TI Hands It to You

Unthinkable a few decades ago and taken for granted today, hand-held computers are changing the ways people compute. The Texas Instruments Compact Computer 40 offers a low price tag, power and speed—all in the size of a paperback novel.

By Frank J. Derfler and Douglas Ferrata

Today, in the age of the microprocessor, we take hand-held computers like the Texas Instruments Compact Computer 40 for granted.

It Wasn't Very Long Ago

Just a few decades ago, the CC-40 would have been something out of a science-fiction story. At that time, hand-held computing was performed with a slide rule and literally involved rubbing two sticks together to get a spark of inspiration. Items like the Keuffel & Esser Log-Log Duplex Decitrig were the prized possessions of every engineer and scientist.

The K&E was the Mercedes-Benz of slide rules and could handle multiplication, division, logarithms and trigonometry. Slide rules had one big problem, though—they were accurate to only three digits. Serious computations had to be performed on large computers like the IBM 7094.

The 7094 used vacuum tubes and filled a room the size of a large one-room school house. Maybe I should say a small church, because these systems were treated as if they were something supernatural. Only a chosen few, the operators, were allowed to be in the presence of the great machines. The less worthy users could only look at them from afar.

There were no such things as computers for the masses. To use a 7094, you had to punch out your program on a card deck, submit it to the operators through a small window, and wait 30 to 45 minutes—or overnight—for a printout. That was as interactive as it got. If the term "card deck" isn't familiar to you, you might be able to find something on it in the museum...next to vacuum tubes and slide rules.

In the early '60s, if you wanted to do any serious number crunching, you had to do it in the "computer building." There were no such things as portable or hand-held computers. At that time, a magazine article predicted that by the mid-1980s we would have computers as powerful as that 7094 that would fit into a briefcase and cost around $100. That was really science fiction!

Well, given the capabilities of the TI Compact Computer 40, and taking inflation into account, that prediction was surprisingly accurate. Flash Gordon would feel right at home. Hand-held computing has come a long way.

Sizing Up the CC-40

The TI CC-40 measures 9¾ × 5¾ × 1 inch, weighs about 1½ pounds, and sells for $249.95. It has a typewriter-like keyboard, a separate numeric keypad and a 31-character liquid crystal display.

