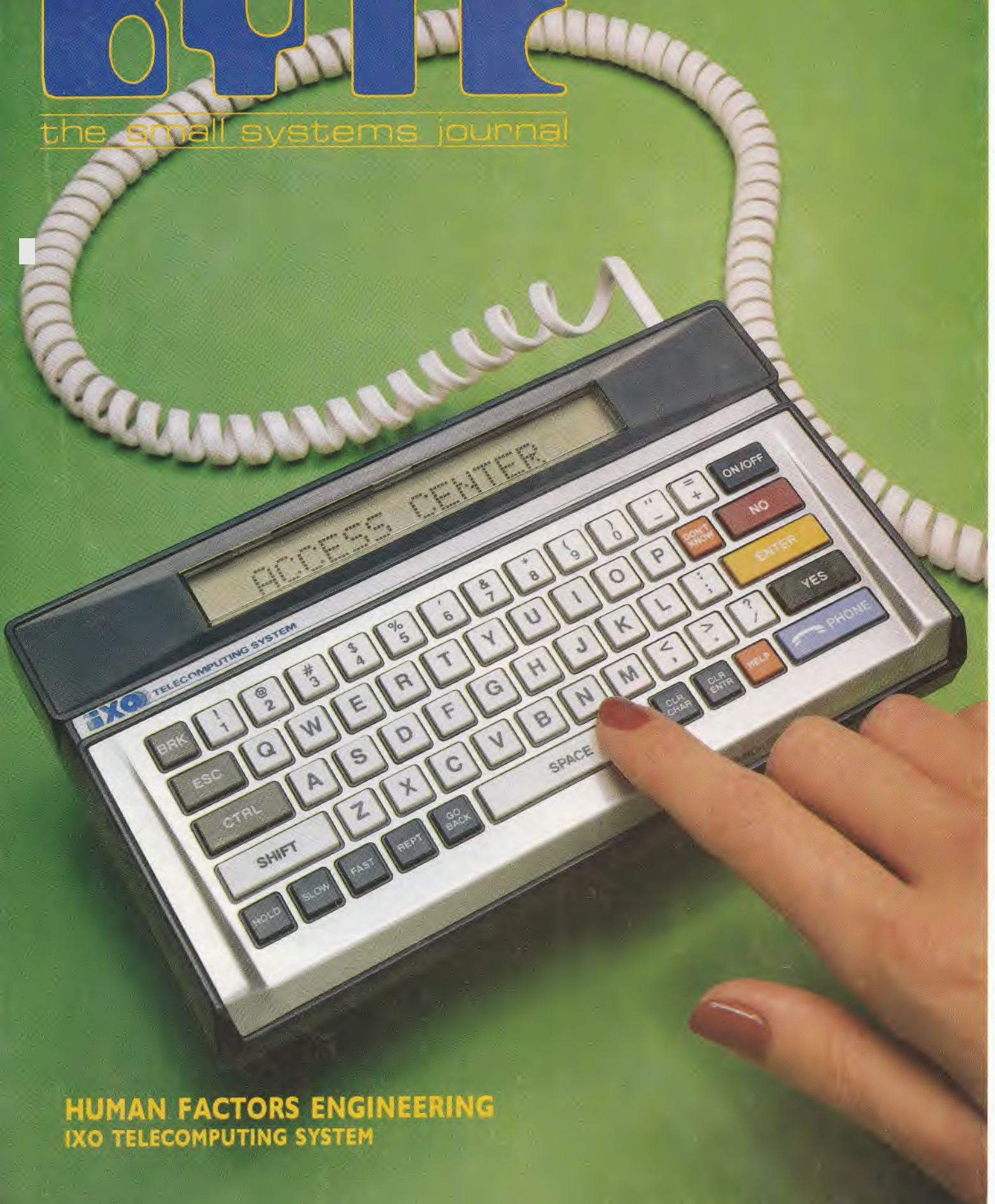


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HUMAN FACTORS ENGINEERING
IXO TELECOMPUTING SYSTEM

Editorial

A Revolution in Your Pocket

by Chris Morgan, Editor in Chief

Imagine a terminal that costs about \$500 and can:

- access the Source, CompuServe, Dow Jones, or other remote database or computer services
- automatically handle the protocols to access these services so that you need only enter your password to be online
- have a full ASCII character set
- have a built-in modem with autodialer and full- and half-duplex capability
- be able to emulate other terminals
- have an uninterruptible power supply
- fit in your pocket
- operate from a battery

Sounds amazing, doesn't it? Yet it's not fantasy; the product does exist. It's called the IXO Telecomputing System (hereafter referred to as the Telecomputer), and it's featured on our cover this month.

