Actual Size
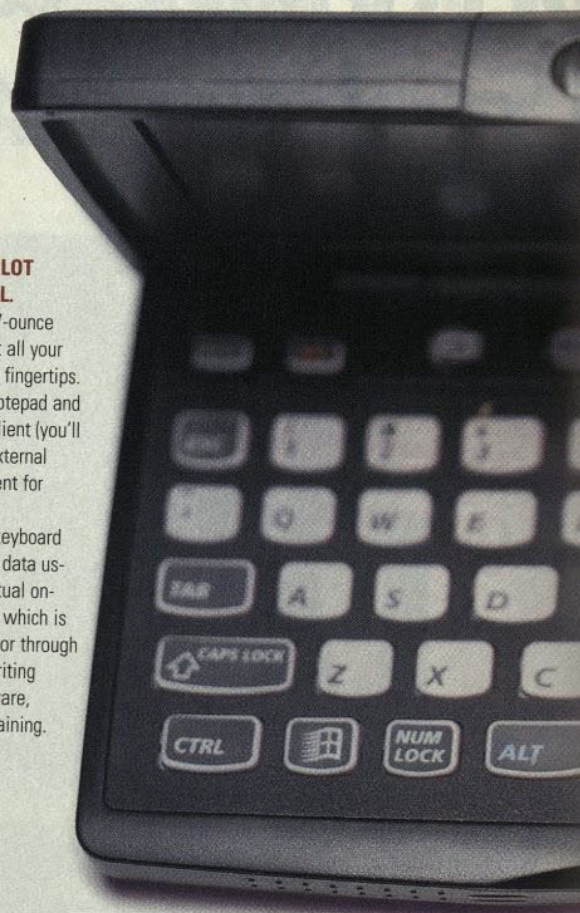
3COM PALMPILOT PROFESSIONAL.
PRO: In a 5- to 7-ounce package, you get all your PIM data at your fingertips. You also get a notepad and even an e-mail client (you'll need a special external modem attachment for transmission).
CON: Lack of a keyboard means you enter data using either the virtual on-screen keyboard, which is time-consuming, or through the unit's handwriting recognition software, which requires training.

Actual Size

The Ultimate Personal

By Robert S. Anthony Can today's hand–held PCs and pocket–size gizmos send

Wouldn't life be grand if every communications and data management tool you ever needed could fit on your wrist or in your pocket?

Although Dick Tracy–style TV communicator watches are not quite here, many recent advances have been made in the hand-held computing market. It's no longer strange to spot someone reading e-mail on a digital cellular phone or transmitting messages with a two-way pager.

Hand-held computing is hardly a new concept. Long before the operating system Windows CE was a glint in Microsoft's corporate eye, Apple Computer, Hewlett-Packard, Psion, Sharp Electronics, Texas Instruments, and many others offered small devices that provided some degree of connectivity to e-mail or desktop PCs. These devices ranged from several ounces to 3 or 4 pounds, and they typically ran proprietary operating systems or DOS.

Although hand-held PCs (HPCs) have

HP 620LX PALMTOP PC.
PRO: Windows CE 2.0 devices offer support for color, and porting applications is made easier given the OS's shared elements with Windows 95. Also, a built-in keyboard makes data entry much more convenient.
CON: These devices are larger and bulkier than PalmPilot-class units, and battery life for color devices is a quarter to a half that of monochrome units. Though the built-in keyboard is better than a stylus for data input, the tight spacing between keys (compared with desktop keyboards) makes it uncomfortable for anything but short memos or e-mail.

Actual Size

Peripheral
your notebook into an early retirement?

been around for a long time, this category didn't find broad appeal until fairly recently. Significant attention came to the class in 1996 with Microsoft's introduction of Windows CE for HPCs. The OS was a response to common weaknesses in previous HPCs, such as the lack of applications and a babble of proprietary operating systems.

Windows CE shares the look and feel and some programming elements of Windows 95, but the two are not identical. Applications must be rewritten for Windows CE. But at least theoretically,

because of the shared elements, Windows CE eases the porting task. Unfortunately, Windows CE 1.0 became more notable for its limitations than for its features: It lacked color support and a spell-checker, and printing was often nearly impossible.

As users waited for an improved Windows CE, the pocket-size 3Com Palm-Pilot, with its proprietary OS, caused a sensation in the hand-held market when it was launched in January of 1996. The

FRANKLIN REX-3-DS PC COMPANION.
PRO: All your PIM data fits in a compact and ultra-portable device. This unit is no bigger than a business card holder, weighs just 1.4 ounces, and runs for months.
CON: This is a read-only device: You can't enter any new data into the Rex-3-DS, nor does it yet have the broad application support that PalmPilot, Psion, and Windows CE devices have.

Editors' Choice

- Franklin Rex-3-DS PC Companion
- Psion Series 5 Handheld Computer
- 3Com PalmPilot Professional

PC MAGAZINE EDITORS' CHOICE

Our three Editors' Choice winners run the gamut of the hand–held market and range from the tiny read–only Franklin Rex-3-DS PC Companion ($180 street) to the stylus-based 3Com PalmPilot Professional ($370 street) to the full-featured Psion Series 5 Handheld Computer ($600 street) with a built-in keyboard.

The Rex-3-DS offers super portability and minimum bulk. The unit lets you store and view PIM information (up to 3,000 contacts, tasks, or appointments), all in a Type II PC Card. The Rex-3-DS is a read-only device; you input new data to your PC and then update the unit. Synchronization is painless: Use either a serial connection or a PC Card slot.

If you want a choice you can occasionally input new data into but still don't want much bulk, then the PalmPilot is for you. Just 5.7 ounces, the PalmPilot fits neatly into a suit pocket. The device offers you a notepad as well as access to your PIM data and e-mail (with the optional modem). Use either the virtual keyboard or the Pilot's Graffiti handwriting recognition software to enter new data. Synchronization back to your PC is painless with the supplied cradle and software; you can also synch up through the optional modem or LAN kit. The wide range of third-party applications and accessories available are also a boon.

The monochrome Series 5 is for those who can't do without a built-in keyboard but don't need the functionality or weight of a notebook PC. The unit runs on Psion's own EPOC32 OS, but using or transferring Windows files is not a problem. Spreadsheet, word processor, and database applications are built-in, just as with Windows CE devices, and you also get a built-in voice recorder. Windows CE 2.0 devices show a lot of promise, but for now none that we tested surpass the Series 5's balance of features, price, and battery life.

The Apple MessagePad 2100 ($1,150 street) earns an honorable mention. This monochrome stylus-based unit is larger than most of the tested devices, but it has truly usable handwriting recognition software as well as the best backlight we saw. An external keyboard is optional. The unit is compatible with both Mac and Windows, and a host of third party software is available.

PalmPilot's utter simplicity and fast data synchronization features helped it gain a huge market share and brought awareness of HPCs to a wider audience.

Windows CE 2.0, which finally shipped in October of 1997, offers a number of enhancements. The vastly improved Web browser and support for color and 16-gray-scale displays, True-Type fonts, Ethernet connectivity, and e-mail attachments have led to a new class of more robust Windows CE hand-held PCs. The OS is also gathering ISV support.

Despite these improvements, Windows CE 2.0 faces serious challenges: It has to contend with popular rivals such as the PalmPilot, which has loads of ISV support, and it has to compete with devices such as electronic organizers with augmented features, which cost a third or half as much as some Windows CE units. In addition, Psion's robust EPOC32 operating system (used by the Geofox and Psion devices we review), many years old and designed from the ground up for HPCs, also has features and third-party applications that rival those found in Windows CE 2.0.