The display can be scrolled side-

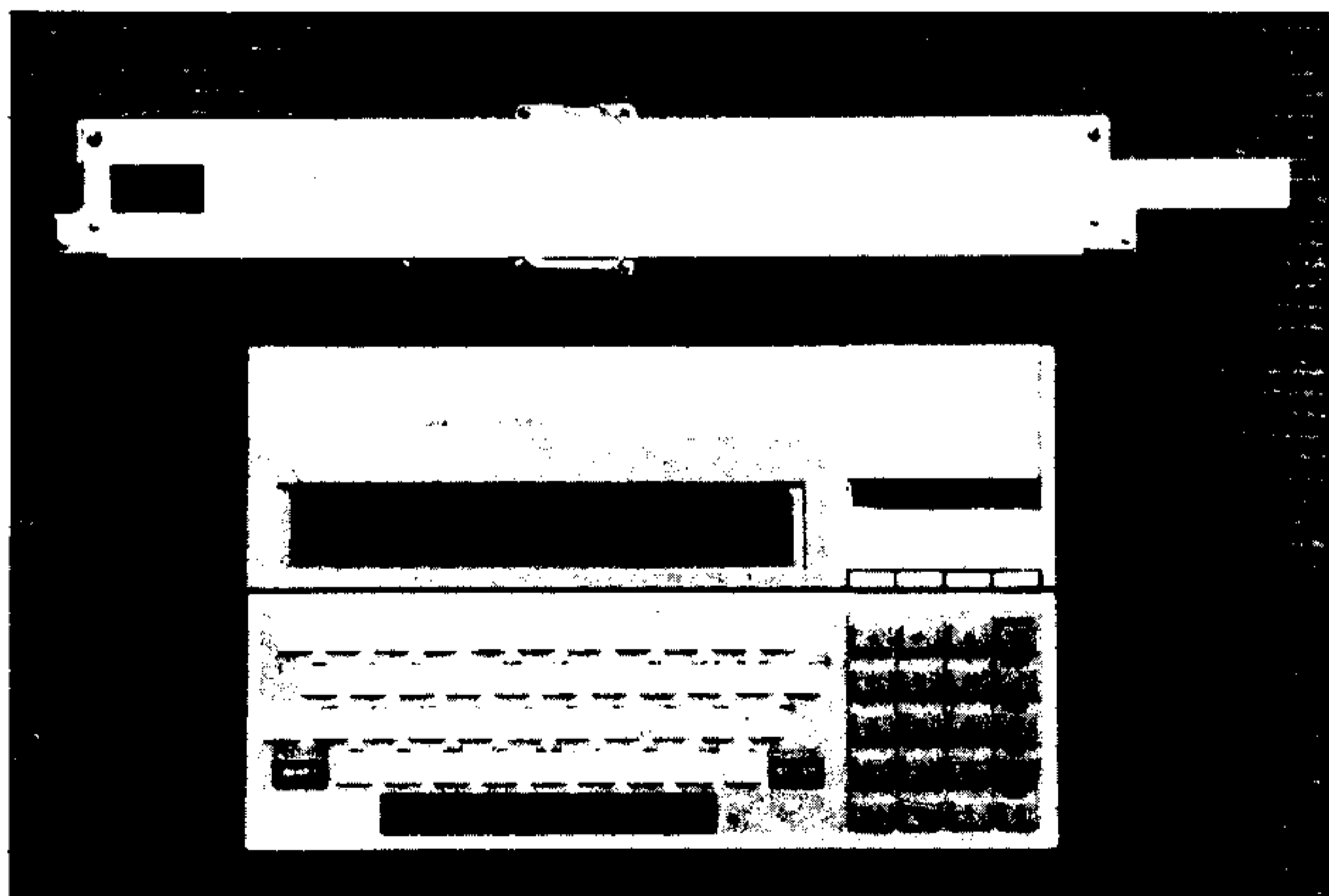*Contact the authors at PO Box 691 Herdon, VA 22070.*

Photo 1. Hand-held computers 1963/1983. The Keuffel & Esser Log-Log Duplex Decitrig and the Texas Instruments Compact Computer 40.

ways to show the contents of a full 80-character line.

The computer is built around a 2.5 MHz TMS70C20 eight-bit microprocessor and comes with 32K ROM and 6K bytes of RAM. Internal RAM can be increased to 18K, and an additional 16K can be added via memory expansion cartridges, bringing the total RAM to 34K.

Information in memory is retained when the computer is turned off by a trickle charge that powers the RAM chips. TI calls this its constant memory feature. Power is provided by either 4 AA batteries or an ac adapter. The batteries power the computer for up to 200 hours and an automatic

power-down feature helps conserve them by turning off the machine after ten minutes of nonuse. This feature can be overridden if desired. A fold-out stand on the back is provided to allow for easy desktop use.

The Display

The liquid crystal display for the CC-40 uses a 5×8 dot matrix and produces a full set of ASCII characters, both upper- and lowercase. In addition it can also produce Greek, Japanese and special user-defined characters.

The display also contains certain indicators showing if the shift, control and function keys are in effect and if the angular measurement is in use

(DEG, RAD and GRAD), as well as the status of the uppercase lock, I/O status, low battery and the position of the screen.

In addition, there are six user-defined indicators on the bottom of the display. Any of these indicators can be turned on or off from a program. Prompts and messages can be displayed on the screen in seven languages. English and German come with the machine and French, Italian, Dutch, Swedish and Spanish can be added with cartridges.

The Keyboard

The keyboard has an arrangement like most larger microcomputers, with a 44-key typewriter portion and a 20-key numeric keypad. The keys click when depressed, like those on a calculator, and if held down have an automatic repeat capability of about ten characters per second.

Some of the keys have up to four uses based on the position of the control, shift and function keys. A clear plastic overlay is provided to show Basic keywords assigned to the alphanumeric and punctuation keys. The Basic keywords are entered by using the function key. One of the drawbacks of the CC-40's small size is that only a small keyboard can fit on it. Unless you have small hands, it's definitely a one-finger-entry machine.