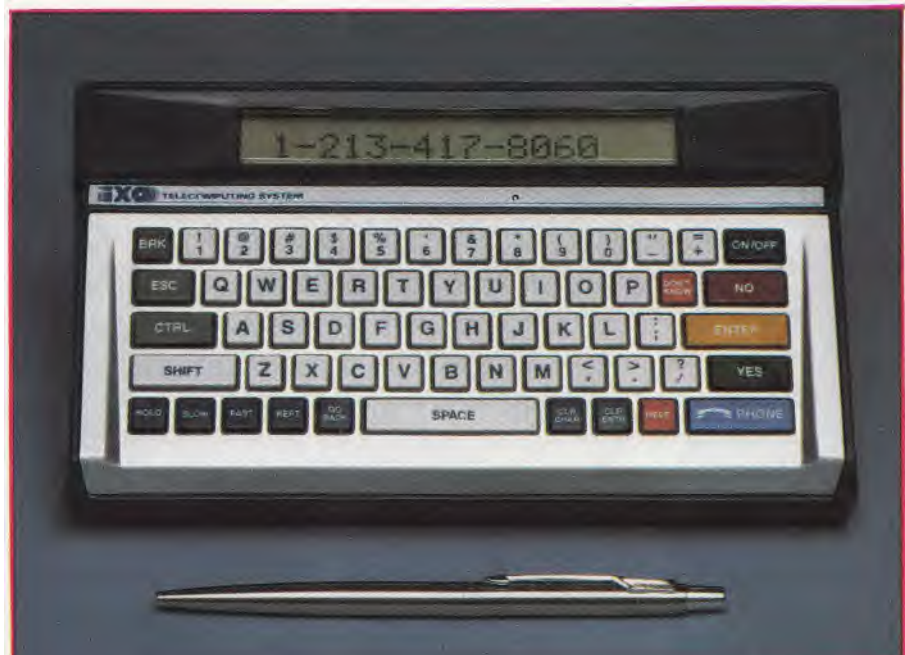


Photo 1: *The IXO Telecomputing System. It's a complete pocket terminal with built-in modem and autodialer that will sell for about \$500. The phone number displayed is IXO's Access Center.*

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I first saw the Telecomputer nearly a year and a half ago when I visited its inventors, husband-and-wife team Bob and Holly Doyle, at their Cambridge-based company, Macrocosmos. The Doyles conceived of a portable but powerful computer terminal, and with the aid of electronic-design wizards Michael Suchoff and Andy Barber, they built a limited number of prototypes. The Doyles later joined forces with former Mattel Electronics president Jeff Rochlis to form IXO Inc., the company that markets the Telecomputer. I received one of the prototypes for testing last year and I've been using it ever since. I'm still amazed at the features packed into its exceedingly small package.

This month's theme is human-factors engineering, and the IXO Telecomputer is an excellent example of a terminal designed with the user in mind. The Telecomputer, which will be generally available this summer, has a lot to offer in addition to its human factoring. It has, for instance, a sophisticated security-protection system and innovative, compact circuitry. I'll touch on these topics, but my main objective here is to discuss the implications of IXO's design philosophy.



Photo 2: The Telecomputer is powered by a built-in Polaroid Polapulse flat battery.



Photo 3: The FCC-registered Telecomputer is designed to attach directly to a phone using a standard modular jack. When in use, the terminal draws all of its power from the phone line.



Photo 4: Four peripherals for the Telecomputer (clockwise from upper left): an acoustic interface (not the same as an acoustic coupler because the modem circuitry is already contained inside the terminal); the RS-232C interface, a video interface; and a 20-column printer.

The Telecomputer marks the beginning of a whole new "genus" of computer products: no-compromise portable computers that are truly user-friendly. Let's take a closer look at its features.

