

Color and Sound Computer System

\$299⁹⁵



- Z80 Based
- 12K Memory
- 10 Day Return Privilege
- Expansion Module Takes to 44K

Z80 BASED PROCESSOR UNIT

- 5 times more processing power than the Z80 alone.
- Completely assembled and tested.
- 8K ROM, 4K RAM.
- High resolution color display
- Expandable to 44K system with full BASIC.

24 KEY KEYBOARD

- Adapts to different program cassettes for a variety of applications with simple overlay cards.

INSTRUCTION MANUAL

- Gives clear, illustrated, step-by-step instructions on how to install your Bally and start enjoying it within minutes of taking it out of the carton.

4 REMOTE HAND CONTROLS

- Determines action for each movement of the game being played in 8 different directions. Squeeze the trigger for shooting in Gunfight or for tracing on the screen in Scribbling.
- ALL FUNCTIONS OF THE CONTROLS CAN BE ADDRESSED IN TINY BASIC!
- Pistol grip design. Each control numbered on top.

CASE

Case is 5" x 11" x 15", made of high impact clear plastic with storage space for 15 cassettes.

3 GAMES INCLUDED

- Gunfight, a 2-player game. Walk your fighter around the screen, raise or lower his arm and shoot.
- Checkmate, 0-4 players. Crash opponents into your trail, their trail or the sides of your TV screen.
- Scribbling; draw or write almost anything you choose in 256 different color patterns.

CALCULATOR INCLUDED

- The Bally Professional Arcade will work for you as well as entertain you. Its sophisticated 5-function, 10 memory printing calculator with scroll button and entry correction helps you reconcile bank balances, compute taxes and the like.
- Convenient algebraic entry system allows problems to be entered in the same order written. If you want to calculate $3 + 4 - 5$ press only $3 + 4 - 5$.
- Easy to operate. Add, subtract, multiply, divide. See exactly what takes place and how it looks on your TV screen.

AUDIO CASSETTE CONTROLLER

Save your programs on your audio cassette drive with the 300 baud controller that will be available to compliment TINY BASIC. Connects up to the port for pistol grip 4. By utilizing power from the light pen option it requires no additional power supply.

MACHINE LANGUAGE LOADER

A 256 byte loader allows you to load your own programs and make more efficient use of storage.

EXCITING NEW FEATURES

AUTOMATIC TV PROTECTION

- Even if you forget, the Bally automatically remembers to blank out the display after 5 minutes of inactivity thus preventing damage to your TV.
- Press reset key to resume your program at any point.

REMOTE GAME SELECTION

- Sit in your easy chair, select and start a game with your remote hand control.
- Bally is the only programmable video game with this convenient feature.

Tiny Basic in ROM

- With Audio Cassette Interface
- Program Color and Sound
- Accepts Pistol Grip Inputs
- 10 Day Return Privilege
- \$49.95
- In Stock Now.

The first in the Functional Series of Videocade ROM Cartridge Software, TINY BASIC is loaded into the system in seconds. Your Arcade can be programmed with an educational or game cassette one instant, and with TINY BASIC the next. We have seen the program and think it's the best value available today.

COMMANDS

The TINY BASIC language supports the following commands: GO, FREEZE, RUN, LIST, FOR, TO, NEXT, INPUT, GOSUBROUTINE, RETURN, ABSOLUTE, IF, LET, REMARK, RANDOM, GO TO, ERASE, PRINT.

KEYBOARD OVERLAY

All commands and characters are accessed from the 24-key keyboard with the guidance of a color-coded plastic overlay (see fig. 1). Four shift keys are used in conjunction with the remaining 20 keys. Upon striking one of these color coded shift keys the screen background temporarily assumes that color. Numbers and calculator functions require no shift key.

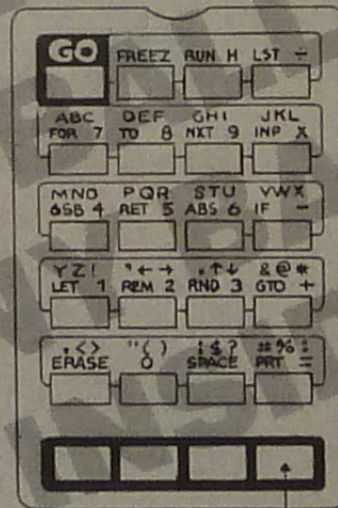


Fig. 1. COLORED SHIFT KEYS

Above each key are 4 characters each with their own color which are called out by hitting the appropriate shift key (as each shift key is hit the screen turns that color). Black characters, numerals, calculator functions need no shift code.

As stated earlier, TINY BASIC commands require only a single keystroke in conjunction with the shift key. Alphabetic and special characters are generated with a "shift" and another keystroke. Under program control each keystroke generates a unique musical note.

