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RADIO SHACK

INTRODUCES

THE WORLD OF COMPUTING

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WELCOME TO THE WORLD OF PERSONAL COMPUTING!

We've been living in the Computer Age for more than twenty years. But most people still think of computers as million dollar electronic monsters.

You've seen the made-for-the-movies computer. Rows of flashing lights, whirring sounds, bespectacled men in white lab coats seated at mysterious control panels. Feed some punched cards, paper tapes, tax returns and financial statements in one end . . . and out pop more punched cards, more paper tapes, bills and credit statements.

This "Please don't fold, spindle or mutilate" reputation of the computer is about to be demolished (finally!) by the remarkable advances in miniaturization which gave us the pocket calculator and digital watch. The **microcomputer** has arrived, and computers are going to become as common as telephones and television sets.

Think of the impact on the way we conduct business, educate students and keep track of our personal finances! Now the power of the computer is available to the appliance repair shop, the accountant, the neighborhood classroom, the corner grocer, even the individual.

The microcomputer is ushering in a fantastic new phase of the Computer Age. *Welcome to the World of Personal Computing!*

So What Is a Microcomputer good for? Or, more specifically, maybe you're asking — "What can I do with it? . . . what can it do for me?" Reasonable question — let's give you some reasonable answers.

Personal:

A Microcomputer can be used to control home appliances and lighting, security systems, air conditioning and heating systems (programmed to conserve energy). There are lots of personal time-saving applications too, such as — check book balancing, personal budgeting, keeping track of recipes and creating menus, inventory of groceries and math review for the student at home.

Lots of people think of a Microcomputer as "the ultimate toy" . . . but it's lots more than that! Of course you can play games such as Blackjack and Backgammon, create computer-generated drawings and many other *just for fun* things.

Business:

In business a Microcomputer reduces tedious, time-consuming clerical functions to automatic, error-free lightning-fast operations. Use it for general ledger accounting, small business payroll, inventory control or accounts receivable. When used in conjunction with tape or disk memories, all such records can be permanently stored for later use (or tax purposes). Microcomputers are already being used to control machinery and thousands of manufacturing processes.

Educational:

Teachers and students are already using computers for reading skills, tests, math and in many forms of programmed learning. Math, simple or advanced, can be learned and checked without a teacher's personal attention. Learn music theory, grade papers, keep track of students' progress — or even teach computer programming! . . . all with a Microcomputer.

GETTING ACQUAINTED WITH THE MICROCOMPUTER

A microcomputer looks like a sleek typewriter keyboard:



But it's no ordinary typewriter. This machine prints characters on a television screen instead of paper! Look closely; see the wire that connects the keyboard to the TV monitor?



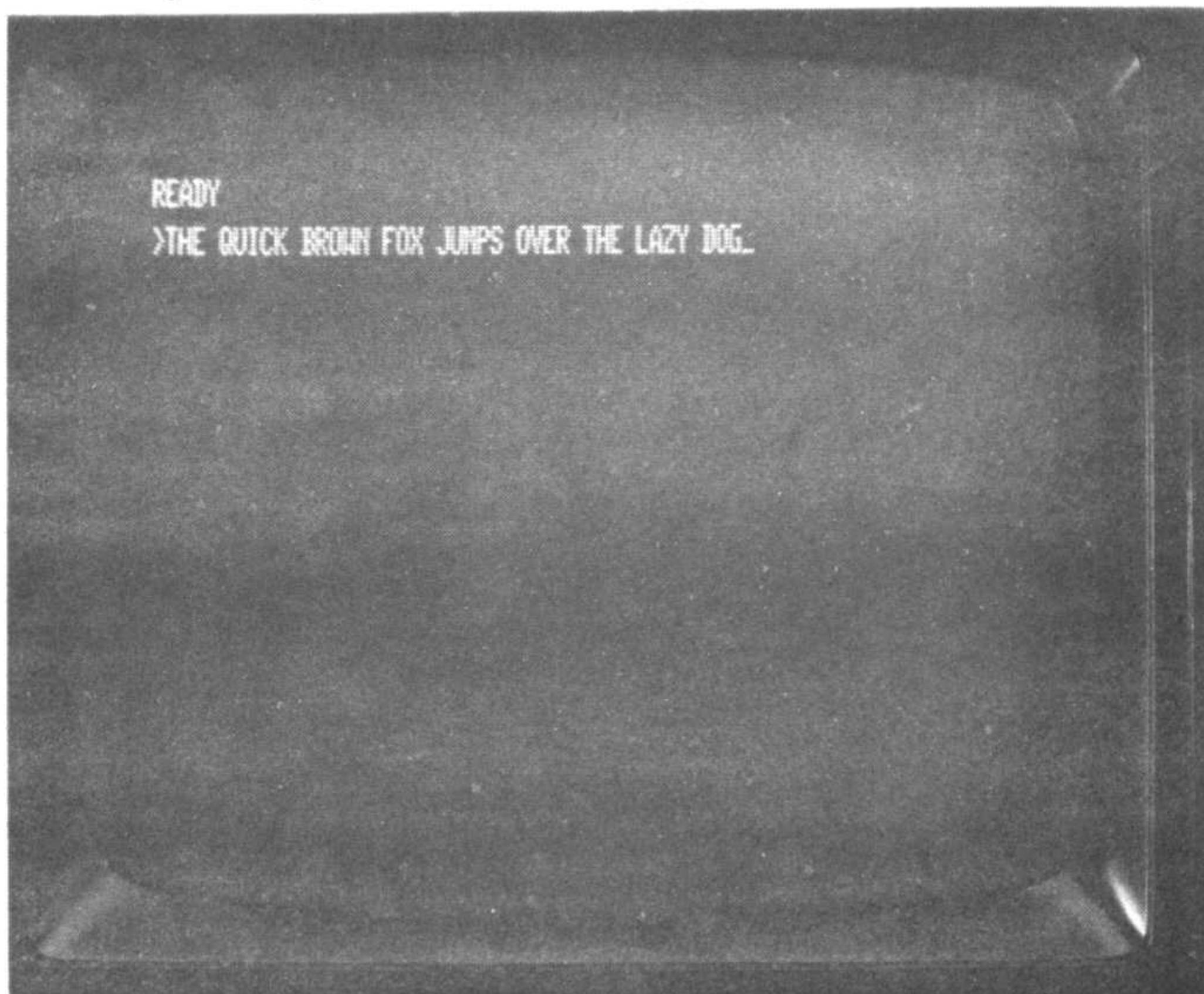
A glowing red light tells you the keyboard is turned on. The TV screen reads

```
READY  
> _
```

Go ahead, type a word on the keyboard:

```
> HELLO_
```

Easy to use, isn't it? How 'bout some more? First, press the key marked CLEAR. Then try every letter in the alphabet:



GIVING ORDERS TO A MICROCOMPUTER

Everyone might be a little hesitant about how to tell a computer something — and with long programs, it can take some time. But it's a snap to create a simple set of orders (program) for a microcomputer.