The Telecomputer comes in a small plastic case containing densely packed CMOS circuitry and a Polaroid Polapulse flat battery to drive it (see photo 2). The heart of the design is an NEC 4-bit microprocessor with 1K bytes of CMOS RAM (random access read/write memory).

The keyboard, which is slightly too small for extended typing sessions, contains several unusual keys to help the naive user (and sometimes the not-so-naive user). These include the YES, NO, DON'T KNOW, HELP, and PHONE keys. They are brightly colored to attract your attention. The HOLD, SLOW, FAST, REPT, GO BACK, CLR CHAR, and CLR ENTR keys are dark blue. The usual BREAK, ESCAPE, and CONTROL keys are gray. The blue and gray colors tend to keep the more complex keys in the background in order not to distract or intimidate the beginner.

A Session with the Telecomputer

After you remove the Telecomputer from its box and turn it on, you then connect it to your telephone line by plugging your telephone cord's modular jack into the female socket at the back of the terminal (see photo 3). At this point the Telecomputer begins to draw all of its power from the phone line while the phone is "off hook," i.e., while the phone is in use (a clever arrangement by the machine's designers). Since the phone companies require all phone devices to draw 20 milliamps to prove that the devices are using the lines anyway, this becomes a perfect source of power for CMOS circuitry! In fact, telephone devices are allowed to draw 5 microamps while "on hook," so it becomes theoretically possible to trickle-charge a battery.

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After you hit the ON switch, the unit's liquid-crystal one-line display begins presenting a series of questions in menu format. The first query you see is "ACCESS CENTER?" The best way to learn about the unit is to dial the Access Center, a remote computer resource center maintained by IXO to service Telecomputer customers. You simply type in the telephone number and the unit automatically dials it. The Telecomputer senses whether your phone line is Touch-Tone or rotary-dial and sends out the appropriate signals. Once online, you can experiment with the simulated services offered by the Access Center, including a checkbook-balancing program, a travel-agency simulation that demonstrates booking airline flights, a television guide database to help you find TV show times, and so on. The main purpose of this exercise is to illustrate the advantages of services using plain English dialogue back and forth between the user and the computer. In time, real versions of such computer services will be available. When connected to the Access Center, you can always press the HELP key if you get stuck and get a more detailed explanation of what to do next. You can also press the DON'T KNOW key if in doubt as to the correct reply to the computer's questions. (If only the existing databases had these features!) The Telecomputer's designers have been trying for some time to convince the people who run the databases to adopt these user-friendly approaches. Let's hope they do.

The most important feature of the Access Center is that it can download protocols for The Source, Compuserve, and Dow Jones into your terminal's RAM. (These were the three services available at the time I evaluated the unit; more will undoubtedly be added later.) Downloading protocols takes about 30 seconds and needs to be done only once because the information is permanently stored in the terminal as long as the battery holds up, which is at least a year—longer if you're "off-hook" frequently. Once you're connected, the Access Center asks you to type in a password that you must use in all future dealings with the Center and also asks for your name.

I was surprised the second time I called the center to find that it greeted me with "HELLO CHRIS. PASSWORD?" It's hard to convey the excitement of seeing a message like this on a miniature terminal connected directly to your phone line. Future shock, indeed.

The next time I used the terminal, I decided to get on the Dow Jones database and analyze some stocks. I powered up the Telecomputer, entered my password, and it immediately asked "DOW JONES?" The downloading had worked! Out of curiosity I pressed NO and the terminal stepped to the next item: "THE SOURCE?" NO again. "COMPUSEVE?" NO. "MANUAL ACCESS?" (The latter mode lets you dial any general database or computer by entering a telephone number.) I cycled around to "DOW JONES?" again and pressed YES. (Incidentally, you can type "yes", "Y", hit the YES key, or the ENTER key to tell the terminal yes. The designers have obviously thought of every possibility to

James Martin, data-processing and futures expert, offers the following predictions about the role of the pocket terminal ten years in the future. The following excerpt is from his book, *Telematic Society: A Challenge for Tomorrow* (Prentice-Hall, 1981).