FEATURES

- Multiple statements/line; Multiple lines/statement
- Maximum program line 104 characters
- PEEK & POKE
- Line & Rectangle (Horizontal and vertical lines and rectangle commands)
- Backspace erase and space forward editing function
- Displays 11 lines x 26 characters
- Strings

MULTIPLE INPUTS

In addition to the keyboard, TINY BASIC can address all the control functions of the four pistol grips through the following special variables.

Variable "i" is the pistol grip number 1, 2, 3, or 4.

- Ti Grip Trigger. 0 not depressed, 1 depressed.
- Udi Knob Up Down. 0 grip control knob neither up nor down; 1 grip control knob up; 2 grip control knob down.
- Lri Knob Left Right. 0 grip control knob neither left nor right; 1 grip control knob left; 2 grip control knob right.
- Pi Knob dial. Value of from 0 to 255 representing the setting of the knob.

MULTIPLE OUTPUTS

TINY BASIC programs have control not only of the characters, lines and rectangles appearing on the screen, but also which of 256 colors and lines that they appear in. The TINY BASIC programmer also has access to the music generator.

TOKEN FEATURE

Each command is specified by a shift code and the appropriate command key as specified by the keyboard overlay. Even though each command code is specified by a single code, and is stored internally as a single character, it is completely spelled out on the screen.

BURN IN PROTECTION

To prevent television tube damage, the screen is automatically cleared after 5 minutes of inactivity. Program contents are not lost, and will appear when keyboard activity resumes.

NCE/Compumart Inc.
1250 N. Main St., P.O. Box 8610
Dept. P78 Ann Arbor, MI 48107

Bally BASIC

BASIC is a language designed to make computers easy to understand and use. Simple words like RUN and PRINT tell your computer what to do.

There are many versions of BASIC, as well as several other computer languages. Palo Alto Tiny BASIC, developed by Lichen Wang, eliminates many complex expressions used in mathematics and physics and is particularly easy for beginners to learn.

Bally BASIC, written by Jay Fenton, is an expanded version of Palo Alto Tiny BASIC that allows you to draw pictures, select colors, and play music on your TV. By adding full color graphics and sound, Bally BASIC expands your Bally Professional Arcade to include colorful computer games, electronic music, and video art.

This programmed instruction course, written by Dick Ashworth, is your introduction to understanding and using Bally BASIC. You will learn how to talk to your computer in a few minutes and then you can expand your knowledge and enjoyment in the directions that interest you most.

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INDEX

Operating Instructions Programming Course

- Lesson 1. Printing, counting and loops 18
- Lesson 2. Random numbers, inputs and what if? 30
- Lesson 3. Subroutines 40
- Lesson 4. Strings 48
- Lesson 5. Electronic Music 54
- Lesson 6. Graphics 64
- Lesson 7. Computer Games 78
- Lesson 8. Video Art 90

Programs

- Computer Games
- Electronic Music
- Graphs and charts
- Video Art
- Learning Skills

Terms and Symbols

- Computer Words
- Inputs, outputs and controls
- Error messages

3

Operating Instructions

If you are using your Bally Professional Arcade for the first time, please follow the directions in the Owner's Manual packaged with your unit. Connect your Bally Professional Arcade to a black and white or color TV and try out several of the games.

After you are familiar with your arcade and know how it operates, try Bally BASIC and discover the enjoyment of having your own personal computer.

REMOVE the keypad overlay from its envelope in the front of this manual. (This envelope is a good place to store your overlay when you're not using it.)



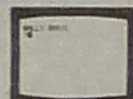
INSERT the Bally BASIC cassette in the cassette slot and press down firmly.



PLACE the keypad overlay on the keypad.

4

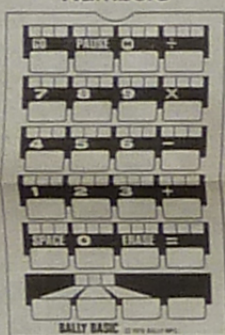
RESET your computer by pressing the RESET button next to the cassette. Your TV screen should look like this picture.



CAUTION
RESET erases your program if you press this button by accident. If you press this button again, from the beginning.
EJECT causes your programming cassette to pop up so you can remove it. Pressing the eject button accidentally will cause your program to stop. If this happens, push the cassette back into place, press RESET, and enter your program again.
STATIC
The same static that causes dots on your TV screen or noise in the speaker can affect your computer. If static interrupts your program and causes it to stop, press RESET and enter it again.

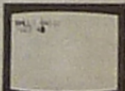
5

Numbers



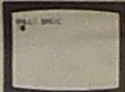
Your Bally BASIC keypad is divided into three separate kinds of information: NUMBERS, LETTERS AND WORDS.
The WHITE numbers and symbols on your keypad are printed on your TV screen when you push those keys.