After all, you've been programming things like vending machines most of your life . . . and without even realizing it.

Remember the last time you set a clock radio or alarm clock? You **programmed** the clock to wake you at a specified time.

Or how about your last elevator ride? First, you **programmed** the elevator to come to your floor by pressing a button marked "UP" or "DOWN." Then you **programmed** it to take you to the floor whose number you pressed on the control panel.

And we all use **mental programs** to make decisions and solve problems. You might say programming's as common as setting a thermostat, feeding a parking meter, dialing a phone or working a crossword puzzle.

Let's explore programming for a few minutes with a look at an every-day programmable appliance — **the automatic washing machine**. It has a lot in common with the basic principles of a computer.

You feed the washing machine . . . dirty clothes, detergent and hot & cold water. You set the machine's controls and the timer — this tells it what sequence of detergent, wash, rinse, etc. to process the clothes and all. When everything is done, you take out clean clothes (dirty water also gets put out).

In computer lingo we talk about INPUT, Central Processing Unit (CPU), MEMORY and OUTPUT.

Let's compare the two — washing machine and Computer:

INPUT — that's no problem (input the clothes, etc.)

CPU — is our control switches (controls the whole process)

MEMORY — the timer . . . it keeps track of when things need to be done.

OUTPUT — you've got that already (clean clothes)

We'll come back to this again later on, but let's carry on with our washing machine.

Go on and fill the entire screen with letters, words, numbers and sentences if you want. Make an error? No problem. You can electronically erase it by hitting the ← backspace key. Then retype the correct character.

By the way, the computer uses only capital letters, so don't try to use the SHIFT key (as you would with a standard typewriter) just type out the letters.

Amazing gadget, this TV typewriter. But does it have any **practical** uses?

Indeed it does! Behind those keys is a powerful microcomputer with literally thousands of applications.

For starters, say you want to know how many miles your car travels on a gallon of gas. You've just filled the tank and found it took 14.6 gallons to drive 288 miles.

First, type

```
PRINT 288/14.6
```

Then hit the ENTER key. Before your finger leaves the key, the screen will flash

```
19.726  
Ready  
>_
```

... the number of miles your car drove on a gallon of gas. (The READY tells you the computer is ready for more!)

Of course this is a trivial problem for a computer, the kind of thing you'd use a pocket calculator for. Later on we'll try something a little fancier. But first let's look at how we have to "talk" to a computer.

You **program** a washer by selecting the water level and temperature and setting the time for the various cycles. Here's a typical washer program:

STEP	
1	Enter clothes
2	Enter detergent
3	Select WARM water temperature
4	Select FULL water level
5	Fill tub
6	WASH cycle
7	RINSE cycle
8	Spin-dry
9	Stop

Of course this nine step automatic washer "program" makes the washer seem far more complicated than it really is. Once you've learned how to use the controls, you program a washing machine in seconds.

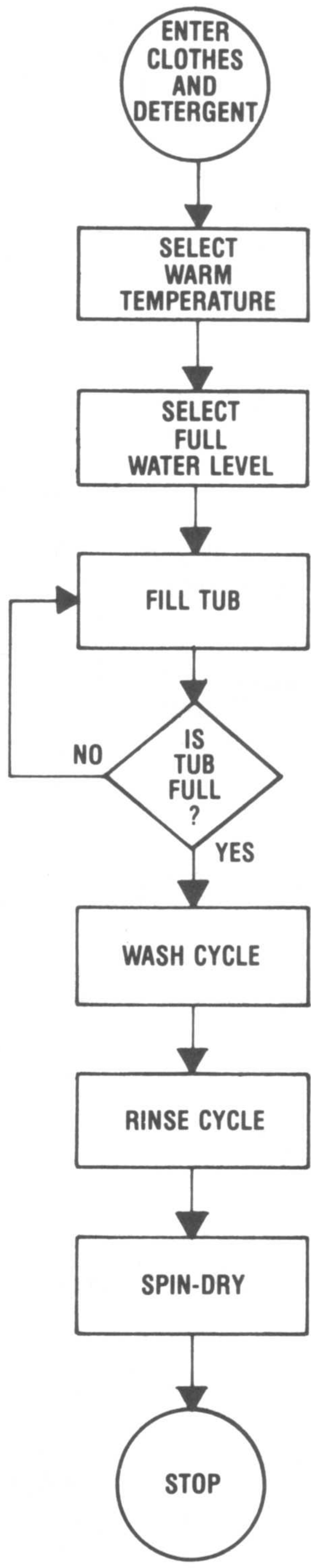
Computer programs are like that. Since they look unfamiliar they often seem more complicated than they really are. Yet you can often compose a simple program at the keyboard of a microcomputer! Thanks to the automatic error-catching features of the computer, you can edit your programs and find the "bugs" (errors) in a matter of minutes.

Think you'll be writing more advanced programs? Computer programmers have come up with a clever programming tool you should know about. It's called the **flow chart**.

Flow charts use simple geometric outlines for the various steps in a program. On the next page is a flow chart version of the washing machine program:

Follow the sequence of events as they flow through the chart. See how much simpler the washer program becomes?

Flow charts help you visualize a problem and organize the best program solution. They also let you explain your program to someone in only a minute or so.



There isn't enough space in this booklet to teach you how to program. But to stimulate your interest in some of the excellent books on the subject here are a few things you can do with a computer that understands BASIC (that's the "language" most microcomputers understand — more on that later):

You can order the machine to remember words, sentences, even entire paragraphs by simply preceding each line with a number and a PRINT statement. Just enclose the text you want to save in quote marks.

You can order a computer to automatically solve a problem hundreds or even thousands of times, each time with new information. Since a computer can run through hundreds of program steps in a second, it's ideal for solving repetitious or long and involved arithmetic problems.