It's Basic

Like most of the other hand-held computers on the market today, the CC-40 comes with its own version of ROM Basic. It's an enhanced version, with some 105 commands, functions and statements. Variable names can be from one to 15 characters long. If you're familiar with some of the more popular versions of Basic, you shouldn't have any trouble with TI's CC-40 version.

About a quarter of the commands are unique, however, and are designed to reduce programming steps and achieve the full potential of the display.

Software Selection

If you aren't into Basic programming, or are interested in off-the-shelf software to make your job easier, the library of software for the CC-40 may be just what you need. This software comes on two types of media—cartridges (Solid State Software) or cassettes (Wafertapes).
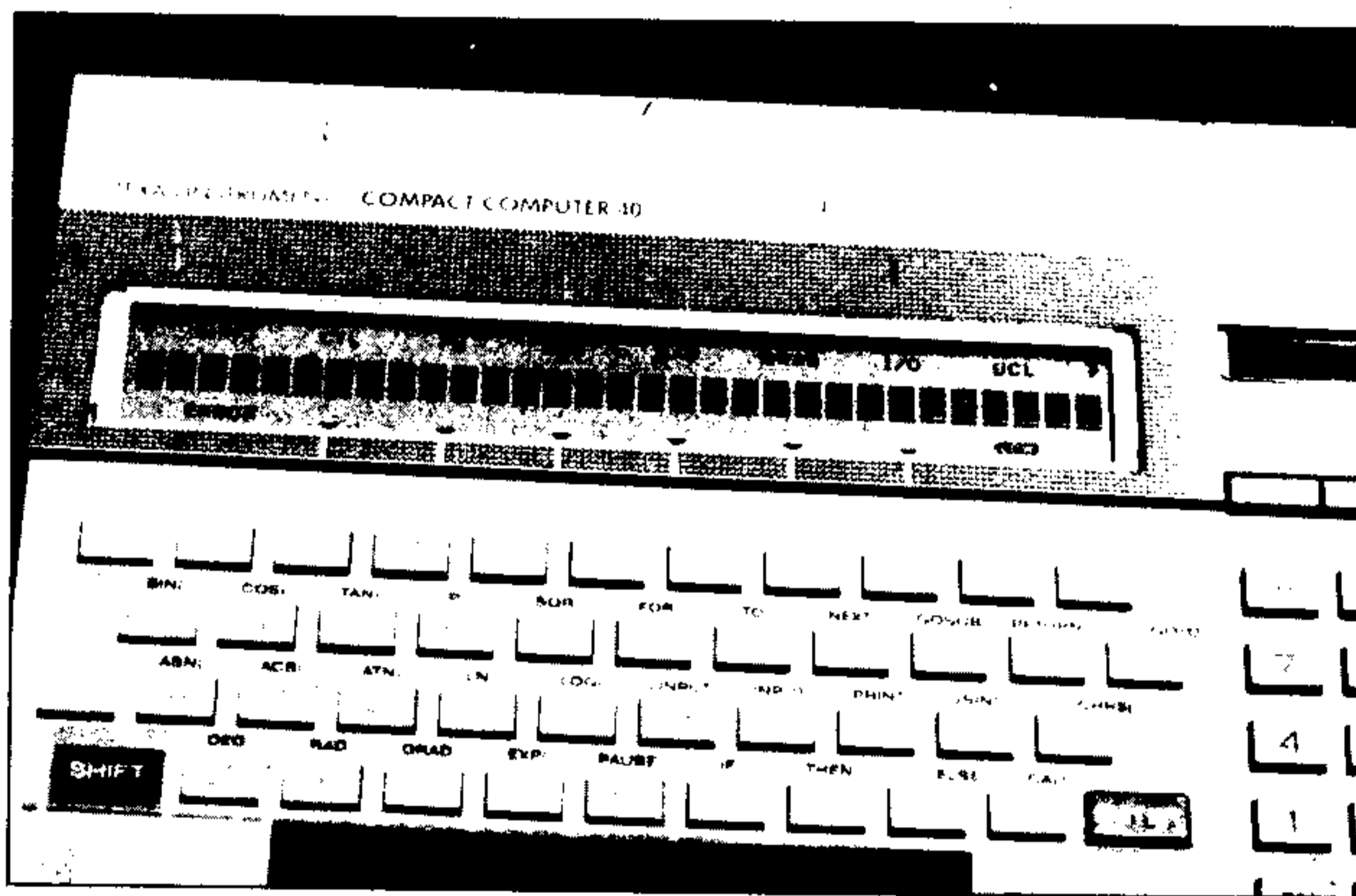
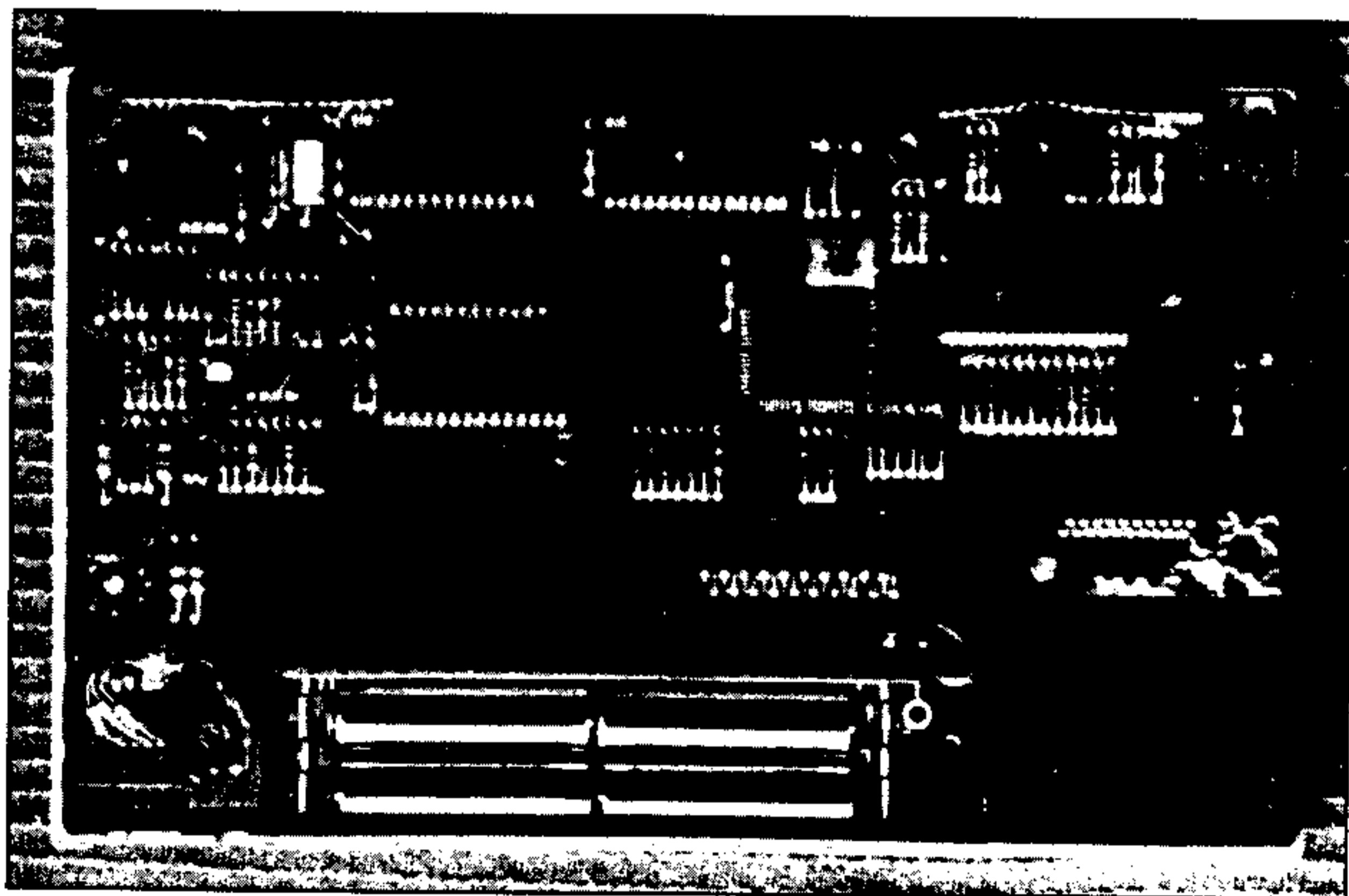*Photo 2. Eighteen display indicators are provided to show various states, warnings and error conditions.*

