TEXAS INSTRUMENTS

COMPUTER ADVANTAGE CLUB

INTRODUCTION TO COMPUTING WITH THE TI-99/4A

TEXAS INSTRUMENTS

PRINTED IN U.S.A.

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Texas Instruments Consumer Hotline: 1-800-TI CARES.

Texas Instruments invented the integrated circuit, the microprocessor and the microcomputer, which have made TI synonymous with reliability, affordability, and compactness.

Developed by the staff of the
Texas Instruments Computer Advantage Club

ADVANCES IN COMPUTER TECHNOLOGY

3000 B.C.—Asia
A counting machine, the abacus, begins to be used.

1640s—France
Blaise Pascal, philosopher, builds the first adding machine that carries sums.

1801—France
Inventor Joseph M. Jacquard designs punched cards to direct a weaving loom to select colored threads in weaving patterned cloth. By using different cards, Jacquard is able to change the patterns the loom weaves.

1890s—United States
Herman Hollerith and John Shaw Billings use a machine to count the United States census. Their machine uses punched cards for census data.

1930s—United States
Vannevar Bush, electrical engineer, designs and builds the first analog computer.

1937 to 1944—United States
Howard A. Aiken of Harvard University builds the first digital computer with IBM's assistance.

1940s—United States
John Mauchly and John Presper Eckert of the University of Pennsylvania build ENIAC, a speedier computer than those built previously.

1948—United States
Bell Labs invents the transstor which eventually replaces the bulky vacuum tubes previously used in computers.

1951—United States
UNIVAC, the first computer produced for sale, is installed at the Bureau of Census.

1954 to 1957—United States
An IBM-sponsored committee creates a new programming language to help scientists and mathematicians. FORTRAN (for FORmula TRANslator) becomes the basis for several other languages.

1958—United States
Jack S. Kilby of Texas Instruments invents the integrated circuit, a single piece of silicon containing complete electronic circuits.

1960s—United States
John Kemeny and Thomas Kurtz of Dartmouth College create a new programming language in order to encourage undergraduate students in all academic fields to use the computer. The new language is BASIC (Beginner's All-purpose Symbolic Instruction Code).

1970—United States
Gary Boone of Texas Instruments invents the single-chip microprocessor, an integrated circuit containing all the elements of a computer's central processing unit (CPU).

1971—United States
Gary Boone and Michael Cochran of Texas Instruments invent the single-chip microcomputer. All of the elements of a computer fit into a silicon chip the size of a baby's fingernail.

1976—United States
Texas Instruments invents Solid State Software™ which allows electronic devices to be "reprogrammed" through the use of interchangeable, plug-in modules.

1978—United States
Texas Instruments introduces the single-chip Speech Synthesizer, first used in the Speak & Spell™ electronic learning aid. This Speech Synthesizer is the first integrated circuit to duplicate electronically the human vocal tract and is eventually used in the TI Home Computer.

WHAT CAN A COMPUTER DO FOR YOU?

You and the Computer

Asking people what a computer can do for them brings a wide range of responses. Some people think first of the dramatic uses of the computer which we have seen on television news. Televised reports on the latest space flight show Mission Control and a room filled with computers. A research center's computers provide the background for a television announcer's report on a new life-saving medical technique. We hear election returns—and the computer's projections of the outcome of the election. Even though these events are far from our daily experience, television has made us aware of the power of the computer.

Although the dramatic uses of the computer are often thought of first, other people respond to questions about what the computer can do for them by noticing things in everyday life. We go to the bank in the evening and push a few buttons to make a deposit or to transfer funds from one account to another. We buy groceries, and computers at the checkout counter respond to the barcoded price on a package and record the price on our grocery bill—and on the store's inventory list.

Computers keep track of warehouse inventories, place orders for more materials, and send out bills. Computers prepare our bank statements and record the charges made on credit cards. The computer has become a common, almost unnoticed part of our everyday lives.

Businessmen and women use word-processing software to send a personal letter to each customer by simply changing the inside address. People who run typing services make use of word-processing packages to improve their services and decrease their costs. Other software packages record customers' names and addresses on a mailing list which can be updated without retyping the entire list.

Individuals owning small businesses are not the only ones who can profit by using a personal computer. Home management requires sophisticated record-keeping and decision-making skills. Personal computers using software packages selected to meet individual needs can make the financial tasks involved in managing a home easier.

The same software package which provides information for a businessperson making decisions about borrowing money helps individuals planning to buy a car or a home determine which loan is the best financial decision. Keeping records of tax-related expenses can be made less difficult with a personal computer which calculates at the end of the tax year entries made throughout the year. Software packages also simplify keeping an inventory of household property because items can be added—and deleted—easily. Software packages can even assist with the monthly task of balancing a checkbook.

The Personal Computer

Some people do not think of the large computers used in space flights, in banking, or in business when they are asked what the computer can do for them. They think instead of the small personal computer which they can use in their homes. For these people, the answer to the question "What can a computer do for you?" brings a different response. It can do what I want it to do.

. . .in Homes

The personal computer is designed to meet the needs of the people who use it. The personal computer is "user friendly." It can be used by people who have never programmed a computer as well as by sophisticated users. The personal computer can respond to a computer language such as BASIC or to software packages which are preprogrammed. The personal computer is a convenient size for home use, requiring only a table or desk to hold the system. As the microcomputer has brought reduction in size of computers, it has also brought lower costs, which make ownership by individuals possible. Because of the personal computer's flexibility, the question "What can a computer do for you?" brings answers as diverse as the people who are asked.

. . .in Business

Men and women with small businesses take advantage of the low cost and convenience of the personal computer to handle many aspects of their businesses. Software packages keep track of inventory and cash flow. Software cartridges compute interest charges and help provide information necessary to make good decisions about borrowing and lending in a period of rapidly changing interest rates. Business people also use software programs to keep records of business-related expenses and calculate totals for each type of expense.

. . .for Education

Not only can the personal computer make life easier for us in business and in homes, but it can also enrich our lives. Software packages in statistics or real estate management can provide both tools for our work and practice with a new subject. Software packages can help us learn how to program in a computer language so that we can create our own computer programs. We can even buy computer programs designed to help us learn such things as typing and chess.