REVIEW CRITERIA

For this roundup, we looked at devices that provide PIM and scheduling functions and then offer significant additional features. The single exception was the Franklin Rex-3-DS PC Companion, a read-only PC Card–size organizer that is in a category by itself.

Our filter netted us four keyboard-input HPCs: The Geofox-One Professional and the Psion Series 5 Handheld Computer both run Psion's EPOC32 OS, whereas the Casio Cassiopeia A-20 and the color HP 620LX Palmtop PC run Windows CE 2.0. We review two pocket-size pen-based devices: the Texas Instruments Avigo 10 and the 3Com PalmPilot Professional. We also looked at the Apple MessagePad 2100, a larger pen-based unit.

The three remaining devices look like cellular phones, but all provide some form of Internet connectivity and store PIM data. The Nokia 9000i Communicator stores data locally and opens to reveal an LCD screen and a QWERTY-style keyboard, whereas the two dual-mode cellular phones from Mitsubishi and Samsung work with the AT&T PocketNet Service to provide access to data stored in a secured server (as discussed in our PocketNet review).

Although many Windows CE 2.0 HPCs were announced in late 1997, not all were available as production-level units in time for this roundup. The units we review are representative of this type of system, but for a broader view, we also cover

SUITABILITY TO TASK

Note that not all of the units in this roundup will have full Suitability to Task ratings. (*N/A* means "Not applicable: The product does not have this feature.") For the units that can be judged by these categories, our ratings are as follows:

General use covers ease of use in performing such tasks as file management, note-taking, updating contact lists and address books, creating To Do lists, and taking notes on a memo pad.

Field/mobile use reflects the unit's battery life, weight, dimensions, and rugged design. Systems rated *excellent* also offer mobile communications.

Systems rated *excellent* in **handwriting recognition** have no-training and training scenarios, as well as great accuracy.

Communications reflects the unit's capability to synchronize data with a desktop. Its communications via a modem or IR port were also tested. A system rated *excellent* will also have fax, cellular, and e-mail capabilities.

four forthcoming units in the sidebar "Near-Final Windows CE 2.0 Services." Other Windows CE 2.0 units not available for this roundup include the Compaq C-Series PC Companions, the monochrome HP360LX, the Hitachi Hand-held PC, the LG Phenom Plus, and the Novatel C-O-N-T-A-C-T.

THE NEXT LEVEL

The HPC category continues to broaden, thanks mostly to Windows CE. The OS will soon appear in unexpected places—such as in your car. Microsoft's Auto PC's (A/PCs) will combine your car stereo with a Windows CE computer. In addition to a touch screen and standard audio functions, A/PCs will respond to speech commands and support GPS devices for navigation and route-mapping functions. Intel is working on a similar concept, the Connected Car, which will be OS-independent.

Microsoft's Jupiter project will bring the Windows CE OS to a larger computer format, similar in size to Toshiba America's Libretto series of mininotebooks. These units will offer larger displays and more user-friendly keyboards than HPCs. Finally, Microsoft's Palm PCs (P/PCs) will port Windows CE to pen-based organizers with size and functionality similar to the PalmPilot. Some P/PCs, from companies such as Casio, Everex, Philips, and others, will be announced by the time you read this. A/PCs and Jupiter products probably won't be available commercially until mid or late 1998. (For more information, see Trends in this issue.)

WHAT DO YOU NEED?

HPC vendors will readily admit that their devices are not meant as full-time notebook replacements. The target user is someone who needs quick access to PIM data, reasonable access to e-mail, and the ability to view and edit small files.

The Rex-3-DS does an admirable job of keeping itself out of your way while still keeping PIM data handy, but it is a read-only device. The Avigo and the PalmPilot offer quick synchronization with desktop data, but we find pen-based input is best for those intending to do minimal data entry.

The Apple device, the Psion, and the Windows CE units offer a wider range of features on top of PIM and scheduling functions, which include scaled-down versions of familiar word processing and spreadsheet applications, but in a larger, heavier format. The enhanced phones we review provide a solution for those needing 24-hour access to personal, corporate, or financial data—if they're within the range of a supporting cellular and digital network.

In the end, you may decide to buy more than one of these devices, since none of them cover all of the bases. The only limit is the thickness of your wallet.

Our Contributors: ROBERT S. ANTHONY is a senior writer at *PC Magazine*. BRUCE BROWN is a contributing editor, and CADE METZ is a senior staff writer for *PC Magazine*. RICH FISCO was the project leader, and ANUSH YEGYAZARIAN was the associate editor in charge of this story.

Apple MessagePad 2100

At 22.4 ounces, the Apple MessagePad 2100 is the heaviest unit we reviewed. The $1,150 street price also makes it the most expensive unit of our tested configuration (the base unit is $1,000), and at 1.1 by 4.7 by 8.3 inches, it is one of the largest. The unit is, in several aspects, the slickest and most cleverly designed HPC of the bunch, however. (No surprise for some, since Apple has been in this market since its inception.) The MessagePad's connectivity, expandability, and abundance of useful built-in applications make it a good choice, particularly for those working in mixed computer environments: The unit is compatible with Windows 3.1, 95, and NT, and with Apple Macintosh.

SUITABILITY TO TASK	
Apple MessagePad 2100	
General use	Good
Field/mobile use	Good
Handwriting recognition	Excellent
Communications	Fair

The MessagePad runs the Newton 2.1 OS. Standard applications, including a word processor and spreadsheet, calculators and conversion formulas, PIM, and connectivity software are stored in the 8MB ROM, and user applications and data can be saved in the standard 4MB DRAM, in the 4MB flash RAM, or on optional 2MB or 4MB flash storage PC Cards. The two Type II PC Card slots can also accept modems or pre-programmed cards with customized applications. A lot of third-party software is also available for the unit.

A removable lid protects a generous 16-shade 4.9- by 3.3-inch display, which lights up brightly when the backlight is on. The screen can work in either portrait or landscape mode and accepts input from an on-screen keyboard via a trainable handwriting recognition engine or an optional $80 external keyboard (price included above). The unit's four double-A alkaline batteries should run for six weeks of normal use or up to 24 hours of continuous use.

The system's handwriting recognition software worked well and is easy to use and simple to adjust for cursive or printed text. As a matter of fact, this is the only unit to allow cursive text input, and it even lets you select the spacing between letters. The sound played back by the built-in voice recorder is somewhat scratchy, though.—*Bruce Brown*
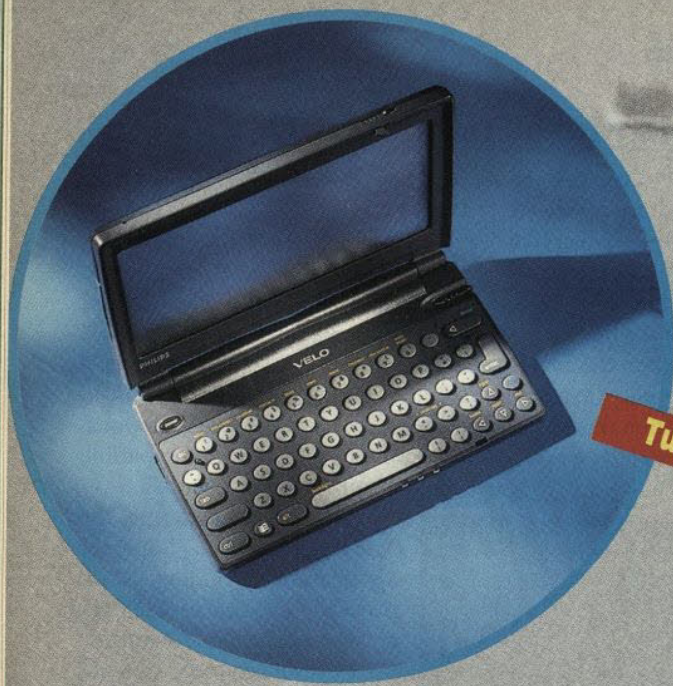
Apple MessagePad 2100. Street price: $1,150. Apple Computer Inc., Cupertino, CA; 800-538-9696, 408-996-1010; www.newton .apple.com. *Choose 570 at www.pcmag .com/infolink.*

