

Report On IBM's New PCjr

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After months of incessant speculation and rampant rumors, IBM finally unveiled its new home computer in New York on November 1. The PCjr (code-named "Peanut" before its introduction) will be demonstrated at IBM dealers in December and available sometime in January. This report is a firsthand look at the machine which industry observers predict will be a significant development in the evolution of the home computer industry.

Never before in the history of personal computing (admittedly a brief history) has a product been so eagerly awaited by so many. The rumors of a forthcoming IBM home computer started more than a year ago, and every week seemed to bring another theory about what the computer would be like. Many of these theories contradicted each other. IBM stubbornly refused to confirm even the existence of such a machine, but nobody let that slow them down.

On one subject everyone seemed to agree: The introduction of a home computer by IBM—the company which is virtually synonymous with computers—would be a turning point in the history of the personal computer industry. First, there was IBM's traditional domination of the mainframe industry. Second, there was the phenomenal success of the IBM Personal Computer, which by itself has spawned a whole sub-industry in PC compatibles, look-alikes, and add-ons. And third, since IBM's research and development budget is larger than the budgets of some small nations, there were high hopes that IBM would deliver a revolutionary machine that would reinvent the home computer.

After all these expectations, perhaps it's inevitable that the PCjr is a bit less than what some people expected for the money. But there seems little doubt that it will indeed be a commercial success and exert a major impact on home computing.

Truly A Junior PC

Much can be grasped from the name "PCjr," favored by IBM over the more flippant code name "Peanut."

Once you get past the obvious cosmetic differences, the closer you look at the PCjr, the more it resembles the full-grown PC. Rather than designing the PCjr from the ground up, IBM chose to start with a PC and scale downwards. In almost every sense, the PCjr is truly a junior PC. It is apparent that one of IBM's overriding design considerations was to retain as much compatibility as possible between the PC and PCjr, while protecting the PC's business market against competition from the PCjr. These considerations explain both the PCjr's capabilities and its limitations.

To preserve compatibility, both computers share the same 16-bit microprocessor chip for their Central Processing Unit (CPU), the Intel 8088. The floppy disk drives, disk format, and Disk Operating Systems (DOS) are virtually identical, so disks are completely interchangeable. The fundamental keyboard functions are the same. The BASIC languages are generally compatible. And the internal operating systems, too, are virtually identical. The PCjr even looks like a downsized PC, with a main "System Unit" and remote keyboard.

As a result, a very large proportion of existing PC software will run as is on the PCjr. In fact, according to IBM, about the only programs that won't work are those which exceed the limitations imposed on the PCjr as a scaled-down PC—mainly memory limitations and the single disk drive. Although the 16-bit CPU can address up to 1000K (one megabyte) of memory, IBM has limited the PCjr to a maximum of 128K addressable RAM. There are also no provisions for adding more than one disk drive. Therefore, any PC program which fits in 112K (video subtracts 16K overhead) and requires only one drive should run without modification on the PCjr.

Two Basic Models

IBM plans to market two configurations of the same basic computer, although the higher model is expected to account for at least 80 percent of sales. The only difference is that the upper model comes with twice as much memory, a built-in disk drive, 80-column video capability, and (of course) a higher price tag.

The Entry Model can be upgraded to the Expanded Model by adding the 64K RAM/80-column video board (\$140) and disk drive (\$480).

The PCjr Entry Model, as it's called, retails for \$669. It consists of a box-like System Unit (the actual computer), a remote cordless keyboard, and an external power transformer. The System Unit contains all the main circuit boards and chips, including 64K RAM and 64K of Read Only Memory (ROM). The 64K ROM includes a built-in Microsoft BASIC (referred to by IBM as "cassette BASIC"); the computer's main operating system, called BIOS (Basic Input/Output System); a self-testing diagnostic program activated when power is first switched on; and "Keyboard Adventure," a program which uses graphics to acquaint newcomers to the keyboard.

Like all home computers designed to work with ordinary TV sets, the Entry Model is limited to a 40-column-wide video display. An external RF modulator is required and costs \$30 extra.