Children, in particular, enjoy the new opportunities for learning available because of the personal computer. Children can create programs on the computer using LOGO, a programming language designed to appeal to children because of its exciting graphics and its ease of use. Computers can offer additional benefits to young learners. Many of the subjects which children need to learn require hours of drill and practice. Although practicing multiplication tables may not be exciting, it's fun to shoot an alien spaceship carrying a multiplication problem by firing a missile with the correct answer. Computers can be programmed to evaluate the number of errors being made by a child and can adjust the level of difficulty of the problems being presented to the child.

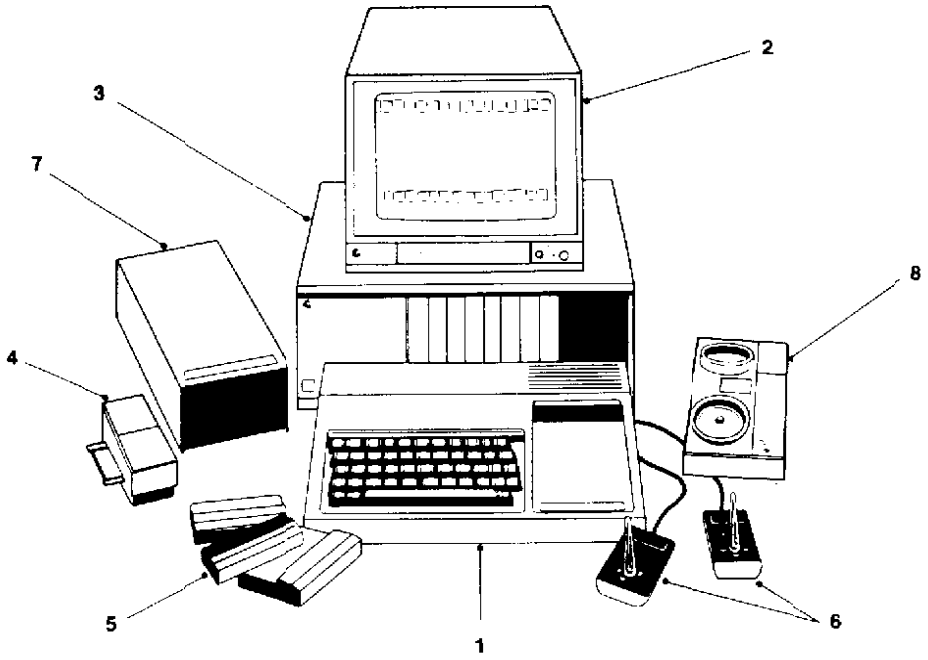
. . .for Entertainment

Personal computers help us with our businesses, with home management, and with educational enrichment, but they are also fun. We can have all the excitement of video games in our own homes. We can have a chess opponent who is always ready to play—and who will play at the level of skill we choose. With the correct software, the computer will play with us whether the game is bridge or blackjack.

You and the Personal Computer

The personal computer deserves its name. It is a computer for personal needs. Before you can answer the question "What can the computer—the personal computer—do for you", you will need to ask yourself a question. What are the things I need done? Help in my business? Record-keeping and home management information? Educational opportunities available in my home? Entertainment for my family and friends? When you think about what you want done and what the personal computer can do for you, you may decide that the personal computer is your computer.

COMPUTER COMPONENTS



1. **TI-99/4A Home Computer**—A typewriter-like console that allows you to enter, store, and manipulate data.

2. **Video Monitor**—A ten-inch color screen with a display format for 24 lines of 32 characters and audio capabilities.

3. **Peripheral Expansion System**—A compact system designed to centralize the Disk Memory System, the RS-232 Interface, the Memory Expansion unit, and other accessories in one place..

4. **Speech Synthesizer**—A device which reproduces human speech electronically and accurately, allowing the computer to communicate verbally.

5. **Home Computer Software**—A large library of preprogrammed cassettes, disketes, and Solid State Cartridges designed to help you learn, keep household records, or play stimulating games.

6. **Wired Remote Controllers**—Eight-position remote control with top-mounted action button allows you to move objects on the screen.

7. **Disk Memory System**—Stores data or programs that you wish to save for later use.

8. **TI Telephone Coupler (Modem)**—Allows your Home Computer to send or receive information through a telephone.

PROGRAMMING LANGUAGES

In order to communicate with a computer, we must use programming languages which both the computer and the operator can understand. There are several languages available for use—each with special capabilities and purposes. Listed below are several of the most common.

BASIC stands for Beginner's All-purpose Symbolic Instruction Code. It is the most popular programming language in use today, as it is very much like our own English language. As with English, one may encounter several dialects of BASIC. The TI-99/4A dialect is called TI BASIC, and it gives your computer a full range of programming capability for most home and personal applications.

TI Extended BASIC provides more complex capability for business and professional software. It will enable you to produce moving, animated graphics on the screen which is not possible with TI BASIC. TI Extended BASIC allows faster execution and provides access to the Memory Expansion Unit, thereby increasing the amount of information your computer can process.

TI LOGO is designed especially for children who are just becoming familiar with computers. Its simple, easy-to-learn commands allow you to progress from sketching, animated graphics, and writing, to mathematics and complex problem solving. TI LOGO lets you experience the world of computer programming through self-paced exploration and discovery.

PILOT stands for Programmed Inquiry, Learning, Or Teaching. This programming language is used for educational program development for Computer Assisted Instruction (CAI) and is readily learned by instructors for classroom use. Instructors use PILOT to create programs which demonstrate concepts, simulate laboratory-like environments, and provide individualized drill, practice, and testing.

Pascal gives access to a large library of professional and technical programs. Relatively easy to read and understand, it is designed to run on various types of computer systems. The TI-99/4A system utilizes the TI P-code Card peripheral and the UCSD p-System* Compiler software to translate input in UCSD Pascal* directly into the native machine instruction language compatible with the computer.

TI FORTH is an advanced programming language. Compact and powerful, it also has the capability to use Assembly subroutines. Although easier to learn and use than Assembly, detailed programming knowledge is necessary for utilization of TI FORTH.