▶ **The Apple MessagePad 2100 has a great, bright display and excellent handwriting recog-nition software.**
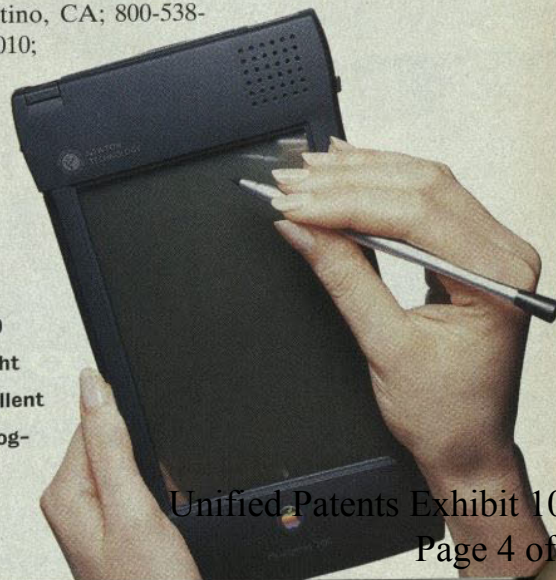
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AT&T PocketNet Service

If your area is covered, AT&T PocketNet Service offers you a convenient service that is bound to improve and proliferate. PocketNet works with dual-mode analog cellular voice and CDPD data phones, which can be used to access e-mail alerts and the e-mail forwarded to PocketNet, PIM data stored on a private section of AT&T's Web site (no data is stored locally), and surprisingly data-rich information sites. Security includes password protection for the Web site and e-mail, and authentication codes for voice data; other data is sent with authentication and encryption.

Subscribers choose one of two similar 9.6-ounce phones, from either Mitsubishi or Samsung ($300 street). PocketNet Service costs $29.99 per month for unlimited data access (cellular phone service must be contracted separately, and can be quite costly).

On your private Web site, you can create and store up to 5,000 contacts, viewable and editable from the phone or desktop; you can also synchronize contacts and schedules from major PIMs via Puma Technology's IntelliSync for AT&T PocketNet ($69.99 list). The e-mail and other messages you receive can also be forwarded to a fax machine for hard copy. The Web sites accessible through PocketNet use a special format to allow you to view them. When you have a good digital connection, the sites offer quick access to sports, news, financial, travel, and entertainment data. Check with AT&T for a complete list of accessible sites. Seventy U.S. metropolitan markets are covered (exceptions are Atlanta, Kansas City, Los Angeles, and New Orleans).

Although the phone can also function as a pager, but delays caused by Internet traffic could make it unfeasible for transmitting truly urgent messages. Navigating the PocketNet menus with the phone's buttons and entering data via the keypad were both reasonably easy, though not suitable for significant amounts of data entry.—*BB*

AT&T PocketNet Service. Street price: Telephone, $300; service, $29.99 per month. AT&T Wireless Services, Kirkland, WA; 888-328-2288, 425-803-4000; www.att.com/pocketnet/. *Choose 571 at www.pcmag.com/infolink.*

Casio Cassiopeia A-20

A marked improvement over Casio's original line of Windows CE 1.0–based Cassiopeias, the Casio Cassiopeia A-20 ($600 street) is a perfectly adequate Windows CE 2.0 HPC. Although it comes with a large and useful software bundle, the unit's features do not match up well against the more robustly equipped competition.

The 15.2-ounce Cassiopeia's 8MB of RAM and 8MB of ROM (both at system maximum) and the size of its screen (6.2 inches wide, 640-by-240) compare well with most Windows CE 2.0 HPCs. But the 4-gray-scale, passive-matrix display pales in comparison to the 16-gray-scale and 256-color displays on other Windows CE 2.0 units we saw. The unit does have a backlight, though.

The Cassiopeia's keyboard offers fairly responsive rectangular "Chiclets"-style keys with a 12-mm key pitch, and its embedded function keys are labeled with blue icons. The system comes with a serial cable to connect with a desktop PC. The serial port is protected by a slide-away door.

A Casio Bonus CD includes Symantec's Norton pcAnywhere (CE remote-control software), bFAX Professional (fax software), LandWare Virtual Courier Lite for Desktop cc:Mail and Microsoft Mail/Exchange, and a handful of other titles. The CD also includes a software patch to correct a minor problem with the unit's backlight switch. Additional software is available to registered owners at the company's Web site.

The Cassiopeia lacks a built-in modem but includes a standard Type II PC Card slot and a Compact Flash card slot. Near the rear IR port is a tiny jack for connecting to Casio QV-series digital cameras ($300 to $700 street). Also integrated on the unit is a digital audio recorder.

Casio claims 25 hours of use with two standard double-A alkaline batteries. The unit ships with an AC adapter and a lithium ion battery pack.—*Robert S. Anthony*

Casio Cassiopeia A-20. Street price: $600. Casio Inc., Dover, NJ; 888-204-7765, 973-361-5400; www.casiohpc.com. *Choose 572 at www.pcmag.com/infolink.*

| SUITABILITY TO TASK			
AT&T PocketNet Service		**Casio Cassiopeia A-20**	
General use	Poor	General use	Fair
Field/mobile use	Good	Field/mobile use	Fair
Handwriting recognition	N/A	Handwriting recognition	N/A
Communications	Fair	Communications	Fair

◄ **AT&T PocketNet Service** can be convenient if you live and work within a covered area.