- 1
- 2
- 3
- SPACE
- 4



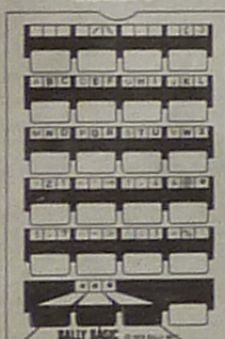
Now use the ERASE key to remove the numbers from the screen.

- ERASE
- ERASE
- ERASE
- ERASE
- ERASE



7

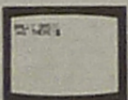
Letters



The GREEN shift key selects characters on the left.
The RED shift key selects characters in the center.
The BLUE shift key selects characters on the right.

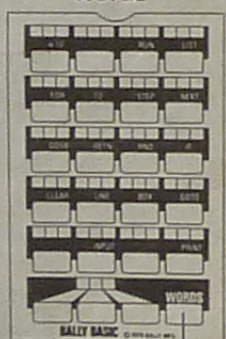
To print a letter or character on your TV screen, use the shift key in the same color. First press either the GREEN, RED or BLUE shift key to select the color of the letter you want. Then press the key that is under the letter you want to print.

- RED 5
- BLUE 5
- SPACE
- RED 6
- RED 9
- RED 8
- BLUE 5
- RED 8
- BLUE 1



9

Words

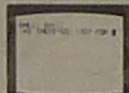


The GOLD shift key selects the WORDS printed in GOLD.

10

Words the computer understands are printed on the keypad in GOLD. Press the WORDS key, and then press the key under the words you want to print on your TV.

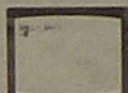
- WORDS
- BOX
- WORDS
- STEP
- WORDS
- FOR



11

You can now print numbers, letters and words on the screen. Next you will learn to put programs into your computer.
Reset the computer by pressing the RESET button.

RESET

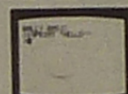


The RESET button erases all instructions and programs in the computer's memory and clears the screen.

Now you will enter a short program. Number the first instruction 10. Use the WORDS key to say PRINT and then spell out 'HELLO'.

10PRINT "HELLO!"

GO



The GO key acts like a carriage return on a typewriter and moves you to the next line.

12

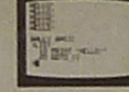
Now you can run the program. The computer will print the word 'HELLO!'. Then it will go back to the beginning of your program and start over. To stop the program, press the halt key (H) and hold it down until the computer halts.

- RUN
- GO
- H



Now LIST your program again.

- LIST
- GO



14

REVIEW

Now make sure you understand how to operate your computer and enter and run programs.

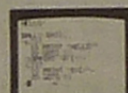
1. Insert your Bally BASIC Programming Cassette and put the keypad overlay in place.
2. Press RESET (next to cassette). This erases any old programs.
3. Enter each instruction and press GO. Or press WORDS and GO for a new line number.
4. LIST the program, and check each instruction carefully. PAUSE key lets you pause when listing long programs.
5. If there are any mistakes enter the instruction again using the same line number. To remove an instruction completely re-enter its line number and press GO.
6. When your program matches the example press RUN and GO.

Now you have two choices. You can go to LESSON ONE and continue learning how to write your own programs, or you can go to the PROGRAMS section of this manual and try out any of the programs you like.

17

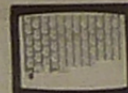
Now enter this new instruction to replace line 10 in your program. Don't forget the comma at the end!

10PRINT "BYE!",
LIST
GO



If your program matches the example, run it and see what it does. Use the halt key (H) to stop.

RUN
GO

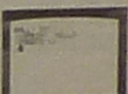


15

Now add the second instruction to your program and number it 20. Notice that GOTO is one word. Press the GO key to end the line.

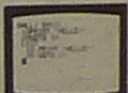
20GOTO 10

GO



Now the program is in the computer memory. To look at the complete program, ask the computer to LIST it.

LIST
GO



Check your program and see if it matches the example. If your TV screen doesn't match this picture, RESET your computer and enter line number 10 and line number 20 again.

13

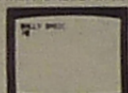
Programming Course

Lesson 1 Printing, counting and loops.

Before you begin these lessons please read and understand the OPERATING INSTRUCTIONS. They begin on page 4 and show you how to enter, list and run programs on your computer.
Learning to write your own programs isn't hard at all. Soon you will be able to have your computer play your own games, music and video art.

Let's begin by writing a short program. First RESET the computer with the RESET button.

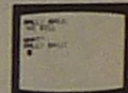
RESET



18

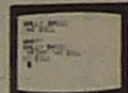
Now spell out HI and your name. Press GO to end the line.