Assembly (TMS9900) is very similar to machine language. Commands written in Assembly language need not be interpreted by the computer to machine code. Therefore, programs run much faster than when entered in high-level languages (languages using everyday words such as BASIC). Because detailed knowledge of Assembly language is necessary in order to utilize the language, beginning programmers usually start with a higher-level language.

*UCSD p-System and UCSD Pascal are trademarks of the Regents of the University of California

Now, let's try running a couple of simple programs just to see how they work and what they can do. Get into TI BASIC by turning the computer on and pressing any key to go to the Master Selection List. Press 1 for TI BASIC and type the following program, pressing ENTER at the end of each line. (If you make a mistake, press the FCTN and S keys to backspace to the error and type over the error to correct it.)

```
10 CALL CLEAR
20 PRINT "HELLO, I AM THE TI-99/4A"
30 PRINT :::::
40 GOTO 20
```

Now type RUN and press ENTER. What happened? Press FCTN 4 (CLEAR) to stop the program. Type EDIT 20 and press ENTER. Using FCTN S or FCTN D to move the cursor, change the wording between quotation marks by typing over the old text. When finished, press ENTER. Now, RUN the program again and note what happens.

When you type RUN and press ENTER after typing a program, the screen should turn green and the program should begin. If the computer beeps and prints an error message on the screen, you probably have a "bug" somewhere in your program! "Bugs" are usually caused by typographical errors. SOLUTION: Type LIST and press ENTER to view the program in memory. Check each line closely for errors. If an error is found, type EDIT 10 (or whichever line number contains the error) and press ENTER. Correct the error after using the arrow keys (FCTN S, FCTN D) and the space bar to move the cursor to the error. Press ENTER when the corrections are completed, then RUN the program.

Type NEW and press ENTER before entering another program. The following program helps demonstrate color combinations on the screen.

```
NEW
10 CALL CLEAR
20 INPUT "SELECT A NUMBER FROM 3 TO 16 THEN PRESS ENTER: ":S
30 INPUT "SELECT A NUMBER FROM 1 TO 16 THEN PRESS ENTER: ":F
40 INPUT "SELECT A NUMBER FROM 1 TO 16 THEN PRESS ENTER: ":B
50 CALL CLEAR
60 CALL SCREEN(S)
70 CALL COLOR(2,F,B)
80 CALL HCHAR(12,3,42,28)
90 GOTO 20
RUN
```

Type RUN and press ENTER to execute the program. To stop the program, press FCTN 4(CLEAR).

These programs make the computer count!

```
NEW
10 CALL CLEAR
20 FOR X=1 TO 50
30 PRINT X
40 NEXT X
50 END
RUN
```

```
NEW
10 CALL CLEAR
20 FOR X=5 TO 50 STEP 5
30 PRINT X
40 NEXT X
50 END
RUN
```

```
NEW
10 CALL CLEAR
20 FOR X=10 TO 50 STEP 10
30 PRINT X
40 NEXT X
50 END
RUN
```

This program makes the computer play a recognizable tune!

```
NEW
10 CALL SOUND(1500,131,10)
20 CALL SOUND(1500,196,10)
30 CALL SOUND(1500,262,10)
40 CALL SOUND(250,311,5,262,5,196,5)
50 CALL SOUND(1500,330,5,262,5,196,5)
60 END
RUN
```

You may want to quiz yourself with this program.

```
NEW
100 CALL CLEAR
110 PRINT "THIS PROGRAM WILL QUIZ YOU"
120 PRINT "ON SOME NEW TERMS"
130 PRINT "YOU LEARNED TODAY."
140 PRINT :::
150 PRINT "WHAT TERM DESCRIBES THE"
160 PRINT "KIND OF COMPUTER MEMORY"
170 INPUT "THAT IS ERASABLE? B$
180 IF B$="RAM" THEN 210
190 PRINT "TRY AGAIN:"
200 GOTO 140
210 PRINT "VERY GOOD!"
END
220 RUN
```

Run this program and see what happens. Answer the question both correctly and incorrectly. Can you follow the steps in the program to find out why the computer responds differently to a right and to a wrong answer?

Try editing and changing these programs.

AVAILABLE SOFTWARE

Information Management

Cartridges	Diskettes and Cassettes
Home Financial Decisions	Mailing List
Household Budget Management	Personal Finance Aids
Securities Analysis	Checkbook Manager
Personal Record Keeping	Personal Tax Plan[7]
Tax/Investment Record Keeping	TI-Count Business Packages[7]
Personal Real Estate	TI Mini-Writer
Personal Report Generator	Personal Enrichment
TI Writer[8]	Cartridges
Microsoft™ Multiplan™[8]	Physical Fitness
Terminal Emulator II	Weight Control and Nutrition
	Touch Typing Tutor
	Music Maker

Education

Cartridges	
Early Learning Fun (For ages 3-6)	Word Invasion
Beginning Grammar (For grade levels 2-5)	Multiplication 1[9] (For grade levels 3-4.)
Number Magic (For ages 6 and up)	Division 1[9] (For grades 3-5.)
Video Graphs (For all ages)	Computer Math Games II & V[9] (For grade levels 1-9)
Early Reading[4] (For beginning readers.)	Alien Addition (For addition skills)
Reading Fun[4] (For grade levels 1-3.)	Minus Mission (For subtraction skills)
Reading On[4] (For grade level 3)	Alligator Mix (For discrimination skills)
Reading Roundup[4] (For grade level 4)	Meteor Multiplication (For mutiplication skills)
Reading Rally[4] (For grade level 5)	Demolition Division (For division skills)
Reading Flight[4] (For grade level 6)	Dragon Mix (For discrimination skills)
Addition/Subtraction 1[9] (For grade level 1.)	Key to Spanish
Addition/Subtraction 2[9] (For grade levels 1-2.)	Weight Control and Nutrition
Numeration 1 (For grades 1-3.)	TI LOGO II
Numeration 2 (For grades 4-6.)	Scholastic Spelling[4] (For grade levels 3-6.)
Word Radar (For all ages.)	Early LOGO Learning Fun (For young children)
Touch Typing Tutor[4]	

Milliken Math Series (For grade levels K-8)

- Addition
- Multiplication
- Integers
- Decimals
- Laws of Arithmetic
- Measurement Formulas
- Subtraction
- Division
- Fractions
- Percents
- Equations

Diskettes and Cassettes	
Music Skills Trainer (For ages 10 and up.)	Bridge Bidding I
Computer Music Box (For ages 10 and up.)	Bridge Bidding II
Market Simulation	Bridge Bidding III
Music Maker Demonstration	Speak & Spell™ Program
Basketball Statistician	Speak & Math™ Program
Spell Writer	
TI PILOT	
Text-to-Speech (English)	

PLATO® Learning Center[12]

Now PLATO Basic skills courses are available on disks. Choose from more than 450 programs in the PLATO curriculum. Here's all that's required to use PLATO courseware:

—TI-99/4A Home Computer
—TI Disk Memory System
—TI Memory Expansion
—PLATO Interpreter Solid State Cartridge
—PLATO Program Packages (your choice)

The PLATO Interpreter Solid State Cartridge package includes:

—The Survey Disks: They ask the student questions about their skills in reading, grammar, and math.