► The Cassiopeia's 4-gray-scale display is lacking compared with the 16-gray-scale and color displays found on its competitors.
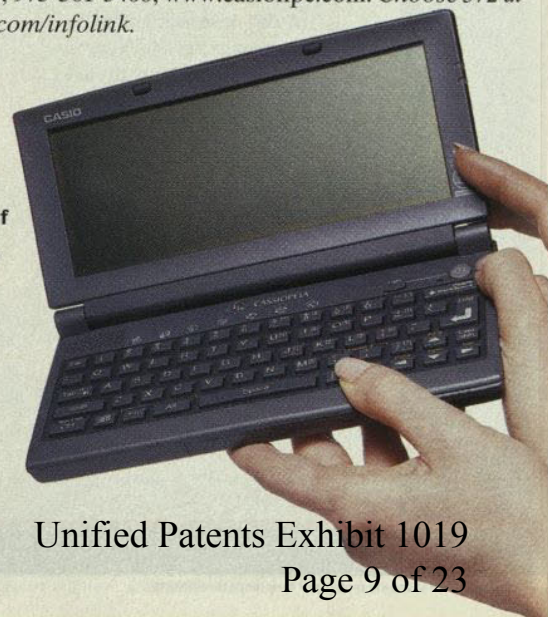
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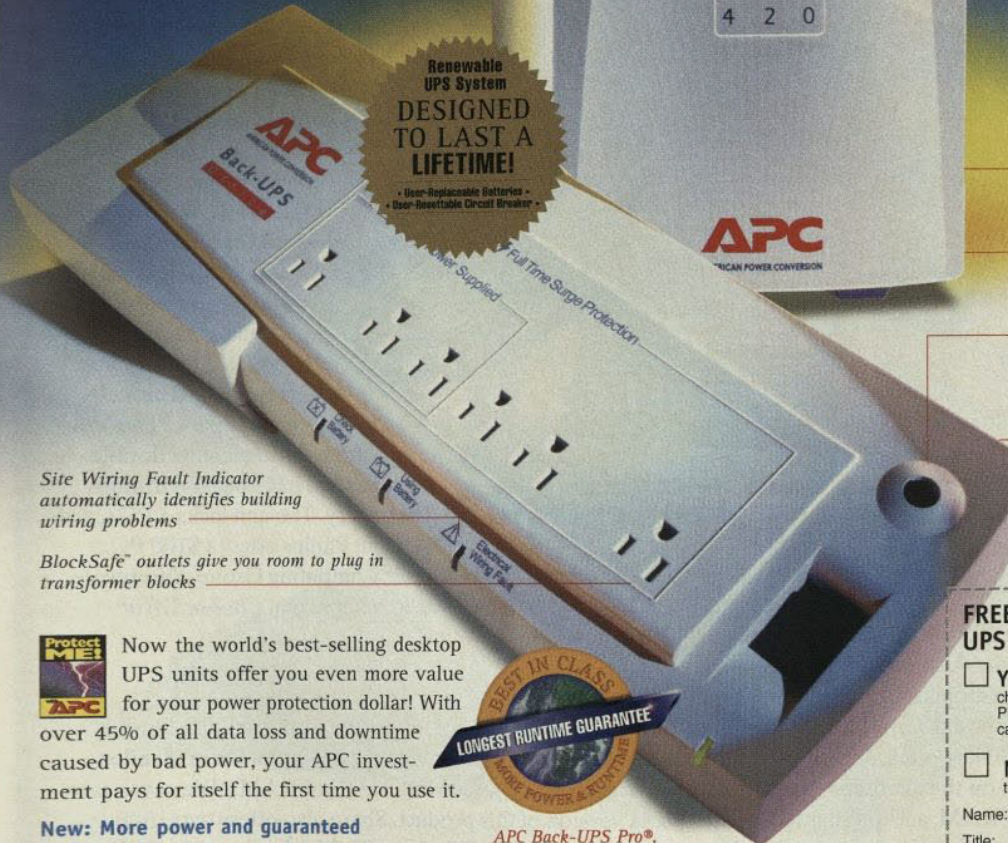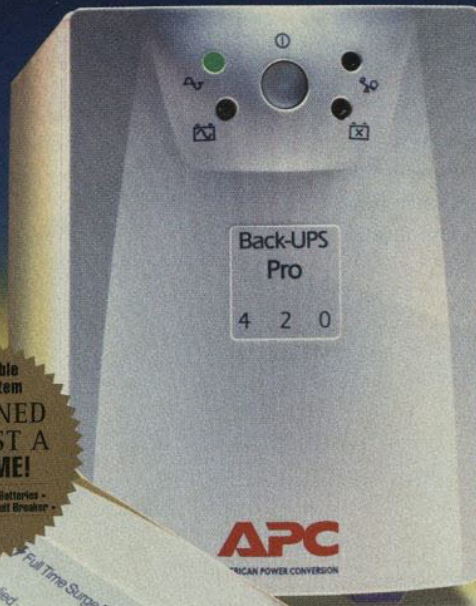
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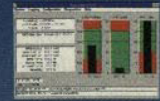
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Near-Final Windows CE 2.0 Devices

By Robert S. Anthony

The Fall Comdex '97 show in Las Vegas was teeming with *announced* Windows CE 2.0 hand-held PCs, but many were not in final production in time for this roundup. But we did acquire a few almost-ready HPCs, most of which will be ready for sale by the time you read this.

NEC MOBILEPRO 700 SERIES

NEC Computer Systems Division opens a new class of larger, more finger-friendly Windows CE 2.0 HPCs with its **NEC MobilePro 700** series. The near-ready, 24-ounce, four-gray-scale monochrome MobilePro 700 ($699 direct) and the early prototype of the 28.8-ounce MobilePro 750C, a color unit, feature backlit 7-inch-diagonal, 640-by-240 displays that are significantly larger and more readable than the 6.5-inch displays on most Windows CE 2.0 HPCs. Each unit has programmable function keys and comes with a stylus.

Clockwise from top: The NEC MobilePro 750C, Sharp Mobilon HC-4500C, Philips Velo 500, and NEC MobilePro 700.

The 9.6-inch width of each unit allows for a responsive keyboard with 12 separate function keys and a 16.5-mm key pitch. By contrast, a standard desktop keyboard has a 19-mm key pitch. The Windows 95–based Toshiba Libretto 70CT mininotebook has a 15-mm key pitch. Windows CE devices have a 14-mm key pitch, on the average.

Each unit comes with 8MB of RAM, a 33.6-Kbps low-power hardware fax modem with a phone jack, and a digital audio recorder. With Microsoft Pocket PowerPoint and other applications that support the built-in VGA port, you can send color graphics to an external monitor.

NEC claims that two double-A batteries will last 30 hours in the MobilePro 700. The MobilePro 750C, expected to sell for less than $1,000, comes with a lithium ion battery pack; battery life should be 10 to 12 hours. The color unit is not expected to ship until mid-1998. (NEC Computer Systems Division of Packard Bell NEC, Boxborough, MA; 888-863-2669, www.necnow.com. *Choose 576 at www.pcmag.com/infolink.*)

PHILIPS VELO 500

Philips Mobile Computing Group offers the **Philips Velo 500**, a revision of its Windows CE 1.0 unit the Velo 1. The Velo 500 ($640 street with 16MB of RAM) comes with a larger, backlit 640-by-240, 16-gray-scale monochrome display. The Velo 500 maintains the Velo 1's shape and built-in software modem but speeds the modem up from 19.2 Kbps to 28.8 Kbps and moves the flip-open jack to the back of the display panel. Also included is a digital audio recorder.

The Velo 500 has 61 small but responsive oval-shape keys, with a 12-mm key pitch. The 15.3-ounce unit has two Miniature Card slots for ROM or RAM upgrades and comes with a docking station with a serial cable for desktop PC connectivity.

Like most Windows CE units, it offers quick-launch application buttons and a stylus. Philips claims 12 to 15 hours of battery life with the standard nickel hydride battery pack. The Velo can also use two alkaline double-A batteries and has a backup lithium ion battery. The unit lacks a PC Card slot, but Philips offers a $100 PC Card module. (Philips Mobile Computing Group, Sunnyvale, CA; 888-367-8356; www.velo.philips.com. *Choose 578 at www.pcmag.com/infolink.*)

SHARP MOBILON

Sharp Electronics Corp. offers the Mobilon line of hand-held PCs, which top out with the 256-color **Sharp Mobilon HC-4500C** ($1,000 street with 16MB of RAM). We saw a late beta version of this product. Sharp also offers two 16-gray-scale monochrome Windows CE 2.0 Mobilons: the $600 **HC-4000** (4MB of RAM) and the $700 **HC-4100** (12MB of).