You can even use a microcomputer as a teaching machine! School kids who hate arithmetic will spend hours glued to its keyboard punching in answers to addition, subtraction, multiplication and division problems the computer automatically flashes on its TV-like screen.

And that's not all. The recreational and entertainment aspects of personal computers are as varied as they are fascinating! Anyone for a game of computerized Blackjack, Backgammon or tic-tac-toe? Or Star Trek? or computer-generated illustrations?

Finally, remember that you **don't** have to know how to program to use a microcomputer. Plenty of BASIC programs are available from books and articles. And you can buy ready-made software in the form of pre-recorded tape cassettes from microcomputer manufacturers like Radio Shack.

Happy programming . . . and *WELCOME TO THE WORLD OF PERSONAL COMPUTING!*

A SAMPLE PROGRAM

You've already seen how easy it is to type some simple entries on a computer. Now let's try a simple, but practical program.

Say you work in a store and need a quick way to figure the sales tax (let's say 5%) on a sale . . . and add the tax to the subtotal to get the total. Here's a few instructions called a **program** you can type into the computer to solve this problem in the twinkling of an eye.

First, press CLEAR and ENTER. The screen will read

```
READY  
>_
```

then type

```
10 INPUT S
```

Check the screen to be sure you've made no errors. Then load this instruction into the computer by pressing ENTER.

Now type

```
20 LET T = S * .05 + S
```

Check for errors; then hit ENTER again.

The screen now displays

```
10 INPUT S  
20 LET T = S * .05 + S  
>_
```

Now type

```
30 PRINT T
```

Hit ENTER. OK, now you're ready to run the program — *YES, IT'S THAT EASY!* Just type

```
RUN
```

The computer comes back and asks

```
?_
```

It wants the subtotal (the value of S). OK, let's say it is 149.95 — type that

```
149.95
```

Hit ENTER and your answer is flashed on the screen

```
157.447  
READY  
>_
```

You've got your answer and it's ready to RUN again. Try 57.88 this time.
Type

RUN

The computer will ask you

?_

Type in 57.88. Hit ENTER and

60.774 is your answer

See how easy it is? And there are thousands upon thousands of applications (and programs) for this great machine.

Now maybe you want to know a little about what you just did (or maybe you don't — not yet — if not, just skip ahead). Let's look at the three lines of our program.

Hit CLEAR (to clear the screen) and then type LIST (this gives you a listing of the program that's loaded).

```
LIST
10 INPUT S
20 LET T = S * .05 + S
30 PRINT T
>_
```

Each line begins with a number . . . usually 10 digits apart (i.e. 10, 20, 30 . . .) to allow for later additions in proper sequence, to help the computer keep track of things, and keep them all in the proper order.

Each line is an instruction to the computer (they're called **statements**) — tells the computer what you want it to do for you.

The first statement (10) tells the computer that you will give it an Input — which is S, the sub-total.

The second statement (20) tells the computer that the total price (T) is the sub-total (S) times (* — the computer uses "*" instead of "×" for multiplication) the sales tax (.05, which is 5%), plus the sub-total (S).

The last statement (30) tells the computer to solve the problem and flash the answer on the screen.

Then, when you type in RUN, that tells the computer to do its thing. It does it and comes back asking for information — the value of S. You give it to the computer and there's the answer . . . and the computer is all ready for more!

Of course, this is just a simple program for the computer — but it can handle a long and complex one just as easily.

Computers used to be much harder to use.

Why? Because they can't "talk" our language. The only language the electronic circuits inside a computer understand is bewildering strings of 0s and 1s. That's called **machine language** in computer jargon. That's why giving orders to a computer used to be a job for only highly skilled . . . *AND VERY PATIENT* . . . experts.

But, now using a computer is as easy as typing! A special program called an **interpreter** is permanently stored inside the computer. The interpreter is a group of circuits that "translates" your words into a "language" that the computer can understand.

The simplest and most popular computer language is called BASIC (Beginners All-purpose Symbolic Instruction Code). Anyone can learn the basics of BASIC in a few minutes . . . and write simple programs within an hour! The BASIC language uses everyday words like PRINT, LIST, RUN, LET, INPUT and END.

But even if you never **write** a single program of your own, you can quickly learn to use a computer that understands BASIC. How? Well, BASIC's been around since the early 1960s, and literally thousands of BASIC programs have been published in books and articles. That means you can type an existing program into your computer without knowing very much about programming.

We've already given you some ideas about everyday "programming" (remember the washing machine?). So let's take a peek behind the keyboard.

BEHIND THE KEYBOARD

The personal computer is so easy to use you'll soon find yourself taking it for granted. But that keyboard you were typing on a few paragraphs ago would have been a room stuffed with miles of wiring and thousands of vacuum tubes twenty-five years ago. Worse, it would have cost more than you'll earn in a lifetime!