—The Parent's Questionnaire: It asks parents questions about their child's academic skills.

Basic Skills 3-8

Mathematics

—Basic Number Ideas
—Addition
—Subtraction
—Multiplication
—Division
—Fractions
—Decimals
—Ratio, Proportion, and Percent
—Geometry and Measurement

Reading

—Making New Words
—Understanding New Words
—Understanding What You Read
—Thinking About What You Read
—Judging What You Read

Grammar

—Parts of Speech
—Building and Using Sentences
—Spelling and Usage
—Capital Letters and Punctuation
—Writing Letters

High School Skills 9-12

Mathematics

—Basic Number Ideas
—Math Sentences in One Variable
—Math Sentences in Two Variables
—Geometry
—Measurement
—Special Topics

Reading

—Reading
—General Reading
—Prose Literature
—Poetry
—Drama

Writing

—Spelling and Punctuation
—Grammar
—Diction
—Sentence Structure
—Logic and Organization

Science

—Physics
—Chemistry
—Earth Science
—Biology

Social Studies

—Geography
—Economics
—Behavioral Science
—Political Science
—History

Milton Bradley Voice Command Video Game Series[14]

New speech recognition feature enables your voice to direct characters on the screen. Cartridge.

The "Bright Beginning Series" includes four games which teach elementary programming, music and other learning concepts—Grades 4-8.

- Terry Turtle's Adventure™
- I'm Hiding™
- Honey Hunt™
- Sound Track Trolley™

"Arcade Plus Series" has six arcade style games that take you from home town ball parks to meteor belts far, far away.

- Championship Baseball™
- Space Bandit™
- Big Foot™
- Super Fly™
- Sewermania™
- Meteor Belt™

Entertainment

Cartridges

Parsec*

Tombstone City: 21st Century

TI Invaders

Car Wars

Alpiner*

Othello[7]

Chisholm Trail

Football

Video Games I

Hunt the Wumpus

Indoor Soccer

Mind Challengers

A-Maze-ing

The Attack[4]

Blasto[2]

Blackjack and Poker[5]

Hustle[5]

ZeroZap[2]

Hangman[5]

Connect Four[6]

Yahtzee[5]

Video Chess

E.T.[8], The Extra-Terrestrial

Munch Man

Munch Mobile

Moon Mine

Sneggit

Diskettes and Cassettes

Tunnels of Doom

Adventure International Series

- Adventureland
- Voodoo Castle
- Strange Odyssey
- Pyramid of Doom
- Savage Island I & II
- Mission Impossible
- The Count
- Mystery Fun House
- Ghost Town
- The Golden Voyage

Mystery Melody

Oldies But Goodies—Game I

Oldies But Goodies—Games II

M•A•S•H[13]

Saturday Night Bingo

Draw Poker

Entrapment

Computer Programming

Cartridges

Speech Editor

Editor/Assembler

Mini-Memory

TI Extended BASIC

Disks and Cassettes

Pascal Development System

Programming Aids I

Programming Aids I

Programming Aids III

UCSD Pascal[10] Compiler

UCSD P-System[10] Assembler/Linker

UCSD P-System[10] Editor/Filer/Utilities

Course Designer Authoring System

Teach Yourself BASIC[11]

Teach Yourself Extended BASIC

Beginner's BASIC Tutor

TI FORTH (Diskette only)

The TI Advanced Assembly Debugger

Math and Engineering

Statistics

Math Routines Library

Electrical Engineering Library

Graphing Package

Structural Engineering Library

AC Circuit Analysis Library

*For TI-99/4A only.

[1]Developed for Texas Instruments by Microsoft™, Inc. Multiplan is a Trademark of Microsoft, Inc.
[2]Developed for Texas Instruments by Aardvark Software, Inc.
[3]Developed for Texas Instruments by Pike Creek Computer Company, Inc.
[4]Developed by Texas Instruments in conjunction with Scott, Foresman and Co.
[5]Developed for Texas Instruments by Addison-Wesley Publishing Company
[6]Developed in conjunction with Scholastic Publishing Company, Inc.
[7]Othello is a Trademark of Gabriel Industries, a division of CBS, Inc.
[8]A Trademark of Milton Bradley
[9]A Trademark of and licensed by Universal City Studios, Inc.
[10]UCSD P-Systems is a Trademark of the University of California
[11]Developed by Texas Instruments in conjunction with Wolfdata Corporation
[12]PLATO is a trademark of Control Data Corporation, U.S.A.

PLATO Courseware is manufactured under license by Texas Instruments Inc.
[13]M*A*S*H is manufactured under license for Fox Video Games, Inc.
[14]All Milton Bradley Voice Command Video Cartridges except I'm Hiding, Terry Turtle's Adventures, and Championship Baseball can be played without the Milton Bradley MBX Expansion System; however, the MBX system is recommended to take advantage of all game features. System includes: Action Input keypad, joystick and headset microphone.

The Milton Bradley Series is manufactured by Texas Instruments, under license from Milton Bradley Company.

Some software packages require use of additional hardware (for example, Speech Synthesizer, peripheral box with cards, cassette recorder system and/or disk memory system consisting of the console and TV or monitor).

Also, some software is available as cassette only or diskette only.

COMMONLY ASKED QUESTIONS

1. **Question:** Will the console work with my television set?