HI BILL
GO



The computer is saying WHAT? because it doesn't know what you said. The words HI and BILL are not words your computer understands.
Instead, try it this way. Use the WORDS shift key to enter the word PRINT. Then spell out "HI BILL". Don't forget the quotation marks.

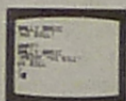
PRINT "HI BILL!"
GO



19

PRINT is one of the special words your computer understands. When you pressed GO, the computer followed your instruction and printed the words between the quotation marks.

Now press GO again and see what happens:



You can't print these words a second time because the computer doesn't remember what to do. To have your computer remember your instruction, just give it a line number.

Number your instruction 10 and enter it again.



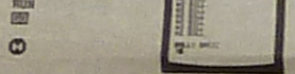
This program uses the letter A as a counter. Here's what happens when you run it.
In line 10 the computer puts a zero in the A counter.

In line 20 the computer adds 1 to the A counter.

In line 30 the computer prints whatever is between the quotation marks.

In line 40 the computer goes back to line 20, adds one more to the A counter, and repeats.

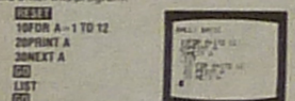
RUN your program and print HI BILL about a dozen times. Then press and hold the halt key.



Each time the computer printed HI BILL it added 1 to the A counter. To find out how many times your program ran, see what number is in the A counter.



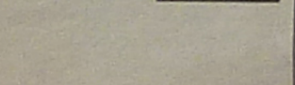
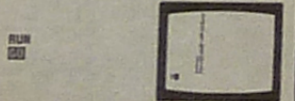
Programs that repeat are called loops. Another way to program a loop is with the words FOR and NEXT. RESET your computer to erase the counting loop and enter this program.



In line 10 the computer puts 1 in the A counter. In line 20 A is printed.

The word NEXT in line 30 means add 1 to A and loop back to word FOR. NEXT A replaces A=A+1 and GOTO 20 which were used in the last program.

Now RUN your program and print the number in A as the A counter goes from 1 to 12.

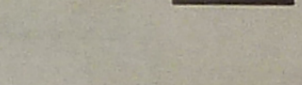


Now you have a one-line program in the computer memory. You can run this program as many times as you like.

To run your program, use the WORDS shift key and enter RUN.



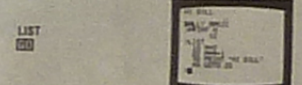
Add a second instruction to your program and number it 20. LIST your program.



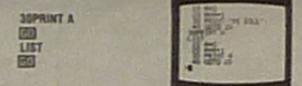
In the example shown here the program ran 12 times and A = 12.

When you say print "A" the computer prints the letter A. When you say PRINT A the computer prints the number in the A counter.

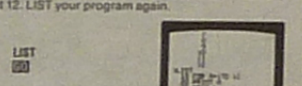
You can also use any other letter you want to be a counter.



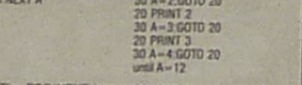
Instead of printing HI BILL over and over, you can print the number in the A counter. Change line 30 by entering the same line number and adding the new instruction, then LIST your program.



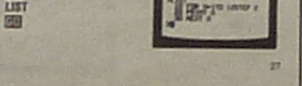
This time the program loop stopped automatically at 12. LIST your program again.



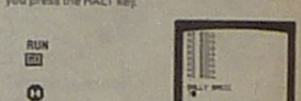
You could also change line 10 and print all the tens from one to one hundred or all the leap years since your birthday. You can even step backwards by using negative numbers. RESET and enter this new program.



The FOR/NEXT loop adds 1 to the counter. You can also add 2, 3, or any other number. Change line 10 to count by 2's.



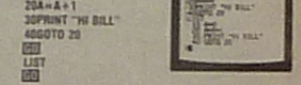
Here's what your new program will do. The computer will print HI BILL, go back to the beginning of your program, print HI BILL, go back to the beginning again, print HI BILL, and on and on until you press the HALT key.



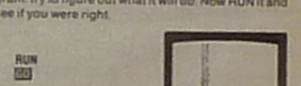
Press and hold halt until the computer stops.

How many times did you run your program? There's an easy way to find out. Make a counter to keep track of the number of items it ran.

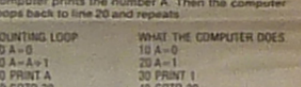
RESET your computer, then enter and LIST this new program.



The computer always lists the latest version of your program. This time before you run your program, try to figure out what it will do. Now RUN it and see if you were right.