Photo 3. The insides of the CC-40 showing the TMS 70C20 CMOS processor on the right.

as
I/O
1 of

-de-
the
1 be
am.
dis-
lan-
>me
ian,
be

1ent
vith
d a
:eys
>n a
: an
>out

four
:on-
lear
1ow
>ha-
The
sing
-aw-
that
1 it.
it's
ine.

held
the
n of
;ion,
ions
can
g. If
1ore
you
TI's

ands
de-
:teps
the

:am-
shelf
, the
may
vare
-car-
cas-

The cartridges plug into the same slot on the upper-right-hand corner of the computer as the memory expansion cartridges, and the cassettes are designed for use with the portable digital tape drive.

Software available on the cartridges includes: finance, advanced electrical engineering, statistics, mathematics, business graphics, editor/assembler and games. All have a suggested retail price of $59.95, except for the editor/assembler, which retails for $124.95.

The software that comes on cassettes includes: perspective drawing, regression/curve fitting, pipe design, inventory control, photography, solar engineering, quality assurance, thermodynamics, electrical engineering, elementary dynamics, nonparametric statistics, production and planning, and profitability analysis. All cassettes sell for $19.95.

Based on the difference in price between cartridge and cassette software, it seems that buying a tape drive could well be worth the investment. Each software package, be it cartridge or cassette, comes with its own instruction manual. But should you have any questions concerning any of the software that you have purchased, TI has a toll-free telephone number that you can call for assistance. In addition to the packages mentioned above, TI is working on a word processor and a spreadsheet program. Both should be available in the near future.

Peripherals

Peripherals for the CC-40 are designed to let you significantly increase its power and capabilities over those of most other hand-held computers. Each peripheral has its own built-in microprocessor. This eliminates the need to use the computer's RAM for peripheral control and reduces the size of the interconnecting cable.

The peripherals are connected to the computer through what TI calls its HEX-BUS Intelligent Peripheral Interface. It is a four-bit, medium speed I/O bus that supports data transfer speeds of up to 48,000 bits/second. It uses an eight-line cable with four data lines, two bus control lines, a ground line and an extra line reserved for future expansion. The list of peripherals includes a printer/plotter, a wafertape digital tape drive, an RS-232C Interface, a telephone modem and a video interface.

A list of accessories available for the peripherals includes ac adapters for the CC-40 and telephone modem, and eight- and 36-inch I/O cables.

Where Does It Fit?

The CC-40 puts the power and speed of a full-blown eight-bit microcomputer into a package the size of a paperback book. Its size allows you to carry it easily in a briefcase or purse, and take it places where only pocket calculators have gone before.

These places could include classrooms, construction sites, factory floors or even courtrooms. Word processing and spreadsheet applications can be done anywhere, not just in places where there is an ac outlet.

The small size, however, imposes some limitations. Thirty-one characters is not a big window on the world and takes some getting used to. Also, the small keyboard is basically a calculator keypad with letters on it. It will never be entered in the touch-typing hall of fame.

In spite of these problems, given the CC-40's price, size and power, it will probably blow away the top-of-the-line hand-held programmable calculators.

It has more memory than the calculators, and Basic beats reverse polish notation any day. The peripherals also give it some of the capabilities of larger microcomputers. So if you want to do some computing on the go, and want to keep your investment low, then the TI CC-40 may be just what you're looking for.■

A Capsule Look At TI's CC-40

Manufacturer
Texas Instruments, Inc., Dallas, TX.

List Price
$249.95

Standard Features
Texas Instruments TMS70C20 CMOS eight-bit CPU; 6K RAM; 32K ROM; 64-key keyboard; 31-character LCD; audible tone; cartridge and peripheral ports; enhanced Basic.

Proportions
One and a half pounds; 9¼ × 5¾ × 1 inch.

Software
Basic, spreadsheet, word processor, engineering and scientific applications, statistics, financial analysis and editor/assembler.

Options and Accessories
Printer/plotter; digital tape drive; RS-232 interface; 300-baud modem; video interface; ac adapter.

Documentation
Users manual describing the hardware and enhanced Basic.