Each Mobilon comes with a built-in 33.6-Kbps fax modem with a pop-open phone jack, and a Type II PC Card slot. The HC-4500 comes with a lithium ion battery pack, and the monochrome units come standard with double-A batteries. The monochrome units have a claimed battery life of 25 hours.

The HC-4500's keyboard offers ample feedback and has seven separate function keys for quick access to major applications. Our unit also came with the Sharp CE-AG04 Color Digital Camera Card ($400), which slides into a Type II PC Card slot and turns the Mobilon device into a complete photo-editing system, with the aid of the included editing software. The camera supports 16.7 million colors at a 640-by-480 image resolution. (Sharp Electronics Corp., Mahwah, NJ; 800-237-4277; www.sharp-usa.com. *Choose 580 at www.pcmag.com/infolink.*)

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Franklin Rex-3-DS PC Companion

One of our Editors' Choice winners, the Franklin Rex-3-DS PC Companion ($180 street) is the least expensive and most portable PDA in this roundup. By design it's also the most limited in functionality: The Rex-3-DS, a PC Card, is a lookup-only device for contacts, tasks, appointments, and short memos. Unlike with the PalmPilot, you cannot enter new information into the Rex-3-DS itself. The unit is right for mobile professionals who don't want to carry a PalmPilot or care about the Rex-3-DS's inability to accept new data without synchronizing with a host PC. The unit's portability—it fits in your wallet—and ease of use can't be beat.

Powered by two lithium watch batteries rated for six months' use, the Rex-3-DS can store up to 3,000 contacts, tasks, or appointments. The 1.4-ounce device is a Type II PC Card with a 1.3- by 2.1-inch, non-backlit, monochrome, high-contrast LCD screen that displays approximately nine lines of 32 characters each. Five flush-mounted navigation buttons are spaced far enough apart for use with gloves on. For users without a computer equipped with a PC Card slot, a small docking station plugs into a serial port. A small leather wallet with a tiny notepad is also included. A 750-item–model Rex-1 sells for $130 without the card dock.

Starfish Software's Rex Information Manager, included with the Rex-3-DS, is a powerful PIM and synchronization program that can import files from other major PIMs and contact managers such as ACT! 3.06, Lotus Organizer 97, Microsoft Outlook 97, Schedule+ 7.0, and Sidekick 98. After the files are imported, synching with the Rex-3-DS takes just seconds, even with a test file of almost 2,000 contacts. Starfish Software will offer a $50 utility for direct synchronization with Microsoft Outlook 97 and Schedule+ 7.0, probably by the time you read this.—*BB*

Franklin Rex-3-DS PC Companion. Street price: $180. Franklin Electronic Publishers, Burlington, NJ; 888-739-6400, 609-386-2500; www.franklin.com/rex. *Choose 573 at www.pcmag.com/infolink.*

Geofox-One Professional

The Geofox-One Professional ($799 direct) uses Psion's operating system EPOC32 and includes all the programs and functionality of the Psion Series 5, including voice recording, database capabilities, and word processing, and adds a standard 33.6-Kbps PC Card modem. Pleasant to use, with a larger-than-usual screen for an HPC, the Geofox-One is bested only in terms of size by its more compact competitors.

The unit weighs only 13.7 ounces and is just 0.8 inches thick and 7.4 inches wide, but its 4.7-inch depth makes it too big to fit in a jacket pocket or even to carry conveniently in many handbags. The unit does come with an AC power adapter equipped with plugs for Europe, the United Kingdom, and the United States, however. A Type II PC Card slot holds the modem and can also accept removable memory cards. Battery life is 25 hours without the modem or backlighting.

The greatest difference between the Geofox-One and most PDAs and HPCs is its screen size. The 6.8-inch-diagonal, 640-by-320 monochrome LCD has minimal backlighting that does not do much good in dim light, but its greater-than-average size and 16-shade gray scale help visibility significantly. The keys have a spacing of just over 14 mm and, with a separate numeric keypad, make writing notes and answering e-mail fairly easy.

Word and Excel files can be converted smoothly via the file-transfer program and the Geofox-One can also run third-party applications written for the Psion Series 5. Instead of a touch screen, the Geofox-One uses an integrated GlidePoint touch pad for navigation. Users accustomed to notebook PCs may feel at home with the touch pad, but in the world of HPCs, touch screens tend to be faster.—*BB*

Geofox-One Professional. Direct price: $799. Geofox Inc., Austin, TX; 888-443-6369, 512-451-5055; www.geofox.com. *Choose 574 at www.pcmag.com/infolink.*

SUITABILITY TO TASK			
Franklin Rex-3-DS PC Companion		**Geofox-One Professional**	
General use	Poor	General use	Fair
Field/mobile use	Good	Field/mobile use	Good
Handwriting recognition	N/A	Handwriting recognition	N/A
Communications	N/A	Communications	Good

◀ The Rex-3-DS's unique PC Card form makes it very convenient; the navigation buttons are well spaced.

▶ The Geofox-One's backlight could be better, but its large, 16-gray-scale display helps clarity.
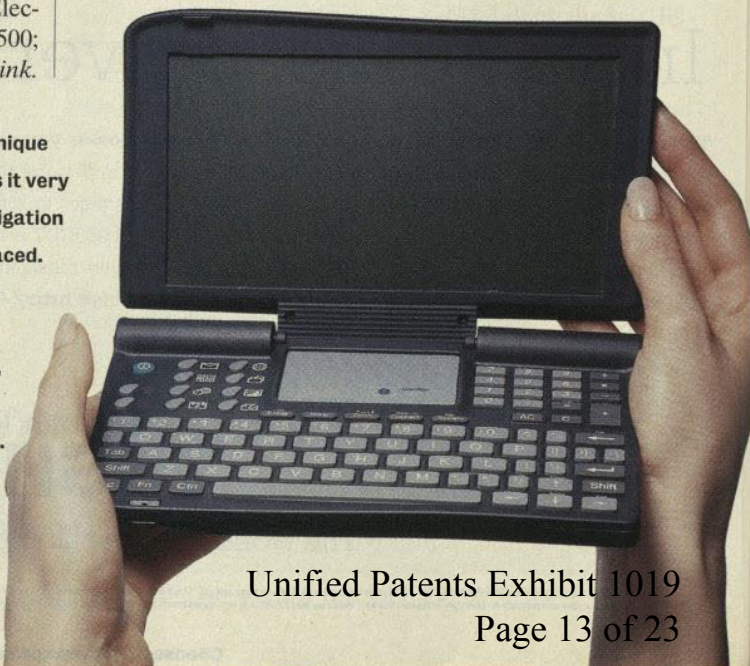
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CAN WE BUILD ONE FOR YOU?

HP 620LX Palmtop PC

Hewlett-Packard, the first to market with a wide-screen Windows CE HPC, in the form of last year's monochrome HP 320LX, is the first to push the envelope again, with its color HP 620LX Palmtop PC ($900 street). The 620LX comes with 16MB of RAM, which goes up to 26MB maximum. The unit's clear, 256-color, 640-by-240 display and its many quick-launch buttons set it in a class above most Windows CE 2.0 HPCs.

At 20.6 ounces including its lithium ion battery pack, the black 620LX is slightly heavier than most HPCs but is not much thicker or wider. To the right of the backlit 6.5-inch display is a narrow "hard icon panel" with four buttons for quick access to brightness, contrast, and audio, and e-mail, fax, and file-locator functions. Eight hard icons on a "quick launch pad" above the keyboard offer access to standard Windows CE applications such as Pocket Excel and Pocket Word. The 620LX also comes with a full version of Bsquare bFAX Pro 3.01, HP's Month-at-a-Glance-Plus, which adds new views to the standard Windows CE 2.0 calendar application, and On The Go Software's Pocket Quicken ExpensAble, which tracks business expenses and can export the data to Intuit's Quicken.