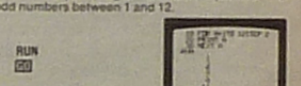


The computer puts a zero in the A counter in line 10. In line 20, 1 is added to A. Next, in line 30, the computer prints the number A. Then the computer loops back to line 20 and repeats.



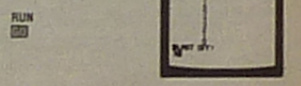
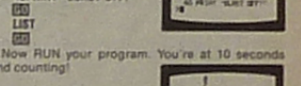
First the computer makes the A counter either 1 or 2. Then if A=1 the computer prints "HEADS" and if A=2 the computer prints "TAILS". Then the computer goes back to line 10 and again sets the A counter to either 1 or 2, and the loop continues.

The computer is using RND (2) to change the number in the A counter. Depending on whether the number is 1 or 2, the computer prints either "HEADS" or "TAILS". Now run the program and see if heads or tails come up more often.



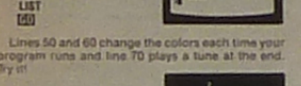
It will ask HOW? when it understands but can't do what you requested.

You have been using INPUT A to put numbers in the A counter. This program inputs numbers into two counters and then prints their sum.

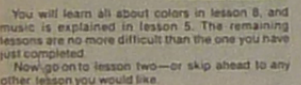


To expedite your order call our toll-free credit card order line 1-800-621-1534. (Note, this line for orders only.)

Now for some fun to end your first lesson. Add these three lines to your program:



Lines 50 and 60 change the colors each time your program runs and line 70 plays a tune at the end. Try it!

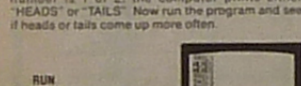


You will learn all about colors in lesson 8, and music is explained in lesson 5. The remaining lessons are no more difficult than the ones you have just completed.

Now go on to lesson two—or skip ahead to any other lesson you would like.

If is a computer word that lets you check and see whether something is true or not.

Enter this program:



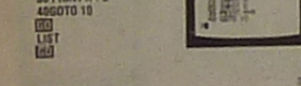
Another way to change numbers in a program is to enter them yourself with INPUT A.

When the computer reads INPUT A, it waits for you to enter a number before it continues running the program.

The letter A after the word INPUT tells the computer which counter to use. In this program the number you input will be stored in the A counter.

When you run the program, the computer will stop and wait for you to input a number.

After you input a number, the computer prints the number you entered and asks for a second number.



Programming Course

Lesson 2 Random numbers, inputs, and what if?

It's often handy to have your computer pick out numbers at random. Here's a program that selects random numbers between one and twenty.



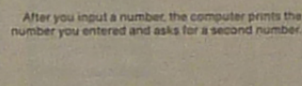
In line 10 the computer will make the A counter equal to a random number between one and twenty. In line 20 the computer prints the number in A. Line 30 sends the computer back to line 10. The computer continues picking a random number, printing it, and looping back to the beginning of the program.

Follow the suggestions below or try your own.

The computer prints A to remind you that your input will be stored in the A counter.

You can have the computer remind you in other ways, too.

Try this change in the program:



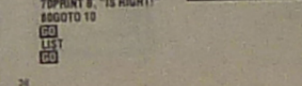
This program is longer than your others so we'll look at it step-by-step.

First the computer picks a random number between one and ten and stores it in the A counter. Then you try to guess the number, and your input is stored in the B counter.

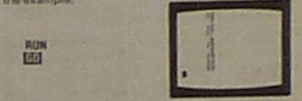
Now there are three things that can be true. If A=B then your guess is right. The computer goes to line 70 and prints your answer and the words IS RIGHT! If A is larger than B, A>B, then your guess is too small. The computer prints MORE. If A is less than B, A<B, your guess is too big and the computer prints LESS.

There are two loops in this program. If A=B the computer goes to line 70, prints the number you picked and the words IS RIGHT! and then loops back to the beginning to start a new game.

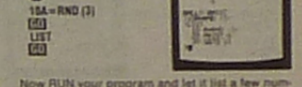
If you didn't get the right answer the computer loops back to line 20 so you can try again.



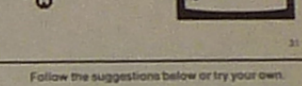
The numbers this program selects are different each time, so don't expect your numbers to match the example.



Now change line 10 to put random numbers from one to three in the A counter.



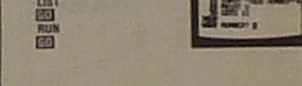
Now RUN your program and let it list a few numbers.



The computer prints A to remind you that your input will be stored in the A counter.

You can have the computer remind you in other ways, too.

Try this change in the program:



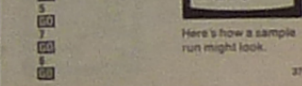
This program is longer than your others so we'll look at it step-by-step.