   Answer: Yes. The TI-99/4A console can be connected to a television set by means of the TI-900 video modulator.

2. **Question:** Will it work like a typewriter or a word processor?

   Answer: Yes. The TI-99/4A with the Typing Tutor or the TI-Writer cartridges can function as a typing or word processing tool.

3. **Question:** Will it drive a large printer?

   Answer: Yes. With the RS-232 Interface card, using the serial port, it will drive any printer that can be driven via the RS-232 standard. For printers with parallel connection, consult the printer's manual and the RS-232 manual

4. **Question:** Can I do fine line graphics?

   Answer: Yes. The screen resolution of the monitor is a 192 by 256 dot matrix. Each dot (pixel) on the screen can be individually addressed by programming.

5. **Question:** Can I edit or change the solid state cartridges?

   Answer: No. The solid state cartridges are programs locked in integrated circuit chips. The user cannot alter them. The only exception is the specially designed Mini Memory cartridge.

6. **Question:** What is the Mini Memory cartridge?

   Answer: It is a cartridge which is designed for program storage. It will retain data for the life of its battery even if the console is turned off or if the cartridge is removed. It gives full support of the 16 BIT Assembly language with debugger using the Editor/Assembler manual.

7. **Question:** Is system documentation (schematics) available?

   Answer: Yes. For documentation, write to:

   Texas Instruments
   c/o The Dealer Parts Dept.
   P.O. Box 53
   Lubbock, Texas 79408

8. **Question:** What is the power consumption of the console and the monitor?

   Answer: The power consumption of the console plus the monitor is about the same as a 150-watt light bulb.

9. **Question:** Can you connect it to large computer data bases?

   Answer: Yes. With the telephone coupler (modem), Terminal Emulator II solid state cartridge, and the RS-232 Interface card, you can access large data bases such as Micronet, The Source, Compuserve, Dow Jones, Texnet (a special edition of The Source for TI-99/4A users), etc.

10. **Question:** Is it durable? Will it withstand electrical shock via static electricity, keyboard abuse, etc.?

    Answer: We have produced what is probably the most durable computer that's ever been made. We applied all we have learned from our years of experience in building handheld calculators to the TI-99/4A. For example, it has been designed to withstand a static electricity shock in excess of 50,000 volts with no physical damage to the computer. The only charge occurring at that particular point is that some data in RAM may be changed or lost. As far as physical abuse to the keyboard, it's probably one of the most rugged keyboards that's ever been put into any computer. The key mechanism itself was designed to be used in a desk top commercial calculator. These calculators receive thousands of keystrokes per day. We have a very durable, very hard to hurt computer. It's been designed to operate under conditions far in excess of those you would ever encounter in your home.

11. **Question:** What is the warranty?

    Answer: If the computer fails within the first thirty days because of defective materials or workmanship, it will be replaced free of charge. For the remainder of the warranty period, the computer will be replaced for a small fee. There are 42 exchange centers located around the United States where you can exchange your out-of-warranty computer for a working computer for a small fee. These are the same repair and exchange centers that currently handle our calculator products.

12. **Question:** Is the RAM really 16K?

    Answer: Some computers have only 5K RAM or less. Ours starts with 16K expandable up to a potent 52K. 52K of RAM on the TI-99/4A actually gives you as much usable room for your programs as many "64K" computers. In fact, when you consider that TI command cartridges can contain up to 36K in program (like TI Extended BASIC and Video Chess) and that the TI home computer has 26K ROM for user friendliness, you can have a total of 110K of memory and program power! And if that weren't impressive enough, the TI home computer has a 16 bit microprocessor chip! No other home computer can make this statement.

13. **Question:** Other than BASIC in what languages can I program?

    Answer: With the correct peripherals, the computer can work in Pascal, TI LOGO, PILOT, FORTH, TI Extended BASIC, and Assembly.

14. **Question:** Is there any package like Visicalc that will let me set up financial models?

    Answer: Microsoft has written Multiplan for the TI-99/4A. The program can do many of the same things as Visicalc, plus a few extras.

15. **Question:** Is there any way to get 80 column width on the screen?

    Answer: Yes, eighty columns are possible using Microsoft Multiplan™*, TI Writer, Editor/Assembler, TI Forth and through the UCSD Pascal system (the screen only views 40 columns at a time, but it is possible to scroll to see the rest).

16. **Question:** Can the computer do things for my home—turn on lights regulate the temperature, control burglar alarms, etc.?

    Answer: At the present time the only things standing between these sorts of functions and our computer are simple peripheral devices that will plug into the computer.

17. **Question:** How much information can I store on a diskette? A cassette? Mini Memory Cartridge?

    Answer: About 90K bytes of data can be stored per diskette, which is about the same as 90,000 keystrokes of information (per diskette, per drive) Double-sided diskettes hold 180K bytes. A 60-minute cassette tape can hold up to 200K bytes. A Mini Memory cartridge will hold 4K bytes of RAM memory using a battery pack.

18. **Question:** What type of diskettes do I need to use with a TI disk system?

    Answer: The TI disk system requires 5¼ inch, single-sided density, 40 track, soft-sectored diskettes.

19. **Question:** Can I use a double-sided diskette with my disk drive system?

    Answer: A double-sided diskette may be used with a double-sided disk drive. The Disk Manager II Cartridge is required (packaged with the TI Disk Controller Card).

20. **Question:** What is double density?

    Answer: Double density allows about twice as many bytes of information per track, almost doubling diskette storage of data.

21. **Question:** Is there a magazine that specifically gives information on the TI-99/4A?

    Answer: 99'er Home Computer magazine does. You can subscribe by writing to:

    99'er Home Computer Magazine
    P.O. Box 5537
    Eugene, OR 97405

22. **Question:** Can I get technical questions answered about the TI systems?

    Answer: For technical questions about programming, specific computer applications, etc., you can call:

    806-741-2663 (collect calls not accepted)

    Or you can write to:

    Consumer Relations Dept
    Texas Instruments Incorporated
    P.O. Box 53
    Lubbock, Texas 79408

SOURCES FOR ADDITIONAL INFORMATION

Because of the rapidly increasing popularity of personal computers, more information is available each day. News magazines include articles on personal computers in business and in schools, and new magazines devoted just to computer information are now available. Use this list as an introduction to this growing field.

