. £27 for additional driver board
Available from	ATPL, Station Road, Clowne, Chesterfield S43 4AB	Watford Electronics, Cardiff Road, Watford, Herts	HCR Electronic Services, The Industrial Unit, Parker Road, Chelmsford, Essex CM2 6ES	Computer Village, 2/3 Hazledine House, Central Square, Telford, Shropshire TF3 4JL	Northern Computers, Churchfield Road, Frodsham, Cheshire WA6 6RD	HCR Electronic Services, The Industrial Unit, Parker Road, Chelmsford, Essex CM2 6ES

either carefully be removed and refitted or bent flat. All that remains is to socket the 'permanent' ROMs (Basic, etc) on the board.

The CVx16-2 proved reliable despite being located over the Beeb's RAM area. An Aries B-20 RAM board can be piggy-backed on the CVx16-2. Switching between sockets 8 and 9 allows, eg, two conflicting DFSs to reside happily. There are two modifications I would like to see – the board cries out for a pair of supporting pillars, and the 12 links are packed too tightly. Despite these gripes I recommend this board for anyone developing sideways firmware. Used in combination with Computer Village's *ROM Master* ROM (£19.95) the CVx16-2 is an indispensable tool for firmware development.

External boards
I have always been in favour of external ROM boards as you don't need to remove the Beeb's lid every time a ROM is changed, and they make room available for other expansion options. The advantage for schools, etc, is that valuable ROM firmware can be moved from computer to computer.
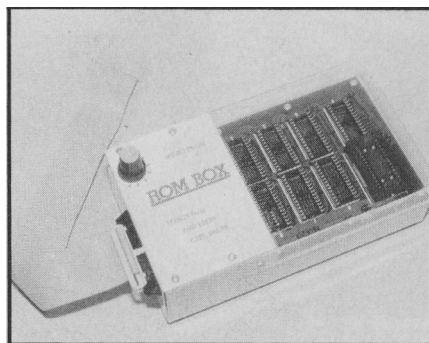
Micro Pulse ROM Box
The ROM Box from Micro Pulse is a beautifully designed and manufactured peripheral which enables you to access up to 11 ROMs. However, not all the eight resident ROMs can be on-line at once –there is a switch enabling only one to be selected at a time.

The ROM Box connects to the BBC micro by a 28-way ribbon cable and an easily detachable edge connector. The 28 DIL header to the cable simply plugs into one of the empty sideways ROM sockets between the OS 1.2 and the Basic chips, then the short (290mm) cable is clamped when the computer's lid is replaced.

The unit works very well. I particularly like the inclusion of a high quality

ZIF socket (position number 5 in the box), allowing easy and safe changing of ROMs. Another thoughtful feature is the red LEDs to indicate the current ROM. The fact that ROMs are isolated means ROM interaction problems associated with internal boards are avoided. It's possible to use the ROM Box with an internal board thus allowing a total of 23 resident ROMs, and it will work with almost any other expansion option.

Two disappointments in this otherwise excellent unit are the lack of onboard sideways RAM and the price. The former problem can be overcome by spending more money on a side-

Micro Pulse ROM Box

ways RAM card, but the solution to the latter is in the hands of Micro Pulse.
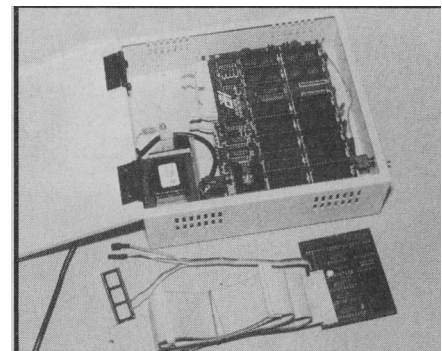
HCR External RAM/ROM
To overcome problems of power drain on the host Beeb, HCR Electronics has marketed an externally powered expansion system. It comprises two units – an adaptor card that plugs into socket 4 in the BBC micro and contains all the necessary buffering and control logic to interface with the external unit. An external card housed in a 215 x 195 x 65mm steel case contains 12 sockets for ROM/RAM combinations. The connection to the external box is via a 700mm 34-way cable. All connnections to the micro are plug-in.

The 12 ROMs of the external board can be added to the four in the BBC micro (the internal card has a piggyback socket). The board may also have CMOS RAM fitted as extra (6116 or 6264 devices). Up to two pairs of sockets are available which configure a pair of 8k ROMs to simulate a 16k ROM. The external box has been designed to allow a second 12-socket board which is selected by a POKE.

This configuration brings the possible number of ROMs available up to 28 (or 24 with 32k of sideways RAM). A write disable switch is included as standard and will operate on RAM fitted to either or both boards.

Installing the system is easy thanks to good design. High quality components help ensure that the operation is smooth and simple. The various configurations are set by 13 link jumpers. Both boards sit very firmly on their pillar-supports and are easily removed when ROMs are to be changed.

For an expansion unit that gives you just about everything except RAM battery back-up, this unit is top of its class. With the HCR unit just about any other expansion option is available to you.

HCR External RAM/ROM System

Conclusion
All the boards have certain strengths which will appeal to people with particular needs. To simply increase ROM capacity the ATPL Sidewise board is a good solution. For the hobbyist who is handy with a soldering iron the HCR 16 board offers similar facilities at a competitive price – it certainly scores over the Watford board. If you wish to develop firmware the CVx16-2 provides a flexible range of facilities.

The two external units are rather different. The ROM Box is expensive for what it offers but does provide a neat method of expanding one ROM socket. The HCR unit is really for the buffs of ROM/RAM expansion – if battery back-up was available this would be the most versatile and comprehensive system on the market. As it stands, it certainly provides an elegant means of expanding your Beeb's sideways ROM and RAM potential.

HOW THEY SCORE

Expansion board	ATPL Sidewise	Watford Mk2	HCR 16	CVx16-2	ROM Box	HCR External System
Design	4	2	3	3	5	5
Construction	4	2	3	5	5	5
Ease of installation	3	2	2	3	5	5
Ease of ROM removal/insertion	3	3	3	3	5	3
Versatility	3	3	3	5	3	5
Documentation	4	3	3	4	3	3
Value for money	4	3	3	4	2	3
Total (35)	25	18	20	27	28	29

Key: 5 *Excellent* 4 *Good* 3 *Satisfactory* 2 *Poor* 1 *Very bad*