The unit's keys are angled up slightly from front to back and are reasonably set for touch-typing. Data can be synchronized with a desktop PC via an included serial cable, which can connect directly to the HPC or to the unit's bundled quick-connect docking cradle. With the unit's included software, data can also be imported from older HP handheld products.

HP claims 5.5 hours of battery life with the standard battery pack (most monochrome Windows CE devices average over 20 hours); this goes up to 11 hours with an optional lithium ion battery pack ($120 street). The unit also comes with a CD-ROM–based guide.—*RSA*

HP 620LX Palmtop PC. Street price: $900. Hewlett Packard Co., Palo Alto, CA; 800-443-1254, 408-246-4300; www.hp.com/handheld. *Choose 575 at www.pcmag.com/infolink.*

Nokia 9000i Communicator

Combining a hand-held computer, a digital cellular phone, and fax capabilities, the Nokia 9000i Communicator is a versatile multipurpose device. Sold by various digital telephone providers, the 9000i's street price ranges from $850 to $1,000, plus monthly charges for telephone, fax, and data service. If you're in an area with GSM coverage in the U.S., the 9000i's compelling range of features make it especially useful as a self-contained organizer and multifaceted communications device.

With the case closed, the 14-ounce 9000i looks like a fat cellular phone at 1.5 by 6.5 by 2.5 inches, but opening the cover reveals a 1.4 by 4.5-inch LCD screen and a full but tiny QWERTY keyboard with numerous navigation and selection keys and on-screen menu items. Typing on the tiny keyboard is somewhat more difficult than on the other HPCs. Keys switch between major functions, including telephone, fax, SMS (short message/pager service for 160-character messages), the Internet, contacts, notes, and calendar—all easy to use—plus a variety of applets including a calculator, clock, and conversion calculator.

The 9000i runs on the GeoWorks OS and has an Intel 386/24 CPU and 8MB of memory, with 2MB of that for user documents. In addition to being a digital telephone, if you contract for all services, the unit can send and receive text-based faxes and can access the Internet, including the Web. No special programming is required by Web site creators, though the 9000i's limited graphics support on its ten-line nonbacklit monochrome screen makes some pages difficult or impossible to read. To back up or synchronize data (via Puma Technology's IntelliSync, optional), you can communicate with a conventional PC through an IR port or an optional serial cable connection.—*BB*

Nokia 9000i Communicator. Street price: $850 to $1,000 (depending on provider); Nokia Inc., Dallas; 800-665-4228, 972-257-9800; www.nokia.com. *Choose 577 at www.pcmag.com/infolink.*

SUITABILITY TO TASK			
HP 620LX Palmtop PC		**Nokia 9000i Communicator**	
General use	Good	General use	Good
Field/mobile use	Fair	Field/mobile use	Good
Handwriting recognition	N/A	Handwriting recognition	N/A
Communications	Fair	Communications	Good

◄ The HP 620LX Palmtop PC has a great, clear 256-color display, but its battery life needs improvement.

► The dual functionality of the Nokia 9000i Communicator is appealing, but its keyboard was more difficult to type on than most.

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Windows Magazine, 8/97

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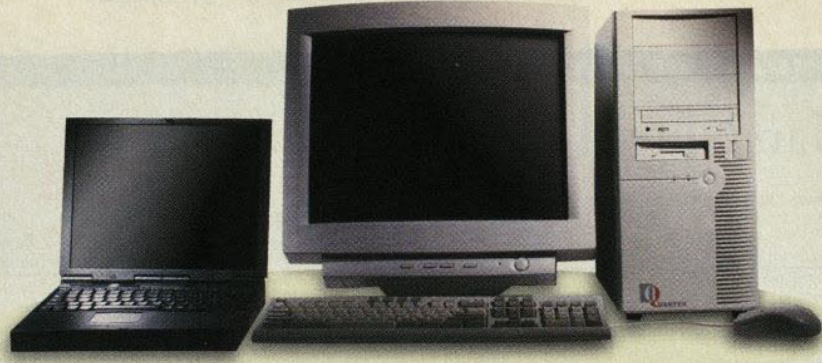
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- 104-Key Keyboard with MS IntelliMouse
- MS Windows 95 with MS Plus
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- 128-bit Riva 128 3D AGP Graphics Card with 4MB SGRAM
- 17" Digital Monitor (15.8" viewable)
- Choice of Intel PRO 100 PCI Ethernet Adapter with Wake-On-LAN* Technology or K56flex protocol Fax/Modem*
- 32X Max EIDE CD-ROM Drive
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- MS Office '97 Small Business Edition
- 3-year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- QSentry Technology (Including Intel LANDesk Client Manager V.3.1)

QP6/300 SB-3 (w/ Pentium® II Processor)... $2149
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QP6/333 SB-4 $2599
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- PCMCIA K56flex protocol Fax/Modem*
- 20X Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95
- Corel Office Suite 8
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- 24-hr./7-day Technical Support
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- 24X Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- 2nd Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports
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- 19" Digital Monitor (18.1" viewable)
- K56flex protocol Fax/Modem* w/Voice Mail and Speakerphone
- Toshiba 2nd-Gen. DVD-ROM Drive w/DVD Decoder Board
- Ensoniq 32-Bit Wavetable Sound Card
- Altec-Lansing ACS-490 Speakers with subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows '95 with MS Plus!
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Page 18 of 23

