



THE HOME COMPUTER market can at best be described as fickle, and at worst, non-existent. There really isn't much you can do with a computer in the home; true, there are lots of potential applications, but in practice they are either too much trouble, too inflexible or require specialised interfaces which are not available. Perhaps the major spur to the growth of the home computer market will be the eventual availability of information utilities designed to take advantage of home computers (unlike Viatel, which is designed for modified domestic television sets).

Nevertheless, it was the home market which IBM addressed with the jr. Never released in Australia, this machine clogged the distribution channels immediately after its release, stubbornly refusing to move off retailers' shelves. This could be attributed to several factors: first, the perfectly disastrous rubber-membrane keyboard with 'chiclet' keys; second, extremely limited memory expansion; and third, confused positioning.

IBM's research had shown a surprisingly large number of 'corporate' PCs were being taken home at least once a week. There was therefore an opportunity to sell more hardware: either a portable PC which would be easier to take home, or a second, low-cost PC which could be left at home and perhaps do double duty as a games machine.

Typically, IBM pursued both strategies, perhaps confusing the marketplace. Certainly, many jrs are in use as home compu-

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The PC jr, IBM's first attack on the United States' home computer market, was far from an unqualified success. Here Les Bell evaluates the IX — the company's second assault, planned to infiltrate homes through the education system.

ters, and some — but only a few — are used as home workstations to complement the office machine. The educational market in the United States hasn't leapt to embrace the machine either, despite fixes for all the machine's problems, combined with aggressive pricing.

It is in this climate that Big Blue has released a new home/education computer in Australia, and no doubt the parent company is viewing Australia as a test market for this product.

The IX is squarely aimed at the education market, with a spin-off in the home market. IBM is supporting the machine with plenty of educational software, and no doubt games and other software will appear in due course.

First Impressions

The IX is physically quite different from the PC and AT. It is smaller (405 by 290 by 90 mm) and finished in a dark-grey colour. The cabinet consists of a metal tray with plastic facias at front and rear, through which the disk drives, switches and connectors protrude.

The front panel is dominated by the two 9 cm disk drives, and below them the two cartridge slots. To the left of centre in the bottom half of the front panel is the window for the infra-red keyboard link, and at the far left is the on-off switch.

The rear of the machine has numerous connectors for peripherals. From left to right, they are: lightpen, cassette recorder, audio, printer, joysticks 1 and 2, optional ▶

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RS232C card, display and keyboard.

Two keyboards are available, with either 79 or 98 keys; the larger one has an additional numeric keypad and duplicate Alt and Fn keys. The keyboard layout is sensible, with a large Return key and Shift keys in the right positions. The function keys, labelled PF1 to PF10, rather than F1 to F10, are across the top of the keyboard. Programs like Flight Simulator will need a new function key layout — but then, they'll need to be rewritten for the JX anyway.

The keyboard is much lighter than the PC's, and has a light keyboard action with a conventional feel. What's unconventional about the keyboard is its infra-red link to the system unit; there is no need for a keyboard cable, although one is available as an option. The keyboard only works when it is in line of sight with the system unit; if the the unit is some distance back from the edge of a desk, this means you can't use the keyboard on your lap. However, the keyboard will work over a considerable angle and distance; I was able to place the JX on a bench across the office and operate it from the keyboard on my desk. Of course, I have 20/20 vision and knew what was on the screen anyway; others may find the principal 'benefit' of the keyboard is that they can sit sufficiently far away from the JX that they can't read the screen.

The keyboard is battery-operated, but if the batteries run down, the cable will supply power. Likewise, if two keyboards are operated in the same room, at least one must be using the cable, otherwise the infra-red links will interfere with each other.

Display

The display supplied with our evaluation machine was driven by the RGB output of

the JX, and provided comparable quality to the Princeton monitor we use on the PC. The colours were reasonably pure, with crisp edges, although the saturation was not as high as on the Princeton. Ironically, the area where the monitor falls down is in sound generation; the speaker is inside the PC, and the volume control on the front of the unit seems to control the timbre more than the volume. The placement of the speaker in the display monitor restricts the kinds of monitors which can be used.

Options

The major option for the JX is the expansion unit which sits on top of it. This carries four general-purpose expansion slots and a 13 cm disk drive, allowing access to jr and PC software on 'conventional' diskettes. The expansion box also has a blank position for another 9 cm floppy disk drive, and there is provision in the software for a hard disk, but no indication of where the hard disk fits. Perhaps a 9 cm hard disk drive is on the cards?

The JX's Logic

The JX is based on the same 8088 micro-processor as the PC, running at the same speed, 4.77 MHz. Memory starts at 64 Kbytes and is expandable to 512 Kbytes, with 64 Kbyte, 128 Kbyte, 256 Kbyte and 384 Kbyte RAM cards (a time-of-day clock is included on the two larger cards). At this stage, it appears unlikely any US-manufactured multi-function cards will be available for the unit, restricting purchasers to the IBM cards. Perhaps there's an opening for a local manufacturer here?

The memory map of the JX follows that of the jr; there is no separate colour graphics adaptor, so 64 Kbytes of system memory are taken up with the video display. However, the video circuitry maps

this area to B8000, just like the bigger machines, so software will continue to work.

Similarly, the I/O ports of the machine generally conform to the jr map. However, the JX makes extensive use of custom chips (there are five custom gate arrays), one of which looks after memory and I/O address decoding, and this circuit allows the programmer to change the addresses of the memory banks and I/O ports under software control. Potentially, this makes the JX a completely 'soft' machine; if a piece of software requires the sound generator chip at a different address, the programmer could simply move it there. In practice, this is likely to be less useful.