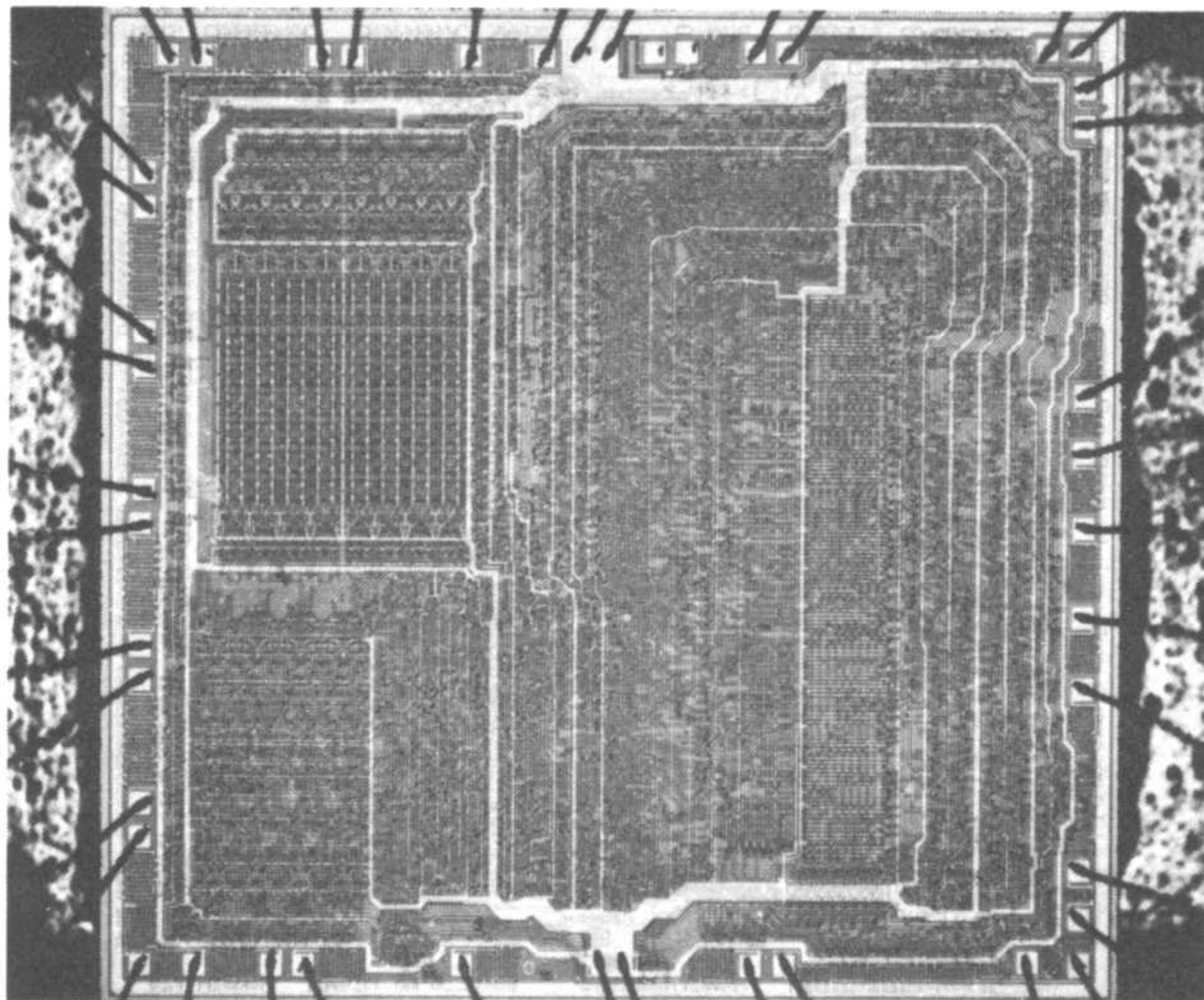
How on earth has the price of a computer tumbled to that of a quality stereo in this era of skyrocketing inflation? And how can a computer be squeezed into such a small space?

The answer is the **microprocessor**, a revolutionary new semiconductor electronic circuit you may have read about. Here's the background:

The basic building block of the computer is a simple electronic circuit called the **gate**. Gates are like switches; they're either on or off. And they can turn other gates on or off. This means a network of gates can do arithmetic, count, make decisions and even store information.

The nerve center of a computer is its **central processing** unit or simply CPU. The CPU contains hundreds, even thousands of gates . . . so it's expensive and hard to make.

Here's where the microprocessor comes in. It's a slice of silicon the size of a watermelon seed crammed with **all** the gates needed for the CPU of a computer. Add some electronic memory circuits and, voila, you've got a computer!



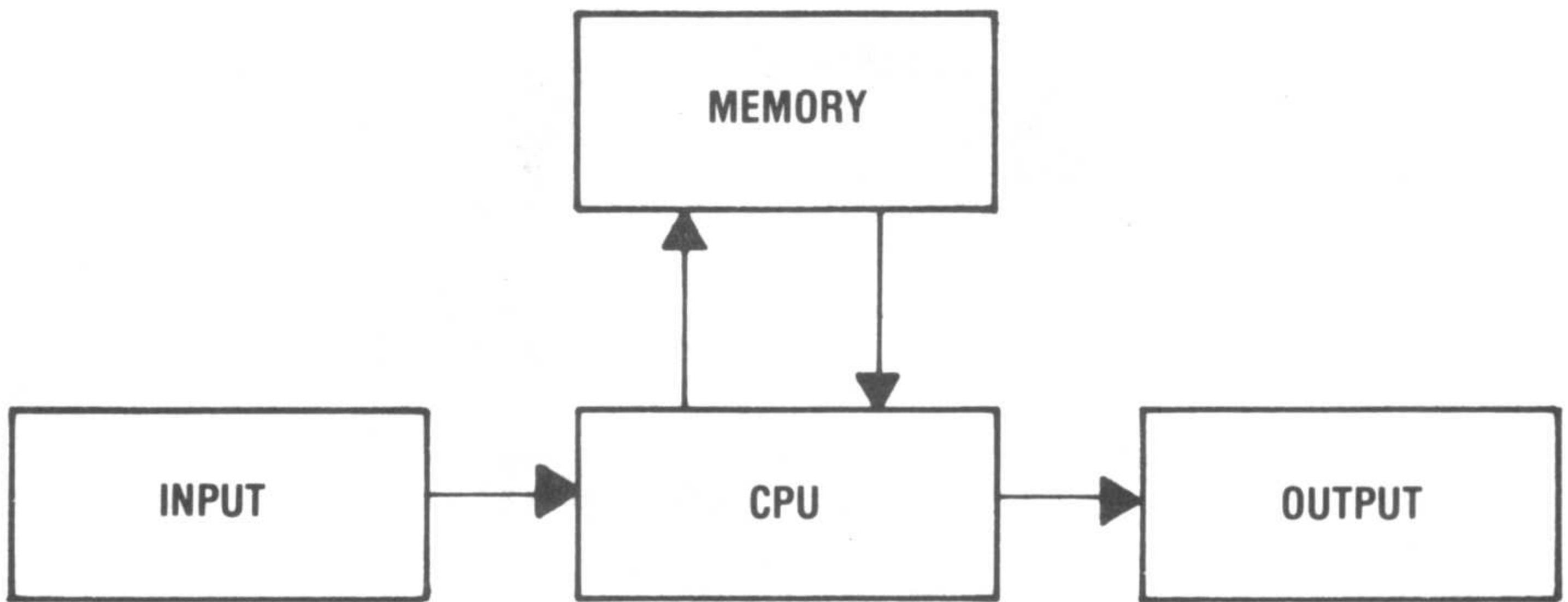
In the next few years midget computers made with microprocessors will be appearing everywhere. Already they're used in such everyday products as microwave ovens, electronic games, automobile ignition systems, automated traffic lights and pocket calculators.

Of course all these applications are important. But **none** of them even begins to make full use of a microprocessor's capabilities.