SUMMARY OF FEATURES

Hand-Held PCs

Reviewed units   Sidebar units*

■ YES ■ NO

Products listed in review order by category

	Apple MessagePad 2100	AT&T PocketNet Service	Casio Cassiopeia A-20	Franklin Rex-3-DS PC Companion	Geofox-One Professional	HP 620LX Palmtop PC	Nokia 9000i Communicator	Psion Series 5 Handheld Computer
Price of tested configuration	$1,150 street	Telephone, $300 street; data access service, $29.99 per month	$600 street	$180 street	$799 direct	$900 street	$900 street	$600 street
Processor type/speed	StrongARM SA-110 / 162 MHz	N/A	Hitachi SH3 / 80 MHz	8-bit RISC / 4.3 MHz	ARM-7 CL-PS7110 / 18.4 MHz	Hitachi SH3 / 75 MHz	Intel 386 / 24 MHz	ARM 7100 / 18 MHz
Operating system	Newton 2.1	N/A	Windows CE 2.0	Proprietary	EPOC32	Windows CE 2.0	Geoworks Geos 3.0	EPOC32
Dimensions (HWD, in inches)	1.1 x 4.7 x 8.3	1.2 x 2.2 x 6.1	1.0 x 7.3 x 3.1	0.3 x 3.8 x 2.1	0.8 x 7.4 x 4.7	1.4 x 7.8 x 4.1	1.5 x 6.5 x 2.5	0.9 x 6.7 x 3.5
Weight with batteries	22.4 oz.	9.6 oz.	15.2 oz.	1.4 oz.	13.7 oz.	20.6 oz.	14.0 oz.	12.5 oz.
Spacing on built-in QWERTY keyboard	N/A	N/A	12.0 mm	N/A	14.0 mm	13.0 mm	13.8 mm	14.3 mm
Speaker/Microphone/Digital audio recorder	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Memory								
Installed/maximum RAM	8MB / 8MB	N/A	8MB / 8MB	288K / 288K	16MB / 16MB	16MB / 26MB	8MB / 8MB	8MB / 30MB
Installed/maximum ROM	8MB / 8MB	N/A	8MB / 8MB	128K / 128K	8MB / 8MB	10MB / 10MB	N/A	6MB / 6MB
Display								
Resolution	480 x 320 pixels	4 lines x 12 characters	640 x 240 pixels	160 x 98 pixels	640 x 320 pixels	640 x 240 pixels	640 x 200 pixels	640 x 240 pixels
Dimensions (HW, in inches)	4.9 x 3.3	0.9 x 1.6	2.5 x 6.2	1.3 x 2.1	3.2 x 6.1	2.5 x 6.5	4.5 x 1.4	2.0 x 5.3
Number of colors or shades of gray	16 shades of gray	1 shade of gray	4 shades of gray	2 shades of gray	16 shades of gray	256 colors	8 shades of gray	16 shades of gray
Backlight	■	■	■		■	■	■	■
Input/Output								
Serial interface/VGA out/Compact card slot	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Built-in PC Card slots	Two Type II	None	One Type II	None	One Type II	One Type II	None	None
Communication								
Built-in software or hardware modem	None	Hardware	None	None	None	None	Software	None
Built-in modem speed in Kbps (data/fax)	N/A	19.2/19.2	N/A	N/A	33.6/14.4	N/A	9.6/9.6	N/A
IrDA port	■	■	■	■	■	■	■	■
Power								
Batteries	Four AA alkaline batteries	Nickel hydride rechargeable battery pack	Two AA alkaline batteries	Two CR-2025 lithium ion watch batteries	Two AA alkaline batteries	Lithium ion battery pack	Two lithium ion batteries	Two AA alkaline batteries
Rated battery life	24 hours	In use, 1.5 hours; standby, 9 hours; off, 55 hours	25 hours	6 months	25 hours	5.5 hours	In use, 3.5 hours; standby, 35 hours; off, 1 week	35 hours
Battery charging time	N/A	30 minutes	N/A	N/A	N/A	4 hours	2.5 hours	N/A
Service and Support								
24-hour, 7-day live technical support	■	■	■	■	■	■	■	■
Standard warranty on parts/labor	1 year/1 year	90 days/90 days	1 year/1 year	2 years/2 years	3 years/3 years	1 year/1 year	1 year/1 year	1 year/1 year
One year on-site service included	■	■	■	■	■	■	■	
24-hour turnaround for parts replacement	■	■	■	■	■	■	■	

* These are preproduction units discussed in "Lightweight Newcomers Add Heavyweight Features."   N/A—Not applicable: The product does not have this feature.

Psion Series 5 Handheld Computer

One of our Editors' Choices, the Psion Series 5 Handheld Computer ($600 street) combines a clever design with a raft of useful applications and utilities written specifically for the operating system EPOC32. These applications are both included with the 8MB Series 5 and available from third parties. The company also licenses EPOC32 to the Geofox-One and to the Philips Mobile Computing Group for use with its GSM digital cellular phones. A powerful PDA that smoothly exports to and imports from Windows 95 and NT applications

◀ The Psion Series 5 Handheld Computer's slide-out keyboard and tilted screen make it especially user-friendly.

	Texas Instruments Avigo 10	3Com PalmPilot Professional	NEC MobilePro 700	NEC MobilePro 750C	Philips Velo 500	Sharp Mobilon HC-4500C
	$300 street	$370 street	$699 direct	$999 direct	$640 street	$1,000 street
	Proprietary	Motorola 68328 / 16 MHz	NEC VR 4102 / 54 MHz	NEC VR 4111 / 78 MHz	Philips PR 31700 / 75 MHz	Philips MIPS / 75 MHz
	Proprietary	Palm OS	Windows CE 2.0	Windows CE 2.0	Windows CE 2.0	Windows CE 2.0
	0.8 x 3.3 x 5.5	0.7 x 3.2 x 4.7	1.2 x 9.6 x 4.8	1.2 x 9.6 x 5.4	1.0 x 6.8 x 3.8	1.2 x 7.3 x 3.7
	7.0 oz.	5.7 oz.	24.0 oz.	28.8 oz.	15.3 oz.	17.3 oz.
	N/A	N/A	16.5 mm	16.5 mm	11.5 mm	14.0 mm
	■■□	■■□	■■■	■■■	■■■	■■■
	680K / 680K	1MB / 1MB	8MB / 32MB	16MB / 32MB	16MB / 24MB	16MB / 16MB
	1MB / 2MB	1MB / 1MB	16MB / 48MB	16MB / 48MB	16MB / 16MB	16MB / 16MB
	240 x 160 pixels	160 x 160 pixels	640 x 240 pixels	640 x 240 pixels	640 x 240 pixels	640 x 240 pixels
	3.5 x 2.3	3.3 x 2.5	2.6 x 6.9	2.8 x 7.6	2.4 x 5.4	2.3 x 6.0
	4 shades of gray	4 shades of gray	4 shades of gray	256 colors	16 shades of gray	256 colors
	■	■	■	■	■	■
	■■□	■■■	■■■	■■■	■■□	■□□
	None	None	One Type II	One Type II	None	One Type II
	None	None	Hardware	Hardware	Software	Software
	N/A	N/A	33.6/14.4	33.6/14.4	28.8/14.4	33.6/9.6
	■	□	■	■	■	■
	Two AAA alkaline batteries	Two AAA alkaline batteries	Two AA alkaline batteries	Lithium ion rechargeable battery pack	Nickel hydride rechargeable battery pack	Nickel hydride rechargeable battery pack
	1 month	8–12 weeks	30 hours	8 hours	12–15 hours	6 hours
	N/A	N/A	N/A	4–5 hours	2.5 hours	3 hours
	■	■	■	■	■	□
	1 year/1 year	1 year/1 year	1 year/1 year	3 years/1 year	1 year/1 year	1 year/1 year
	□	■	□	■	□	□
	□	■	□	□	□	□

Price of tested configuration For devices sold through resellers, assume that street prices will be 10 to 15 percent lower than list prices. Some vendors factor this discount directly into their quoted prices; in such cases we indicate that the cited price is a street price. All street prices are rounded to the nearest $10. Some vendors sell directly to customers. Such prices are listed as *direct* and are not discounted.

Operating system Windows CE is a more compact version of the Windows operating system, and it comes complete with "pocket" versions of Excel and Word. Psion's EPOC32 is a 32-bit operating system designed for the HPC platform. Most other devices are equipped with proprietary operating systems.

Spacing on built-in QWERTY keyboard The measurements we report indicate how much space there is between two keys, as measured from the center of one key to the center of the next. A standard keyboard has a spacing of 19 mm between each pair. As expected, most of these devices are not equipped with full-size keyboards. Please consult individual reviews for comments on usability.

Installed/maximum RAM Random access memory, the main memory in a computer, is the fastest of the various types of memory, and it is rewritable. It can be erased, however, when the power is shut off.

Installed/maximum ROM Read-only memory is programmed by the vendor at the factory and cannot be altered, even by a power outage. ROM is typically used to store the operating system.

Backlight A backlit screen aids visibility in low-light situations.

Built-in PC Card slots PC Card slots are necessary for adding memory, modem, or network cards. In cases where there are no built-in PC Card slots, an optional external device will often be available to add them.