Magazines of Interest

BYTE: The Small Systems Journal
P.O. Box 590
Martinsville, NJ 08836

Classroom Computer News
Subscription Dept.
51 Spring Street
Watertown, MA 02172

Creative Computing
P.O. Box 5214
Boulder, CO 80321

Electronic Learning
Scholastic Inc.
50 W. 44th St.
New York, NY 10036

99er Magazine
P.O. Box 5537
Eugene, OR 97405

Personal Computing
4 Disk Drive
P.O. Box 1408
Riverton, NJ 08077

Popular Computing
P.O. Box 307
Martinsville, NJ 08836

Recreational Computing
Peoples Computer Company
Menlo Park, CA 94025

Technological Horizons n Education Journal
(T.H.E. Journal)
Information Synergy, Inc.
P.O. Box 992
Acton, MA 01720

Beginner's Books

Rejena, C. **Reference Guide to the TI-99/4A,** Computer Publications, Inc., Greensboro, North Carolina.

Cannon, Don L., and Luecke, Gerald. **Understanding Microprocessors.** Understanding Series™ Books from Texas Instruments, 1979. (288 pages. Shipping weight 13 oz. Soft cover.)

Walker, Roger S. **Understanding Computer Science.** Understanding Series™ Books from Texas Instruments, 1979 (280 pages Shipping weight 13 oz. Soft cover.)

To order books or to learn about other books available from Texas Instruments, write:
Texas Instruments Incorporated
P.O. Box 225012, M.S. 54
Dallas, Texas 75265

Consumer Hotline

For information concerning Texas Instruments Computer Advantage Club classes, for purchasing TI Home Computer software, peripherals, or accessories that you are unable to obtain from your local dealer, or for any questions you may have about your TI products, call Texas Instruments Consumer Hotline on our toll free number...

1-800-TI CARES

TI-99/4 and /4A USERS' GROUPS

TI-99/4 and /4A Users' Groups are groups of mostly amateur computer programmers. They gather to exchange information, programs, and programming ideas.

Below is a list of national and international Users' Groups locations. If you or a friend are interested in becoming a part of a Users' Group, contact the group in your area by mail, using the addresses supplied.

INTERNATIONAL GROUPS

The 99/4 Program Exchange
PO Box 3242
Torrance, CA 90510

99/4 Users of America
5028 Merit Drive
Flint, MI 48506
313-736-3774

New York 99/4A UG
34 Maple Avenue
Armonk, NY 10504

International 99/4 Users Group
PO Box 67
Bethany, OK 73008
405-948-1023

ALABAMA

Central Alabama 99/4 Users Group
551 Larkwood Drive
Montgomery, AL 36109

Jasper 99/4A Users Group
1F Northwood Townhome
Jasper, AL 35501

North Alabama 99 Computer
4126 Cherokee Drive
Huntsville, AL 25801

TIBUG
709 Nytol Circle
Birmingham, AL 35210

Wiregrass 99 Users Group
106 Harwood Place
Enterprise, AL 36330

ARIZONA

Arizona 99 Users Group
4329 LaFuenta Avenue
Phoenix, AZ 85004
602-841-8713

Southwest Ninty-Niners UG
6816 E. Lurlene Drive
Tucson, AZ 85730

Yuma 99er UG
1573 E. Kuns Court
Yuma, AZ 85365

ARKANSAS

Artic K-Byters
Route Box 69
Van Buren, AR 72956

Little Rock 99er UG
PO Box 55
North Little Rock, AR 72115

CALIFORNIA

Bechtel Employee's Computer Users
50 Beale Street PO Box 3965
San Francisco, CA 94119

Central Valley Users Group
2419 Clemson Drive
Davis, CA 95616

Golden Gate Computer UG
3617 Guerneville Road
Santa Rosa, CA 95401

Highway 99ers Computer Group
1277 East Avenue
Chico, CA 95926
916-343-4528

Kings 99/4A Users Group
299 W. Birch
Hanford, CA 93230

LA 99er Computer Group
PO Box 3547
Gardena, CA 902-7247

Orange County 99/4A Users Group
3941 BS Bristol St. Suite 172
Santa Anna, CA 92704

Pancho Seco 99/4A HC Users Group
Pancho Seco, 11440 Highway 104
Herald, CA 95638

South Bay 99er Users Group
15380 E. LaChiquita
Los Gatos, CA 95030

San Gabriel Valley 99/4 Users Group
1008 Dore Street
West Covina, CA 91712
213-330-8240