First the computer picks a random number between one and ten and stores it in the A counter. Then you try to guess the number, and your input is stored in the B counter.

Now there are three things that can be true. If A=B then your guess is right. The computer goes to line 70 and prints your answer and the words IS RIGHT! If A is larger than B, A>B, then your guess is too small. The computer prints MORE. If A is less than B, A<B, your guess is too big and the computer prints LESS.

There are two loops in this program. If A=B the computer goes to line 70, prints the number you picked and the words IS RIGHT! and then loops back to the beginning to start a new game.

If you didn't get the right answer the computer loops back to line 20 so you can try again.



Here's how a sample run might look.

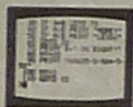
You can change line 10 to A=RND(100) and make the game harder, or add a counter to keep track of the number of guesses it took. Any of the words inside the quotation marks, like "MORE" can be changed to say whatever you want.

Before you try your game on your friends, learn how to win every time. When the computer asks for your guess, just enter the letter A.

Here's a program add-on that you will like. Just enter the line numbers as shown and the computer will put your instructions in the right order.

```

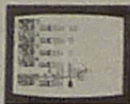
M
80NT=20
81PRINT "60605-5-504-5-50"
100NT=3
110GOTO 10
80
LIST
    
```



Now try the guessing game again and be ready for a surprise when you get the answer right!

```

RUN
80
    
```



Programming Course

Lesson 3 Subroutines

In writing longer programs you may want to use a shortcut. GOSUB and RETURN make it easy to use the same instruction several places in your program.

This program prints the words ROCK, SHEARS and PAPER several times. To avoid having to type these same instructions over and over, we will use GOSUB and RETURN.

Enter the first part of your program.

```

RESET
10GOSUB 201
20GOSUB 202
30GOSUB 203
40GOTO 10
201PRINT "ROCK";RETURN
202PRINT "SHEARS";RETURN
203PRINT "PAPER";RETURN
80
LIST
80
    
```



Here's what you've added.

In line 40 the computer will select 1, 2, or 3 at random and put this number in the A counter. In line 50 the computer will ask for your choice (1, 2 or 3) and the number you INPUT will go into the B counter.

At line 60, the computer will print I PICKED and at line 70 it will GOSUB to line number 200+A.

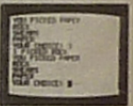
If A=1, the computer will GOSUB to line 201. If A=2, it will GOSUB to 202. And if A=3, it will GOSUB to 203. Depending on the value of the A counter, ROCK, SHEARS, or PAPER will be printed after the words I PICKED.

Lines 80 and 90 use the same GOSUB feature to print your selection. Line 100 loops the program back to the beginning.

Now RUN your program and INPUT 1, 2, or 3 to select ROCK, SHEARS or PAPER.

```

RUN
80
90
100
110
120
130
140
    
```



Programming Course

Lesson 4 Strings

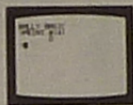
It's often handy to be able to work with a sequence of numbers or letters. These are called strings or arrays and you can have a string of numbers, a string of letters or a string of musical notes.

Here's how strings work. The @ character is your computer's symbol for a string. The first item is AT location 1, or @(1), the second item in the string is AT location 2, or @(2), the third item is AT location 3, or @(3) and so on.

To find the number at location 4 in a string, you would ask for @(4) like this.

```

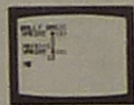
RESET
PRINT @(4)
80
    
```



The fourth location in the string contains a zero. Store the number 12 at location 4 like this, then check it.

```

@(4)=12
PRINT @(4)
80
    
```



This program lists the numbers stored at the first ten locations in the @ string.

When you RESET the computer each location in the string is filled with a zero.

```

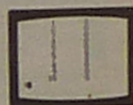
RESET
10FOR A=1 TO 10
20PRINT A,@(A)
30NEXT A
80
LIST
80
    
```



As the A counter advances from 1 to 10, the computer prints 1 and then the number stored at the first location, 2 and the number stored at the second location and so on up to 10 and the tenth number stored in the string.

```

RUN
80
    
```



Here's what's going to happen. When the computer reads line 10, it will jump to line 201 and continue until it reaches the word RETURN. Then the computer will jump back to line 10 and continue.

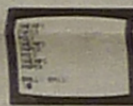
The same thing will happen in lines 20 and 30. The computer will jump to the GOSUB instructions and then return.

In line 40 the GOTO instruction tells the computer to go back to line 10 and start the program over again.

Now RUN this part of your program.

```

RUN
80
84
    
```



Now add these additional lines to your program.