Pocket terminals mushroom in sales and drop in cost as fast as pocket calculators did a decade earlier. Most people who carried a pocket calculator now have a pocket terminal. The pocket terminal, however, has an almost endless range of applications. It can access many computers and data banks via the public data networks. The pocket terminal becomes a consumer product (as opposed to a product for businesspeople) on sale at supermarkets, with human factoring that is simple and often amusing. The public regard it as a companion which enables them to find good restaurants, display jokes on any subject, book airline and theatre seats, contact medical programs, check what their stockbroker computer has to say, send messages, and check their electronic mailbox.

Public data networks are ubiquitous and cheap, and accessible from every telephone. Their cost is independent of distance within most countries.

keep naive users from getting stuck.)

You've probably gone through the usual tedium of identifying your terminal, hitting carriage returns, and going through all the usual make-work dialogue required to get onto databases. The Telecomputer eliminates all that. Once the Access Center downloads its protocols to your terminal, your terminal automatically completes the dialogue with, say, Dow Jones. You need only enter your password and you're instantly online. It takes only a couple of seconds. If you regularly access several databases or electronic mail services, you'll appreciate not having to memorize a lot of annoying protocols. This sort of elegant engineering will help popularize computers.

Another useful feature is the pair of speed-control keys, labeled SLOW and FAST, that control the speed at which text scrolls across the display by sending XON and XOFF control characters to the remote computer. Every time you press one of the keys the display incrementally slows down or speeds up. You can slow the display down to transcribe messages or speed it up to quickly scan through material.

There's little more to add about the operation of the Telecomputer—it's that simple. The built-in autodialer remembers your local Tymnet and Telenet numbers after you enter them once. It even shuts itself off if not used for eight minutes, first giving you an audible warning. The machine is truly "goof-proof."

Peripherals for the Telecomputer (see photo 4), including an acoustic interface (not the same as an acoustic coupler because the modem circuitry is already contained

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inside the Telecomputer—therefore the price is lower); a 20-column thermal dot-matrix printer made by Olivetti; an RS-232C interface; and a video interface designed for use with both TV sets and video monitors, will be available by July.

Design Philosophy

It's no surprise that the Telecomputer takes a human-factors approach. Its designers come from strong backgrounds in consumer electronics. Bob and Holly Doyle have invented more than a dozen computer toys, including Parker Brothers' best-selling Merlin and Stop Thief. While at Mattel Electronics, Jeff Rochlis supervised the production of the Intellivision personal computer and hand-held games such as Brain Baffler (to which the Telecomputer bears a coincidental resemblance). Rochlis's four design goals were to make the Telecomputer cheap (it will sell for approximately \$500 to \$550); portable; easy to use (meaning both ease of access to databases and ease of use via plain English dialogues); and secure.

That last point deserves a volume in itself. Someone once said that today's electronic mail services are more like "postcard" services because the security measures are so lax that any half-competent programmer can crack them. The Telecomputer's three-way security keying system goes a long way to correcting this situation. The user has a password, the terminal has a built-in password (unknown to the user), and the host computer has a password. (This is the proposed standard. Presently, only the IXO Access Center computer adheres to it.) The host

computer combines its password with both the user's password and the terminal password in complex, randomized ways to make it virtually impossible for someone else to emulate your terminal with another terminal or computer, even if he knows your password. It's an admirable approach to securing data. I hope manufacturers will pay serious attention to it.

The Telegraphic Age

Rochlis likes to compare today's computer age to the telegraphic age of the nineteenth century. In many ways, he says, the technique of talking to computers is still in its "telegraphic" stage. Back when the telegraph was the chief means for long-distance communication, telegraph operators were required as intermediaries for all transactions. Unfortunately, they "spoke" a different language than their clients: Morse code. Today, most of the public at large do not know how to operate computer terminals and must rely on computer operators. The latter are in effect the most expensive "peripherals" of all. To bring computing power to the people, we must supply them with cheap *and* easy-to-use computers and terminals.

There is a trend this year toward the development of briefcase-sized computers and terminals. (See the report about Epson's new HX-20 portable computer on page 104.) And that's just the beginning: watch for a series of new, small computers from both America and Japan. But size and cost alone will not guarantee the success of these machines with the general public. Human engineering has to be our paramount concern in the personal-computing field; the IXO terminal is a major step in this direction

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