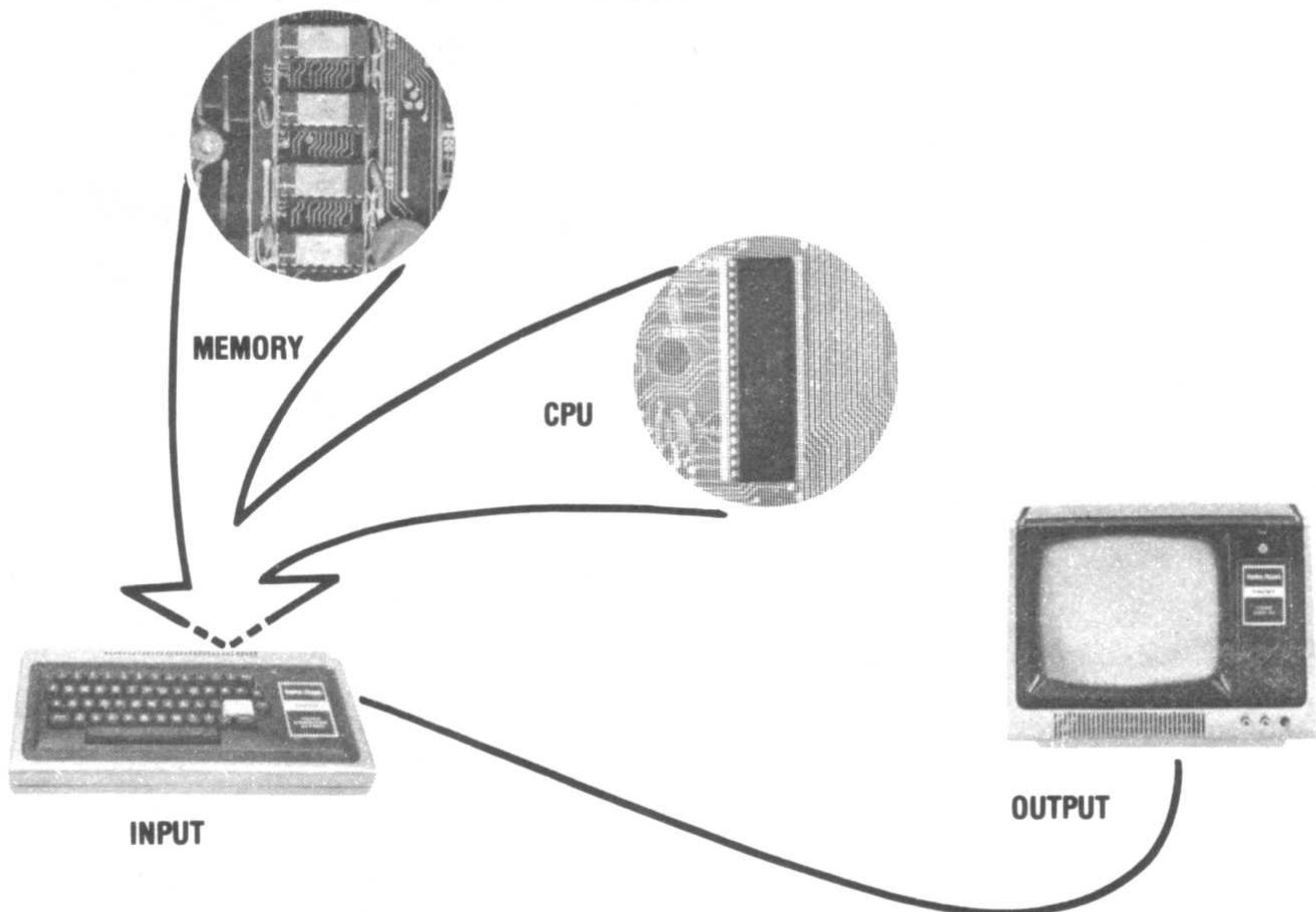
Sure, you can "slave" a microcomputer to a traffic signal or use it to time a roast. But computers are **information processors**; they thrive on a varied diet of numbers, words, arithmetic problems and instructions.

Connect a microcomputer to a keyboard and a TV monitor, and it will happily balance your bank account, keep track of sales and inventories in your business, count the calories in your meals, file your recipes, help you figure your income tax and much, much more.

A computer made from a microprocessor is ridiculously simple. It has four basic sections, and they're connected together like this:

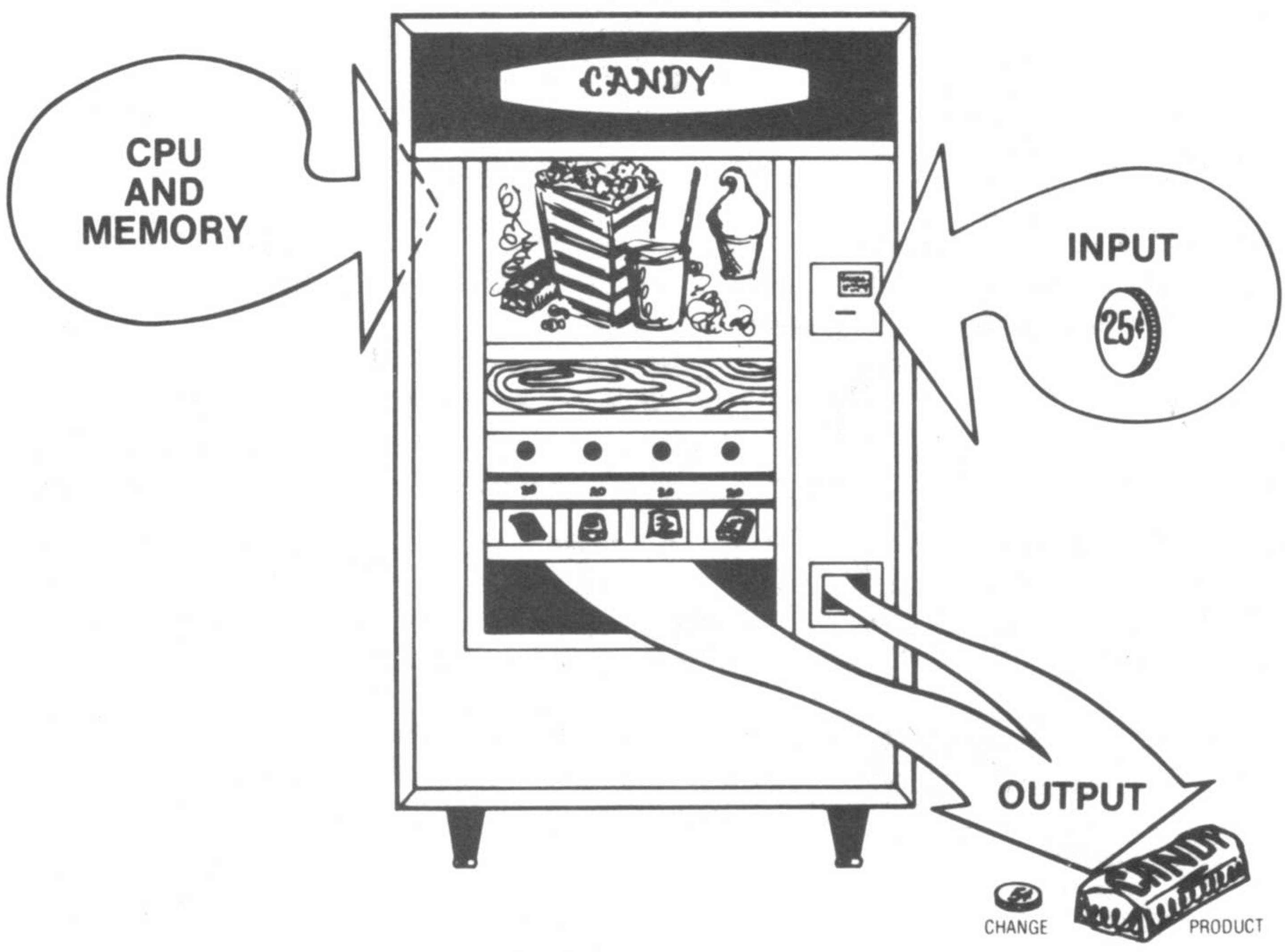


The **INPUT** is the typewriter-like keyboard. The **CPU** is the microprocessor soldered to a circuit board behind the keyboard. The **MEMORY** is a dozen or so encapsulated silicon chips soldered to the CPU circuit board. And the **OUTPUT** is the TV monitor.



Simple, isn't it? The basic organization of a microcomputer is no more complicated than a coin-operated vending machine!

The vending machine's INPUT is a coin and some push buttons. Its CPU and MEMORY are some mechanical gadgets and relays that make change, interpret the instructions (the program) you enter through the push buttons and deliver the product you've selected to the outside world. The product, of course (and your change) is the OUTPUT.



Thanks to BASIC and the keyboard, you don't have to know how a computer works to use it . . . any more than you have to know how an internal combustion engine works to drive a car. But you should know something about the two kinds of memory inside a computer: **permanent memory** (ROM — Read Only Memory) and **temporary memory** (RAM — Random Access Memory)

The **permanent** memory stores the special instructions that tell the computer what to do when you type BASIC statements into the keyboard (the interpreter program).

The **temporary** memory stores the programs and information you type into the computer. You can store anything you want in the temporary memory (until you run out of storage space!). You can even erase or change what you've stored. But turn the power off and you lose everything.

Memory is to a computer what horsepower is to a car, so if you don't mind, let's get technical for the next few paragraphs.

The ROMs and RAMs inside a computer store information in thousands of individual memory elements. Each element stores one **bit** (a 0 or 1). A chunk of eight bits make a **byte**.

As we mentioned before, a microcomputer's built-in BASIC interpreter program is stored in ROMs. The amount of ROM determines how much of the BASIC language's vocabulary the computer can recognize.

ROMs (and RAMs) usually come in multiples of 1,024 bytes . . . or **1K** in computer slang. 4,096 bytes of ROM gives 4K or Level 1 BASIC, adequate for most purposes. Additional ROM will be required for Extended BASIC.

4K (4,096 bytes) of RAM memory is enough to fill a microcomputer's TV monitor with several screen-fulls of letters, numbers and words. That's plenty for many microcomputer applications, but you can add more! Read on . . .

MICROCOMPUTER ACCESSORIES

One of the great things about microcomputers is that you can expand a "quarter horsepower" unit into a "full horsepower" system just by adding such extras as a printer and more memory. Accessories like these are called **peripherals** in computer jargon.

Take memory, for example. A microcomputer has a limited but ample amount of temporary memory (RAMs) . . . perhaps 4K (4,096 bytes). You can always add more RAM if you want (up to some maximum determined by the computer design).

So far we've looked only at the memory **inside** a microcomputer. Would you believe you can plug an ordinary tape recorder into the **outside** of a computer?

A tape recorder allows you to transfer programs and other information from the computer's temporary memory (the RAMs) to inexpensive tape cassettes. You can even transfer information from a cassette to the computer. An external memory like this is optional . . . but it opens up all sorts of exciting possibilities. You can permanently store programs, addresses, phone numbers, inventories and even notes on cassettes! And you can exchange cassettes with friends and mail them to anyone who has a computer like yours.

Cassettes also save lots of time. It can take half an hour or more to type a long program into a computer . . . **if** you don't make any errors. You can effortlessly enter the same program into the computer automatically and error-free with the help of a tape recorder. And all kinds of programs are available already recorded on cassette tape.

There's another kind of computer memory you should know about. It's a circular disk of thin plastic coated with the same magnetic material used to make recording tape. It looks a lot like a flexible 45 rpm record, and it's called the **floppy disk**.

Floppy disks are easy to use. Just slip the protective envelope containing the floppy into the slot in a box called a **disk drive**, turn on the power and you're in business.

As the disk spins at a few hundred revolutions each minute, your microcomputer can record information on any of the many data tracks that encircle its surface. The computer can also **read** information from any of the tracks on the disk.

A floppy disk system is more expensive than a cassette recorder . . . but it can transfer information into and out of a computer in a small fraction of the time required by the slow cassette. This tremendous increase in memory speed means more computer power. And it makes the floppy disk a worthwhile addition to a personal computer . . . particularly those used for small business and educational purposes.

The TV monitor that comes with a microcomputer gives a totally silent, visually appealing information display. But what if you want a permanent record of your programs and any other information that can be flashed on the screen?

This requirement is solved by a **printer**. A printer will make permanent copies ("hard copy" in computer slang) of anything stored in your computer . . . and even its external memory (like cassettes and floppies).