IrDA port Infrared (IrDA) ports are useful for transferring data from the PIM application to your PC or for printing.

the included PsiWin 2.0, the Series 5 is a pleasure to use. A [basi]c connectivity program is also available for $79.

When you open the Series 5 case, the keyboard slides neatly [for]ward, and the screen rests at a tilted angle; the result is that the [uni]t seems larger when opened than expected. Weighing in at 12.5 [ou]nces and measuring 0.9 by 6.7 by 3.5 inches, the Series 5 is a rea[so]nable size to carry. Battery life is rated at 35 hours with two dou[ble]-A cells; an AC adapter is a $29 option.

Though some might consider the unit's inter[fac]e a limitation because it is not a Windows 95, [C]E, or NT clone, the unit's touch-screen appli[cat]ion and function icons facilitate system navi[ga]tion and control. Applications include a word [pr]ocessor and spreadsheet, plus PIM applica[tio]ns, a clock, a calculator, and a sketch pad.

The Series 5's 2- by 5.3-inch 640-by-240-resolution display has a backlight, and in normal room lighting or daylight the screen is quite visible. The unit's keys have a relatively generous 14.3-mm spacing, making the unit fine for creating notes and memos. A convenient voice recorder with ADPCM sound compression captures voice files at 4K per second (8MB of RAM holds 30 minutes of messages). Besides the 8MB of user data storage on our test unit, the Psion unit has a slot for solid-state flash-memory disks. Other options include a universal travel modem that plugs in to the unit's RS-232 port for $129 and a PC Card adapter for $139.—*BB*

Psion Series 5 Handheld Computer. Street price: $600. Psion Inc., Concord, MA; 800-997-7466, 978-371-0310; www.psion.com. *Choose 579 at www.pcmag.com/infolink.*

SUITABILITY TO TASK	
Psion Series 5 Handheld Computer	
General use	Excellent
Field/mobile use	Excellent
Handwriting recognition	N/A
Communications	Good

"Could you possibly
be any more

Texas Instruments Avigo 10

With the Texas Instruments Avigo 10 ($300 street), TI has all but duplicated the 3Com PalmPilot Professional (although it does not use a licensed design). Like its exemplar, the Avigo is a wallet-size device designed primarily for storing PIM data and sharing that data with your desktop PC. It lacks an on-screen writing pad and the abundance of third-party software and hardware the PalmPilot has, but it mirrors the PalmPilot in many other respects.

The Avigo even looks like the PalmPilot. Weighing 7 ounces and measuring 0.8 by 3.3 by 5.5 inches, its graphite-gray case has a backlit LCD and a scattering of push keys on the front. Four of these access the unit's primary, easy-to-use PIM applications: the address, schedule, to-do, and memo functions. Users access all the other software features, including an expense tracker, a simple spreadsheet, and a sketch application, via a row of on-screen icons.

Since the unit lacks a physical keyboard, entering PIM data can be tedious. To move around the screen, you must use a stylus pen and a pair of cursor keys. To input text you use a virtual on-screen keyboard: You can use either a straight QWERTY-style keyboard or one with dynamic T9 technology, which groups several characters together on each key and attempts to guess each word you want, but we found this system increases typing speed only slightly. Data can be transferred to or from your PC over a serial connection or via an IrDA port.

To export files to the Avigo from Lotus Organizer 97, the included desktop PIM package, you must use a version of Puma Technology's IntelliSync software. To export digital sketches or spreadsheets, you must launch the proprietary Avigo Manager. By contrast, the PalmPilot cannot handle sketches or standard spreadsheets at all just out of the box. The Avigo runs for four weeks on two triple-A batteries and has roughly 1MB of RAM.—*CM*
Texas Instruments Avigo 10. Street price: $300. Texas Instruments Inc., Dallas; 800-842-2273; www.ti .com/avigo. *Choose 581 at www.pcmag.com/ infolink.*
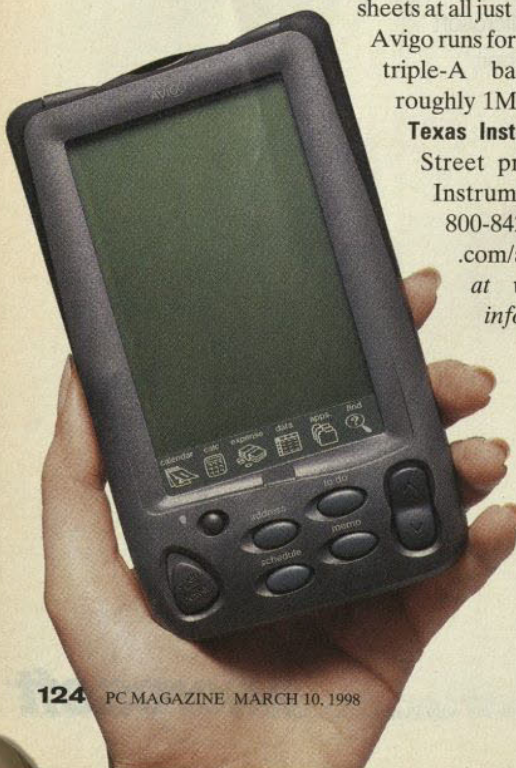
3Com PalmPilot Professional

Chalk one up to simplicity. The 3Com PalmPilot Professional ($370 street) has quickly become the market's leading hand-held computing device, despite a limited, proprietary operating system and the absence of a physical keyboard. The PalmPilot has attracted the following—as well as the support of over 3,000 software developers—because of its unaffected reliability. It also wins our Editors' Choice.

The 5.7-ounce unit is just a bit larger than a deck of playing cards. Externally, it consists only of a backlit LCD, six navigational keys, and a stylus. Several PIM application icons reside within the display. Standard PIM applications, an expense tracker, and an e-mail client are included. The latter lets you read, delete, compose, and organize messages; transmission requires additional software and an external 14.4-Kbps 3Com modem ($129 list).

The unit operates for 8 to 12 weeks on two triple-A batteries and has 1MB of memory—enough for 4,000 addresses, 2,400 appointments, 750 to-do items, and 750 e-mail messages. To enter data, use either the on-screen keyboard or the on-screen Graffiti-based writing pad, which responds to a form of shorthand and comes with a stick-on guide for easy reference. The software is usable, but it will take you time to learn to write the way the unit requires. 3Com claims a ramp-up time of about 30 minutes, which we found to be accurate.

Transferring data through a serial connection from the PalmPilot to your PC is straightforward and quick. To synch up, you can also use the 14.4-Kbps modem or an optional LAN kit ($69 list).

Lotus Notes support as well as myriad third-party applications and hardware add-ons, such as Motorola PageMart paging modules ($169 to $189 list), are also available. A version of the PalmPilot is available with 512K of RAM and no e-mail capabilities ($250 street).—*CM*
3Com PalmPilot Professional. Street price: $370. 3Com Corp., PalmPilot Division, Mountain View, CA; 800-881-7256, 847-676-1441; www.palm pilot.com. *Choose 582 at www.pcmag .com/infolink.* **PC**

SUITABILITY TO TASK			
Texas Instruments Avigo 10		**3Com PalmPilot Professional**	
General use	Good	General use	Good
Field/mobile use	Good	Field/mobile use	Good
Handwriting recognition	N/A	Handwriting recognition	Fair
Communications	Fair	Communications	Good

◄ **The Avigo lacks handwriting-recognition software and the third-party support of the PalmPilot, but it does come with built-in spreadsheet support.**
► **Synchronizing your PalmPilot and your PC is a snap using the included cradle and one-touch-launch HotSynch application.**