Your program is now too long to fit on the TV screen. Press and hold the PAUSE key to stop the listing at line 90 so you can check it. Press GO to continue the listing.

```

40A=RND(3)
50INPUT "YOUR CHOICE:"B
60PRINT "I PICKED "
70GOSUB 200+A
80PRINT "YOU PICKED "
90GOSUB 200+B
100GOTO 10
80
LIST
80
    
```



After you pause at line 90 and check your list. Then press GO to finish list.

```

80
    
```



Now you can play ROCK, SHEARS, PAPER with your computer. The rules are:

ROCK breaks SHEARS
SHEARS cut PAPER
PAPER wraps ROCK

But let's have the computer tell us who won. HALT the program and add that feature with these lines.

```

M
100IF A=B PRINT "A TIE";
GOTO 10
110IF A=1 IF B=3GOTO 160
120IF A=2 IF B=1GOTO 160
130IF A=3 IF B=2GOTO 160
140PRINT "I WIN!"
150GOTO 10
160PRINT "YOU WIN!"
170GOTO 10
80
LIST
80
    
```



PAUSE will stop the list so you can check it.

```

80
    
```



If you would like your computer to keep score, just add these lines. The computer will place them in your program automatically.

```

M
5H=0
8C=0
32PRINT "HUMAN:"H
34PRINT "COMPUTER:"C
145C=C+1
165H=H+1
    
```

If you want to add music, these instructions will do it.

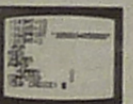
```

141NT=10
142PRINT "135 x 105 x 10000"
143NT=3
161NT=10
162PRINT "3050034050000"
163NT=3
    
```

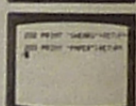
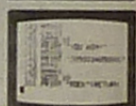
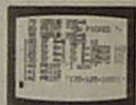
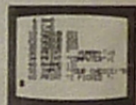
Now RUN your program and see if you can beat your computer.

```

RUN
80
    
```



Here's a complete listing of your ROCK, SHEARS, PAPER game.



Programming Course

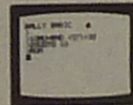
Lesson 5 Electronic Music

There are two ways you can play music on your computer. MU and PRINT. This program sets MU equal to a random number between 31 and 87. Numbers in this range produce musical notes in your TV speaker.

Enter and RUN this random music generator.

```

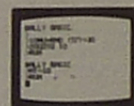
RESET
10MU=RND(57)+30
20GOTO 10
80
RUN
80
    
```



To change the speed of the notes adjust the built in note timer, NT. HALT your program and set the note time to 10.

```

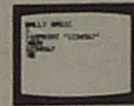
M
NT=10
80
RUN
80
    
```



With PRINT and the numbers 1 through 7 you can play a musical scale.

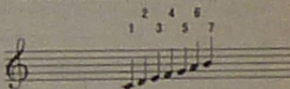
```

RESET
10PRINT "1234567"
80
RUN
80
    
```

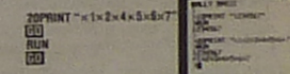


The note timer automatically returns to 3 whenever you RESET.

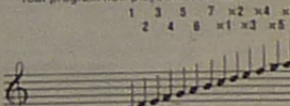
Here are the notes you just played:



To expand this scale one octave higher, just put a multiplication sign in front of each number.

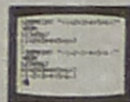


Your program now plays these notes:



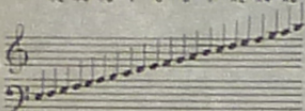
Now draw the lowest octave and play your computer's full musical scale. Put the division sign in front of the numbers 1 through 7.

```
30PRINT "+1=2=3=4=5
+6=7"
GO
GO
GO
```



Your computer's complete musical scale is now:

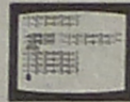
+1 -3 +5 -7 2 4 6 x1 x3 x5 x7
+2 +4 +6 1 3 5 7 x2 x4 x8



57

Sharps are selected by using an addition (plus) sign in front of the numbers and flats are selected with a subtraction (minus) sign.

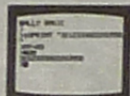
```
40PRINT "+1=2=3=4=5
+6=7"
50PRINT "-1=-2=-3=-4=-5
-6=-7"
GO
GO
GO
```



Always put the sharp or flat sign in front of the octave sign, like this: +2 or +x4.

Now RESET the computer and play this tune. Slow the music down by the note time equal to 20.

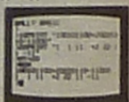
```
RESET
10PRINT "32123302220
3556"
GO
NT=20
GO
GO
GO
```



58

Rhythm can be added two ways. You can space between notes or add a 0, depending on the sound you want. Try these examples and hear the difference.