Think of the possibilities! You can give or mail hard copy versions of your programs (**software**) to friends, organize inventory lists as neat as those produced by full-size computers, categorize business contacts, make updated copies of your financial statement and bank balance and even create your own computerized pop-art designs and greeting cards.

A GLOSSARY OF PERSONAL COMPUTING BUZZ WORDS

BASIC — (**B**eginners **A**ll-purpose **S**ymbolic **I**nstruction **C**ode) A very successful and popular computer language developed at Dartmouth College in 1963-4.

Baud — A term used to define the signalling speed of information in a computer (typically relating to input and output). It is the number of bits of info per second.

Binary — The two-digit (bit) number system based on 0 and 1. Gates are electronic circuits that are either on or off; these two states can represent the binary bits 0 and 1.

Bit — A binary digit (0 or 1).

Bug — An error in the hardware **or** software of a computer.

Byte — A string of eight binary bits.

Central Processing Unit — The nerve center of a computer; the network of electronic circuits that interprets programs and tells a computer how to carry them out.

Chip — Computer jargon for the tiny silicon slices used to make electronic memories and other circuits. A single chip may have as many as 30,000 electronic parts!

Circuit Board — A rigid fiberglass or phenolic card upon which various electronic parts are mounted. Printed or etched copper tracks connect the various parts to one another.

Computer — A network of electronic gates and memories that processes data.

CPU — See Central Processing Unit

Data — Information; often numerical information.

Disk — See Floppy Disk

Diskette — See Floppy Disk

Floppy Disk — A flexible plastic disk coated with the same magnetic material used to make recording tape. The disk stores computer information on fifty or more tracks around its surface.

Flow Chart — A diagram of geometric shapes connected by arrows that show the progression of a computer program. Flow charts are handy for developing complicated computer programs and illustrating how programs work.

Gate — A very simple electronic circuit that is always either **on** or **off**. Clusters of gates can manipulate binary numbers (0 = off; 1 = on). They can also count, do arithmetic, make decisions and store binary numbers. Gates are the basic building blocks of computers.

Hard Copy — The permanent printout of a program or its results produced by a printer connected to a computer.

Hardware — The circuit boards and electronic parts inside a computer.

Input — The means by which data is entered into a computer. Often a keyboard.

Instruction — A statement or command that tells a computer what to do.

Interpreter — The program stored inside a computer that converts or "translates" BASIC statements into the computer's machine language.

K — Short for **kilo** meaning **thousand**. Used to designate memory capacity . . . thus a 4K memory has approximately 4,000 storage elements.

Keyboard — A typewriter-like panel of switches and keys used to enter programs and data into a computer.

Level 1 BASIC — A set of easy English word instructions used to program a microcomputer.

Level 2 BASIC — An expanded form of BASIC that increases programming capability and adds ability to work with other accessory devices.

Memory — Any of the many devices (ROMs, RAMs, floppy disks, magnetic tapes, etc.) that store computer programs and data.

Microprocessor — The central processing unit of a computer assembled on a single silicon chip.

Microcomputer — A computer made by combining a microprocessor with some memory. Microcomputers are small in size, not performance.

Output — The means by which data leaves a computer. Often a television monitor or printer.

Paper Tape — A narrow ribbon of paper which contains computer data in the form of punched holes. A hole indicates the bit 1; no hole indicates the bit 0. Paper tape is sometimes used to enter programs into a computer.

Peripheral — An accessory which can be added to a computer to increase its capability and usefulness (a floppy disk, paper tape unit, etc.)

Personal Computer — An economical microcomputer designed for use by small businesses, schools and computer hobbyists.

Printer — A computer output mechanism that delivers hard copy data.

Program — The list of instructions or statements that tells a computer what to do.

Programmer — A person who writes programs. Usually a professional.

RAM — (**R**andom **A**ccess **M**emory) A temporary memory, i.e. one in which data can be stored so long as power is applied. RAMs store the data that's typed into the keyboard of a microcomputer.

ROM — (**R**ead-**O**nly **M**emory) A permanent memory, i.e. one in which data is stored permanently whether or not electrical power is applied.

Software — Computer programs written on paper or stored on magnetic tape or a floppy disk.

Statement — A single line of a computer program containing a single instruction like PRINT, LET, RUN, etc.

Terminal — An input device such as a keyboard; an output device such as a printer or TV monitor; or both.

User's Group — An informal or formal association of persons who own or operate similar or identical computing equipment. User's groups are usually formed to exchange programs and other helpful information.

A PRACTICAL MICROCOMPUTER

Are there any real "personal-type" microcomputers?

Yes indeed — and there's one available right now . . . at Radio Shack. *The Radio Shack TRS-80 Microcomputer System.*

We've shown you pictures of it in this little booklet. Here's some specs.

TRS-80 microcomputer specifications

Hardware:Microprocessor: Advanced Z-80 8-bit processor.

Keyboard: Integrated ASCII, 53-key professional-type.

Video Display: Memory mapped, all graphics and alphanumerics controlled by BASIC commands. Automatic scrolling.

Text: 16 lines of 64 characters, also software selectable to 32 characters per line.

Graphics: 128 horizontal by 48 vertical. Graphics and text can be interspersed in any manner by software.

Memory: Includes 4K Read-Only-Memory (ROM), 4K dynamic Read/Write Memory (RAM). Internally expandable in the computer case to 12K ROM and 16K RAM. Total memory capability to 62K.

Input/Output: Computer-controlled cassette interface. Expansion port for additional memory and peripherals. Keyboard built-in.

Electrical: U.L. listed for 120 volts AC, 60 Hz.

Dimensions: 16½x8x3½".

SOFTWARE

Radio Shack Level-I BASIC in ROM.

Level 1 Features: standard BASIC statements; floating point arithmetic; numeric, array and string variable; video graphics commands; cassette save and load commands.

Commands: NEW, LIST, RUN, CONTinue, REMark, LET, FOR-NEXT-STEP, GOSUB-RETURN, STOP, END, GOTO, IF-THEN, INPUT, ON . . . GOTO, ON . . . GOSUB, PRINT, CSAVE, CLOAD, DATA, READ, RESTORE.

Functions: MEM, TAB, INT, ABS, RND, +, -, *(multiply), /(divide), <, >, =.

Special Commands (Including graphics): DLS (clear screen), SET (x, y), RESET (x, y), POINT (x, y), formatted PRINT. Array and string capability. Data storage and retrieval.