With 64 Kbytes of memory, the JX is able to display colour graphics at higher resolution than the PC. In particular, at 640 by 200 resolution, the JX can display four colours, while the PC is reduced to monochrome. That's the limit on resolution, however, and I certainly wouldn't advocate the JX as a CAD/CAM machine. The major benefit is for educational software, where diagrams can be detailed yet use colour for emphasis.

Performance

We performed our standard benchmarks on the JX with one major goal in mind: to discover the difference in performance between the older 13 cm disk drives and the new 9 cm type. At the same time, we expected to discover some other small differences from the PC, due to the BASIC interpreter being a bit different, different video memory management and other minor variations.

We discovered the 9 cm drives on the JX are slightly faster than the 13 cm drive, though the difference is not large enough to be significant. However, neither is quite as fast as the PC's floppy disk drive — though, again, the disparity is not that large. The figures are summarised in Table 1, together with the standard PC's results for comparison.

Another important benchmark these days is the machine's ability to run software written for the standard IBM PC. We tried a few different packages on the JX, with mixed results. Relatively 'plain vanilla' programs such as Wordstar and dBase II worked with no problems, and we tried the Norton 2.0 utilities and to our surprise they worked just fine.

However, dBase III would not run because of its copy-protection scheme, and we suspect quite a bit of software falls into

Table 1.

Benchmark	Stage 1	Stage 2	Stage 3	Total	Machine/drives
BMARK	246.38	287.17	338.79	875.19	JX / 9 cm
BMARK	246.01	292.28	346.70	884.75	JX / 13 cm
BMARK	206.41	276.26	329.28	811.95	PC / 13 cm
Interface Age Benchmark 9				851.96	JX
Interface Age Benchmark 9				861.57	PC
Sieve of Eratosthenes				1957.39	JX
Sieve of Eratosthenes				1953.53	PC
Disk File Create				27.49	JX / 9 cm
Disk File Create				29.69	JX / 13 cm
Disk File Create				26.99	PC

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this category. Flight Simulator didn't run either; it would ask us all the questions at the beginning of the program, but then lock up the system, accessing all the drives at the same time.

A variety of software is becoming available in the 9 cm format; IBM has released a range of its software, such as Personal Writing Assistant and the like. The accent is on educational software: the 9 cm diskette is ideal for use in schools as it is rugged and requires far less special treatment than the larger types.

Advantages

So, what are the advantages of the IX over similar PCs? First, it is compact, requiring less desk space than a conventional PC, and its infra-red keyboard link offers some additional flexibility in desk layout.

Next, its low cost will make it available to market segments previously beyond IBM's reach; in particular, this means the education market, small businesses (perhaps) and whatever sales IBM can get in the home computer market.

Third, the IX offers a couple of advantages for the educational market. First, it is IBM's 'chosen' and supported machine for that market. Next, its rugged 9 cm diskettes are ideal for school use, and the IX will work on the Cluster Program network, which IBM is apparently repositioning for educational use. This makes diskless IXs an attractive option for schools.

Disadvantages

The IX also has a couple of disadvantages. First and foremost is its limited expanda-

bility: there is only one free slot in a 256 Kbyte machine, and that will have to be used for a serial port. Any further expansion will require the expansion box, which optionally adds another two slots.

Related to this complaint is the lack of PC hardware compatibility. All the nice add-ons for the PC, like mice, modems, co-processor boards and others, simply will not work with the IX — they are physically incompatible.

The IX can have at most 512 Kbytes of memory, of which 64 Kbytes is used for video RAM, so it can't support programs and spreadsheets as large as the PC can. And of course, at present there is no hard disk for the IX, although the indications are that that will be remedied.

Finally, because its I/O ports and mem-

ory map are different from that of the PC, and in particular the disk size is different, compatibility with PC software is limited. Of course, programs like Lotus 1-2-3 are available in PC jr cartridge form, which will work on the IX.

Who Should Buy?

There are two major groups for whom the IX would be a good choice: first, home users who have no plans for major expansion or attaching lots of peripherals; second, the education market, which is IBM's main target with the machine, and people in this area will find lots of attractive features.

IBM is also interested in capturing some of the small business market with this machine. A two-drive version would probably be adequate for light word processing use, but for accounting applications — which are of prime importance to small businesses — a hard disk would be essential, so I wouldn't recommend the IX for this purpose until one becomes available.

Computer hobbyists with any hardware interest would probably find the machine frustrating because of the lack of expansion capabilities, and would probably be better advised to plump for a clone if they are on a tight budget. Software enthusiasts might find the machine interesting, although some of the more advanced software tools will not run on it.

In summary, the IX is well conceived and well executed. It owes more to the jr than the PC, so its architecture looks a little strange to us in Australia. Once we develop some expertise with it, there may even be some interesting software and hardware developed locally for it. □

Unit:	IBM Personal Computer IX
Made by:	IBM Corp Japan, with a little help from their friends
Processor:	8088
Clock speed:	4.77 MHz
RAM:	64 Kbytes expandable to 512 Kbytes
ROM:	96 Kbytes
I/O:	Two joysticks, sound, parallel printer
Languages:	BASIC, BASIC, BASIC
Keyboard:	79-key or 97-key QWERTY with i/r link
Display:	Defaults to 40 by 25, also has 80 by 25
Graphics:	640 by 200, four colours
Expansion:	Limited, but it can be done
Best points:	9 cm drives; we now have a standard
Worst points:	Limited expansion
Extras included:	Expansion unit, keyboard cable
Price:	\$2115 base (64 Kbytes, no disks), to \$3365 for 256 Kbyte two-drive IX3, all including colour monitor