The Entry Model is designed to use cassettes for storing programs and data. Any standard, good-quality cassette recorder can be connected to the PCjr with an optional \$30 cord. PC and PCjr cassettes are compatible. The data transfer rate is variable, but averages about 1200 baud (somewhat faster than a Commodore or Atari cassette recorder).

The PCjr Expanded Model (\$1269) is identical except for an extra plug-in board which adds 64K RAM (for 128K total); switchable 40/80-column video capability (monitor required for 80 columns); and a double-sided, double-density 5¼" floppy disk drive built into the System Unit. The drive stores up to 360K per disk. The PCjr uses DOS 2.1 (available for \$65), a slightly modified version of the current DOS 2.0. The Expanded Model also comes with two disks, "Exploring the PCjr," a tutorial, and "Your IBM PCjr Sampler," a collection of sample home application programs.

L For Later

Both versions of the PCjr have these features in common: two front-facing slots on the System Unit for plug-in program cartridges; an internal slot for a direct-connect, 300-baud modem card (\$199); a serial port to which standard RS-232-C serial devices can be attached with an adapter cord (\$25); rear connections for two analog-type joysticks (\$80 per pair); light pen input; audio output jack; and outputs for both composite video and RGB (Red-Green-Blue) direct-drive video monitors. There's also an unused jack reserved for future expansion (labeled "L" for "Later," explained an IBM spokesman).

To add a parallel printer port, a snap-on interface (\$99) attaches to the side of the System Unit. Internally, the PCjr System Unit has three

slots: one for the modem card, one for the 64K RAM/80-column video board, and another for the disk drive controller card. The last two slots, therefore, are already occupied in the Expanded Model.

Infrared Keyboard

The most innovative feature of the PCjr is its cordless remote keyboard. Two tiny infrared "light bulbs" poking out the rear of the keyboard establish a remote link with an infrared sensor in the front of the System Unit. The lightweight (25-ounce) plastic keyboard, powered by four AA penlight batteries, can be operated up to 20 feet away from the System Unit. As long as the keyboard remains in line-of-sight of the System Unit, and within approximately a 60-degree arc of the infrared sensor, there are no clumsy cords to bother with. Keystrokes register on the screen reliably and instantly.

The PCjr constantly checks this invisible link and sounds a beeper if it's interrupted—for example, if someone walks between the keyboard and System Unit. IBM says the keyboard batteries should last for months with normal use. When they do begin to fail, the beeper will warn that keystrokes are not registering properly. Battery failures cannot erase programs or otherwise affect the computer.

If another PCjr is operated nearby, the keyboard can be hooked up to the System Unit with an optional cord (\$20) to keep them from interfering with each other. (Incidentally, IBM says the PC keyboard is not compatible with the PCjr.)

Aside from its cordless convenience, the PCjr keyboard itself is somewhat disappointing for a computer in its price range. Perhaps to encourage some people to buy a PC instead of a PCjr, the PCjr keyboard consists of 62 small, flat, plastic calculator-style keys, similar to the so-called "chiclet" keyboards found on low-end home computers. It feels much like a TRS-80 Color Computer keyboard, except the keys are rectangular instead of square.

Also, the keycaps are totally blank—all the lettering is squeezed onto the keyboard surface between the keys. The lettering is crowded and difficult to read in places because some keys have multiple functions. For example, the PCjr lacks the ten special function keys found on the PC. Instead, the PCjr combines the special function keys with the numeral keys, accessed by first pressing a CONTROL-type function key. The PC's separate numeric keypad also is eliminated on the PCjr. However, the PCjr retains the four cursor keys arranged in a handy diamond pattern.

The PCjr's calculator-style keyboard does allow keyboard overlays, not possible on regular typewriter-style keyboards. Since the entire keyboard is redefinable, you can program any

key to perform any function and slip on a custom overlay with your own labels.

Color, Graphics, Sound

To keep things as compatible as possible, the PCjr's sound and graphics are basically the same as those on a PC equipped with a color graphics card. The PCjr does have additional color graphics modes and sound capabilities, but they require a \$75 extended Microsoft BASIC cartridge to access. The 32K cartridge plugs into one of the two front slots on the System Unit and adds numerous graphics and sound commands.