South California Computer Group
PO Box 21181
El Cajon, CA 92021

The Tri-Valley 99ers
306 Flittner Circle
Thousand Island, CA 91360

COLORADO

Boulder 99/4A Users Group
7129 Mt. Meeker Road
Longmount CO 80501

Rocky Mountain 99ers
Box 3400
Littleton, CO 80161

DELAWARE

Delaware Valley Users Group
25 Quartz Mill Road
Newark, DE 19711

Kent County 99/4A Computer UG
Box 354 Andrews Lake
Felton, DE 19943

FLORIDA

Brevard Users Group (BUG)
PO Box 1402
Palm Bay, FL 32906-1402

Daytona 99ers
PO Box 4594
S. Daytona, FL 32021

Greater Orlando 99er Users Group
PO Box 138
Maitland, FL 32751

Manasota 99
6625 Roxbury Drive
Barasota, FL 33581

Northwest Florida 99er
PO Box 364
Pensacola, FL 32516

Penellas Perinsula 99/4 Users Group
5060 86th Avenue N
Pinellas Park, FL 33565

South Florida 99 Users Group
433 Wright Drive
LaKe Worth, FL 33461

Tampa Bay 99er Users Group
13097 Lois Avenue
Seminole, FL 33542

West Jax 99ers
7266 Bunion Drive
Jacksonville, FL 32222

GEORGIA

Atlanta 99/4A Computer Users Group
PO Box 19841
Atlanta GA 30325

Georgia 99/4A Computer Users Group, Ltd
PO Box 88464
Dunwoody, GA 30356

Savanrah Computer Users Group
2723 Stidaway Road
Savanrah, GA 31404

HAWAI

Aloha 99/4A Users Group
92865 Palailai Street
Makakilo, HI 96706

ILLINCIS

Chicago 99/4A Users Group
353 Park Drive
Palatine, IL 60067

East Central Illinois 99UG
3701 Tuttle
Danville, IL 61832

K3 Users Group
Route 2 Box 203
Momerce, IL 60954

Lincolnland 99 Computer Group
PO Box 1434
Springfield, IL 62705

99/4A Owner Users Group
8602 Dorr Road
Wonder Lake, IL 60097

INDIANA

Anderson 99er UG
Route 2 Box 374 A
Pendleton, IN 46046

Hoosier Users Group
PO Box 34334
Indianapolis, IN 46234-0334

Miami County Area 99/4A HC UG
163 West Third
Peru, IN 46970

IOWA

Cedar Valley 99er Users Group
2705 16th Avenue
Marion IA 52302

Centra Iowa 99/4A UG
3013 E 32nd Street
Des Moines, IA 50317

Northeast Iowa HC Users Group
1421 Delta Drive
Cedar Falls, IA 50613

KANSAS

Mid America 99/4 Users Group
PO Box 2505
Shawnee Missior, KS 66201

KENTUCKY

Kentuckiana 99/4A Computer Society
9801 Tiverton Way
Louisville, KY 40222

The Bluegrass Area
2210 Burton Park
Georgetown, KY 40324

LOUISIANA

Bayou 99 Users Group
PO Box 921
Lake Charles, LA 70602

MAINE

Greater Sanford Users Group
RFD 1 Box 275
Springvale, ME 04083

MARYLAND

Batimore Users Group
PO Box 3
Perry Hall, MD 21128

Severna Park 99/4A Users Group
27 Whittier Parkway
Severna Park, MD 21146

MASSACHUSETTS

Club 99
34 Forest Street
Attleboro, MA 02703

Magnetic
57 River Road
Andover, MA 01810

MIT Lincoln Labratory 99/4A UG
244 Wood Street
Lexington, MA 02173

M.U.N.C.H
1241 Main Street
Worchester, MA 01603

New England99ers
99 School Street
Weston, MA 02193

Personal Computer Users
PO Box 782
Westborough MA 01581

Pioneer Valley 99/4 Users Group
3 Market Street
Northampton, MA 01060

MICHIGAN

Central Michigan Computer 99
1970 Kibby Road
Jackson, MI 49230
517-784-4202

Grand Rapids 99 UG
Box 1649
Grand Rapids MI 49501

Home Computer Club
41599 Simcoe
Canton Township, MI 48198

Lower Michigan 99/4A Users Group
18659 Lucy
Allen Park, MI 48101

MINNESOTA

MSP 99 Users Group
PO Box 12351
St. Paul, MN 55112

MISSOURI

Jackson County 99ers
3012 Canterbury
Blue Springs, MO 64015

Kansas City 99/4A Computer Users
1511 N. Troost
Kansas City, MO 64116

Ozark 99er Users Group
Route 1
Republic, MO 65738

99/4A Users Group of St. Louis
271 Oak Pass Court
Ballwin, MO 63011

MONTANA

Big Sky 99ers Computer UG
PO Box 1044
Great Falls, MT 59403

NEBRASKA

Crossroads 99er Computer Group
511 Iowa Street
York, NE 68467

Lincoln 99 Computer Club
5401 S 37th Street
Lincoln, NE 68516

NEW HAMPSHIRE

New Hampshire 99'ers UG, Inc
PO Box 7199, Heights Station
Concord, NH 03301

NEW JERSEY
Central Jersey 99/4A Users Group
PO Box 873
Brick, NJ 08723

New JUG
Islean NJ Public Library
Green Street, NJ 08830

North Jersey 99er Group
52 Laura Avenue
Manaque, NJ 07465

Northern NJ 99er UG
PO Box 515
Bedminster, NJ 07921

SK 99 Users Group
180 Haledon Avenue
Prospect Park, NJ 07508

9900 Users Group
PO Box K
Moorestown, NJ 08057

NEW MEXICO
Bernalillo 99/4A HC UG
2008 Lead Avenue SE
Albuquerque, NM 87106

NEW YORK
Chautauqua County UG
2209 Big Tree Road
Lakewood, NY 14750

R.G. and E.
71 Finnegan Way
Henrietta, NY 14620

Upstate New York 99/4 UG
PO Box 13522
Albany, NY 12212

NORTH CAROLINA
Bits and Bytes Users Group
139 Vance Street
Roanoke Rapids, NC 27870

Carolina 99/4A Users Group
8467 Southard Road
Stokesdale, NC 27357

Charlotte 99 Users Group
DOWD House at 2216 Momentum St
Charlotte, NC 28202

Piedmont 99er Users Group
316 Reynolds Drive
Statesville, NC 28677

The Forsyth 99er Computer UG
4801 Sewyn Drive
Winston-Salem, NC 27104

OHIO
Cin-Day Users Group
PO Box 519
West Chester, OH 45069-0519
513-777-0110

Cleveland Area 99/4A Computer Group
2385 Stanford Drive
Wickliffe, OH 44092

C.O.N.N.I.
1456 Grandview Avenue
Columbus, OH 43212

ECO 99er Users Group
PO Box 1601
E. Canton, OH 44730

Summit 99er Users Group
807 Washington Avenue
Cuyahoga Falls, OH 44221

OREGON
Pacific Northwest 99/4 Users Group
PO Box 3537
Eugene, OR 97405

Portland Users Of Ninety-Nines
PO Box 15037
Portland OR 97215

Salem Oregon Ninety-Niner (SONN)
4981 Jores Road Street
Salem, OR 97302

Willamete Valley 99/4A UG
740 SE Park Avenue
Corvallis OR 97333

PENNSYLVANNIA
Airport Area Computer Club
PO Box 710
Corapolis, PA 15108

Capital Area Users Group
PO Box 637 Federal Square Station
Harrisburg, PA 17108-9998

Central PA 99/4A Users Group
(The Point) I-83 and Union Deposit
Harrisburgh, PA 17109