OPTIONS

Video Display: 12" diagonal screen. 16½x13½x12". U.L. listed.

CTR-41 Data Cassette: Battery or AC operation. U.L. listed.

What about expansion?

Because of the TRS-80's system design, you can "tailor make" a microcomputer system to your needs.

Planned expansion includes an extended Radio Shack Level-II BASIC, second cassette interface, an assembler/editor, a Disk-Operating-System and mini "floppy disk" storage medium, business and hobby printers for dot matrix-type typewritten output, an expansion unit for additional PC boards, modem, and serial and parallel I/O devices for remote access to your computer via telephone lines.

In addition, expansion possibilities include digital cassettes, enhanced graphics, music synthesizers, a 10-key pad and external device controllers that could operate security systems, indoor and outdoor lights, air conditioning, heating and even appliances.

Future applications of the versatile TRS-80

The TRS-80 will be able to handle a variety of applications to fit the needs of just about everyone. Some of these applications may require drawing upon our expanding selection of hardware or software. Businessmen will find the TRS-80 perfect for such functions as general ledgers, payrolls, accounts receivable and inventory control.

Teachers and parents will find the TRS-80 a valuable aid in additional math training, including long division and algebra. Besides programmed instructions, it can be used as an aid to learning music theory.

Any application involving mathematics can benefit from the advanced math functions of a scientific sub-routine package.

Some Common Questions About Microcomputers

- Q.** I'm a layman when it comes to electronics. Does the TRS-80 require any wiring or soldering at all?
- A.** No! Each component of this system is 100% assembled and tested. Some Microcomputers require assembly and soldering, but not the TRS-80.
- Q.** What will I be able to do with the TRS-80?
- A.** Applications of the TRS-80 are limited only by the imagination and ability to write programs. What's more, Radio Shack has prepared programs available today and will introduce more.
- Q.** I don't know how to write programs. Can I learn how, and is it difficult?
- A.** Yes, you can learn! The TRS-80 includes an easy-to-read instruction/programming manual. After reading the manual and a little practice, you should be able to write programs with little difficulty.

Q. What is "RAM"?

A. Random Access Memory is the segment of the computer's memory where programs or data can be stored. The contents of the memory may be changed to another program or another set of data at any time.

Q. How much RAM comes with the TRS-80 Level I system?

A. The TRS-80 Level I system comes equipped with 4K of user RAM. With the 8K RAM option, 4K of RAM can be added for a total RAM capacity of 8K. With the 16K RAM option, 12K can be added for a total RAM capacity of 16K. Conversion is by replacement of integrated circuits.

Q. What is "ROM"?

A. Read-Only Memory is the segment of memory that permanently stores our BASIC interpreter. It retains the interpreter whether power is "on" or "off."

Q. How much ROM comes with the TRS-80 Level I system?

A. The TRS-80 Level I system comes equipped with 4K ROM. Radio Shack level-I BASIC is stored in this ROM. Radio Shack Level-I BASIC in ROM can be substituted for the 4K ROM when available.

Q. I would find a printer to be useful for business purposes. Is one available?

A. In fact. Radio Shack will make *two* printers available. A professional-type printer will best suit the needs of the businessman. Another printer will be smaller in size and perfect for low-cost applications.

Q. Where can I get soft-ware? Programs?

A. Initially there will be a number of cassette programs (games, personal finance, payroll for small business application, math and other education applications). Radio Shack will be constantly bringing out cassette programs and books. Many programs are already written in the BASIC language, which can be used with the TRS-80.

Q. How much memory is accessible by the TRS-80?

A. 62K. Why not 64K? Because 2K RAM is used by the system.

Q. What type of bus does the TRS-80 incorporate? Is it compatible with the S-100 bus?

A. The TRS-80 can be adapted to interface with the S-100 bus. Radio Shack will have an interchange box available for this purpose.

Q. When will accessory, or "peripheral" equipment become available?

A. Planned expansion devices should be available very soon.

Q. What about service on the TRS-80 system?

A. Service can be obtained through Radio Shack stores.

Some More Serious Questions About a TRS-80 System:

Q. Does the System have the capacity for the task I plan to do?

A. That's a good question — if you are using our applications packages, the answer normally will be yes. If you are preparing a special program, you'll have to consider this carefully. Questions such as — length of time required to input data — how long will it take to retrieve data from the storage medium — how long will it take to run the program each time . . . etc. For inexperienced users, we recommend that you add only one application at a time; then, check your results carefully so you know they are right. And, don't expect the Computer to perform miracles.

Another possible answer to this question might be to use more than one TRS-80 system. For example, in a small to medium-size business — using two systems to handle an inventory (split your inventory in two logical sections). Use another system in Payroll. Another in Accounts Receivable . . . etc. There are many advantages to having more than one stand-alone Microcomputer System.

Q. How about others' programs? Can I run them on a TRS-80 system?

A. In many cases, yes . . . with some minor program modifications. We can't give you a hard and fast rule for the answer to this question. Each situation would have to be checked — case by case. Programs on tapes can not be read directly into the TRS-80's tape input, *unless they have been recorded using Radio Shack's tape standard*. Other tapes typically will not load valid data. Programs from books and magazines may have to be modified slightly to be used directly (but you'll know how to do that after you've gone through our User's Manual).

Q. What would I do if my system should "go down?"

A. Well . . . it is possible — we hope it won't happen to you — but if it does; . . . we'll do our best to be sure your down-time is minimal. However, smart computer users plan ahead! Good planning might include buying a back-up system (our low cost makes this solution a lot more practical than with other systems). Or, keep in touch with other owners of TRS-80 systems (swap time with them). Another possibility will be to make special arrangements with a local Radio Shack store (most stores will eventually have one). If you bring your unit to one of our Repair Centers we'll make a quick master board change and you'll be back in business. Of course you can (and should) have an adequate manual back-up system and procedure . . . just in case!

Q. Will I be able to utilize the application software programs offered by Radio Shack?

A. This is another question where we can't give you a simple yes or no. The answer really is yes and no. Yes, you can use them if you are willing to adapt your internal procedures to our approach. However, it

is interesting to note that historically most computer users have elected to stick with their existing procedures — and thus require special programming for computerizing. Therefore, you may want to modify our programs to meet your needs. Again, by the time you've gone through our Users Manual (and have done some experimenting on your own), you'll probably be able to modify our programs with relative ease (or write your own).

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