Without the BASIC cartridge, the PCjr Entry Model has two high-resolution graphics modes: 320 × 200 pixels with four colors, and 640 × 200 pixels with two colors (the latter mode requires a monitor for legible resolution). Sound consists of a PC-type beeper (similar to the Apple II) and a second internal alarm beeper. The System Unit actually contains a more sophisticated sound chip, but the standard BASIC lacks the sound commands to use it.

Adding the BASIC cartridge to the Entry Model allows access to a medium-resolution graphics mode (160 × 200 pixels with 16 colors) and the sound chip. The sound chip has three tone generators covering seven octaves for music, plus white noise for sound effects, with 16 volume levels (similar to the Commodore VIC-20).

The PCjr Expanded Model offers more colors in the high-res graphics modes: 16 colors in the 320 × 200-pixel mode, and four colors in the 640 × 200 mode. The commands WIDTH 40 and WIDTH 80 switch between the 40- and 80-column text modes.

All of the graphics modes can display any of the PCjr's 16 colors, within the limits explained above. IBM says the PCjr has no sprites (also known as player/missile graphics) for animating objects on the screen. However, some animation is possible via "screen flipping"—drawing an alternate screen in memory while another screen is being displayed, then flipping instantly to the second screen.

A Luxurious BASIC

Thanks to the PCjr's Microsoft BASIC, it should be fairly easy to convert straightforward BASIC programs written for other computers to the new IBM. Some commands, such as CLS for "clear screen," resemble TRS-80 BASIC keywords.

It's also a very luxurious BASIC. Most home computers, including the Atari and Commodores, have 8K BASICs in ROM (Applesoft is 12K). IBM says the PCjr's built-in BASIC is 32K long, and the extended BASIC cartridge adds another 32K. This huge BASIC includes commands that are separate utilities on most other home computers,

such as RENUM, for renumbering BASIC program statements; DELETE, for deleting ranges of BASIC lines; TRON (Trace On) and TROFF (Trace Off), a powerful debugging tool which lists line numbers on the screen as they are executed; FILES, to list the disk directory; and KILL, to scratch disk files.

Because of the 16-bit CPU's megabyte of address space, it was possible to add this large BASIC without mapping out any RAM. BASIC uses only a few kilobytes of RAM for overhead. However, IBM says the BASIC cannot address more than 64K, even in the 128K Expanded Model PCjr. The Expanded Model with cartridge BASIC leaves only 60130 bytes free for BASIC programming. The 64K Entry Model, without adding cartridge BASIC, has about 45K free.

An Open Computer

IBM says the PCjr is an "open architecture machine," meaning that full technical information will be available to independent software/hardware developers and users. This is to encourage third-party software and accessories. Expect to see a busy market in replacement keyboards, multiple disk drives, combination boards to make the most of the PCjr's three internal slots, and possibly expansion beyond 128K RAM.

IBM has a few peripherals of its own ready, plus some home software written by outside companies (albeit wrapped in IBM packaging). Besides the joysticks and modem card, IBM introduced a PCjr carrying case (\$60) and the IBM PC Compact Printer (\$175). This is an 80-column thermal printer, friction or tractor feed, which prints at 50 characters per second.

IBM says the PCjr will be sold only at IBM Product Centers and authorized IBM dealers, not mass-marketed through department stores and discount chains like other home computers.

Because of its narrower distribution, and also because of its much higher price, it seems likely that the PCjr will split the home computer market into two levels. With Texas Instruments off the scene, Commodore and Atari will battle for domination of the low-end market. Despite ominous predictions by some industry observers, the PCjr should not significantly cut into this under-\$300 segment. Instead, it will compete more directly with the Apple and Atari's announced high-end models. The Coleco Adam probably will be considered a low-end computer in terms of price, because a complete system costs less than a bare PCjr Entry Model.

Nevertheless, the PCjr's impact will be felt at all levels of the home market. Those in search of elusive standards may settle on the PCjr, as they seem to be doing with the PC. It's also likely that lower-priced PCjr-compatibles will surface before long, perhaps even from Commodore or Atari. ©