Hazleton Area 99ers
PO Box 285
Hazelton PA 18201

Lehigh Users Group
PC Box 4837
Allentown, PA 18103

Meadville Area Computer UG
RD #1, Box 274
Meadville, PA 16335

Philadelphia 99er Users Group
552 Seville Street
Philadelphia, PA 19128

Pittsburgh Users Group
PO Box 18124
Pittsburgh, PA 15236

RHODE ISLAND
Tri-State Users Group
PO Box 457
Lincoln, RI 02864

SOUTH CAROLINA
Carolina Computer Club
225 Wynchwood Drive
Irmo, SC 29063

Piedmont 99ers Computer Group
PO Box 5921
Greenville, SC 29606

Sumter Computer Club 99ers
875 Bay Blossom Avenue
Sumter, SC 29150

TENNESSEE
Athens 99/4 Computer Users Group
2215 Congress Parkway
Athens, TN 37303

Mid-South Users Group
8067 Neshoba
Germantown, TN 38138

Middle Tennessee Users Group
PO Box 367
Estill Springs, TN 37330

TEXAS
Central Texas 99/4A Users Group
PO Box 3026
Austin, TX 78764

Corpus Christi 99ers
3602 Braeburn
Corpus Christi, TX 78415

Dallas Home Computer Group
PO Box 672
Wyle, TX 75098

Houston Users Group (HUG)
18103 Bambridge
Houston, TX 77090

JSC Users Group (JUG)
2321 Coryell Street
League City, TX 77573

Lubbock Computer Club
3211 27th Street
Lubbock, TX 79410

"NET" Northeast Tarrant 99er HC UG
PO Box 534
Hurst, TX 76053

San Antonio Area 99ers
PO Box 2509
Universal City, TX 78148

West Texas 99/4 Users Group
PO Box 6448 M/S 3030
Midland TX 79701

Young Peoples LOGO Association
1208 Hilldale Drive
Richardson, TX 75081

VIRGINIA
Southside 99/4A Computer UG
356 Northwood Drive
Danville, VA 24540

Tidewater 99/4 Users Group
942 Boiling Avenue #106
Norolk VA 23501

WASHINGTON, DC
Washington DC Users Group
PO Box 267
Leesburg, VA 22075

WASHINGTON STATE
Puget Sound 99ers
PO Box 6073
Lynnwood, WA 98036

Western Washington Computer Club
10808 Kuhlman Road SE
Olympia, WA 98503

Tri-Cities 99er Computer Club
PO Box 1039
Richland, WA 99352

WISCONSIN
Fox Cities Users Group
PO Box 2277
Appeton, WI 54913

Madison Area Home Computer
3518 Concord Avenue
Madison, WI 53704

Milwaukee Area Users Group
2007 North 71st Street
Wauwatosa, WI 53213

Rock 99 Computer Club
Route 5 Box 399
Edgerton, WI 53534

Sreboygan Area Users Group
PO Box 1151
Sreboygan, WI 53081

AUSTRALIA
Victoria Coordinator
59 Landstrom Quadrant
Kilsyth 3137
Victoria, Australia

New South Wales Coordinator
PO Box 101
Kings Cross 2011,
New South Wales, Australia

Queensland Coordinator
127 Crowley Street
Queensland, Australia

Western Australia Coordinator
PO Box 246
Mt Lawley 6014
Western Australia, Australia

South Australian Coordinator
26 Suffolk Avenue
Brahma Lodge 5109
South Australia, Australia

Tasmanian Coordinator
2 Binya Street
Glen Orchy 7010
Tasmania, Australia

Canberra Coordinator
69 Canopus Cresent
Giralang 2617
A.C.T., Australia

BELGIUM
Gebruikers Club Vlaanderen
Broekestraat 63
B-9670, Horebeke, Belgium

CANADA
Carleton Home Computer UG
RR #2
Stittsville, Ontario
Canada KOA 3G0

Edmonton Users Group
PC Box 11983
Edmonton, Alberta
Canada T5J 3L1

Kawartha 99er Users Group
45-30 Champlain Cresent
Peerborough, Ontario
Canada K9L 1T1

Sudburry 99ers
2530 Ida Street
Sudburry, Ontario
Canada P3E 4X1

Toronto Home Computer UG
3175 Kirwin Avenue Townhouse #159
Mississauga, Ontario
Canada L5A 3M4

Vancouver Computer Users Group
5835 Mayview Circle
Burnaby, BC
Canada Z5E 4B7

Victoria 99er Group
2602 Peart Road
Victoria, BC
Canada V9B 3T8

Winnepeg Users Group
14 Stillwell Street
Winnepeg, Manatoba
Canada R2Y 0M7

COLUMBIA
Asociacion Columbia
de Usuarios 99/4
Av Nutivara #C 3-6
Medellin Colombia SA

ENGLAND
TI Home
157 Bishopsford Road
Morden Sury SM46BH
England

GERMANY
American Express International
Department 204
APONY 09757
Frankfort, Germany

Binary—The two-digit (bit) number system based on 0 and 1.

Bit—A binary digit (0 or 1).

Byte—A string of eight binary bits.

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

Command—A word or pair of words instructing the computer to do something. Examples: NEW, LIST, RUN, CALL CLEAR.

Console—Main part of the computer containing the keyboard and the CPU.

Cursor—A flashing rectangle showing where a typed character will appear.

Diskette—A flexible 5¼ inch plastic disk coated with the same magnetic material used to make recording tape. Used for permanent storage of data or programs.

Display—The video screen on the monitor.

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.

Graphics—Visual constructions on the screen, such as graphs, patterns, and drawings, both stationary and animated.

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

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

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

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

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

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

Monitor—Television-like device to display programs as they run or are being written.

Output—Information that is being sent FROM the computer, i.e., graphics on the monitor screen, a report being printed. Also, the means by which data leaves a computer—often a television monitor or printer.

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.

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

Programming Language—Numeric or alphabetic commands which a computer can assimilate, understand, and execute.

RAM—(Random Access Memory) - A temporary memory, i.e., one in which data is stored so long as electrical power is applied. Data in RAM can be changed.

ROM—(Read Only Memory) - Certain instructions for computer are permanently stored in the ROM and can be accessed but cannot be changed.

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

Solid State Cartridge—Preprogrammed ROM modules which are easily inserted in the TI computer to extend its capabilities.

Speech Synthesizer—A peripheral that enables the computer to talk.

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

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