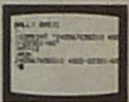
```
RESET
10PRINT "10011100+2020110-11000"
20PRINT "1 1 11 +2 22 11 -11"
GO
NT=20
GO
GO
GO
```



Notice that the notes hold or continue when you use a 0. The space key makes a rest. RUN this program again if you want to listen to the difference.

This next program combines everything you have learned. Notice how the space and the 0's set the rhythm.

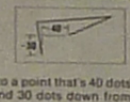
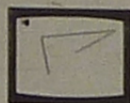
```
RESET
10PRINT "240567650310 40
22-22301+60"
GO
NT=12
GO
GO
GO
```



59

Now add this instruction.

```
30LINE -40,-30,1
GO
GO
GO
```

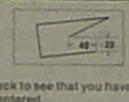


Now the computer moves to a point that's 40 dots to the left of center (-40) and 30 dots down from center (-30).

60

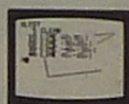
Continue drawing in the lower right section of your screen with this instruction that means 40 to the right (40) and 20 down (-20).

```
40LINE 40,-20,1
GO
GO
GO
```



LIST your program and check to see that you have all the instructions properly entered.

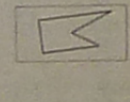
```
LIST
GO
```



61

Finally, draw a line back to the center (0,0) to complete your first graphic design.

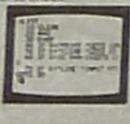
```
50LINE 0,0,1
GO
GO
GO
```



62

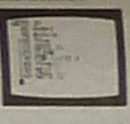
Now build a player piano that stores an entire song and then plays it back. You will enter this program in two sections so it will be easier to check.

```
RESET
10CLEAR
20A=0
30K=K
40IF K="PRINT" GOTO 120
50IF K="CLEAR" GOTO 10
60IF K="30A=A+1;GOTO 100
70IF K="LINE" INPUT NT;
GOTO 30
GO
LIST
GO
```



Compare your program with the example, correct any errors, and then enter the second section.

```
30A=A+1
300(A)=K
100TV=K
110GOTO 30
120CLEAR
130FOR C=1 TO A
140TV=@(C)
150NEXT C
160GOTO 30
GO
LIST
GO
```

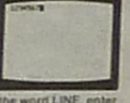


63

Check your program carefully. When you RUN it the screen will go blank.

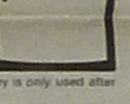
Enter a scale and play it back with the word PRINT.

```
RUN
GO
1234567
PRINT
GO
```



To change the note time, use the word LINE, enter the new note time and press GO.

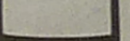
```
LINE
15
GO
```



With this program the GO key is only used after you enter a new note time.

Play back at the new note time, using PRINT as before.

```
PRINT
GO
```



64

The word CLEAR is used to clear the memory so you can enter a new song. With ERASE you can back up and change any or all of the notes.

Now enter this song. The numbers are shown here in groups of four because there are four beats to a measure. Enter the numbers in a continuous line. Do not press GO at the end of each line.

```
CLEAR
100=5 I've been 2002 Can't you
1=512 working on the +1232 hear the whistle
3000 rail- 1600 blow-
1000 road. +5000 ing?
4004 All the 4044 Rise up so
1020 live-long 1122 early in the
3000 day. 3000 morn
000= 000=
```

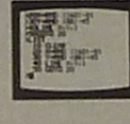
```
100=5 I've been +6000=7 Can't you
1=512 working on the 1=71=6 hear the captain
3000 rail- +5000 shout-
1000 road. Just to 1000 ing
1033 pass the 3040 Di-na
3020 time a- 3020 blow your
2000 way. 1000 horn.
000= 000=
```

Space Key

65

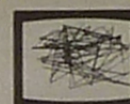
Now write a program that fills the screen with random lines.

```
10CLEAR
20X=RND(160)-81
30Y=RND(88)-45
40LINE X,Y,1
50GOTO 20
GO
LIST
GO
```



The computer selects random numbers for X and Y. Then it draws a LINE to the point on the TV screen that is X dots right or left of center and Y dots up or down. It loops back and picks a new X and Y position and then continues drawing.

```
RUN
GO
```



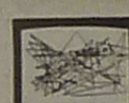
66

The number 1 after LINE means draw a black line. There are four kinds of lines you can make.

```
LINE X,Y,1 = Black
LINE X,Y,2 = White
LINE X,Y,3 = Reverse
LINE X,Y,4 = None
```

Change line 40 and find out what "reverse" lines are.

```
40LINE X,Y,3
GO
LIST
GO
```

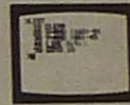


```
RUN
GO
```

67

HALT your program, CLEAR the screen, and LIST your program.

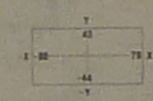
```
CLEAR
GO
LIST
GO
```



Here's how the computer draws lines that match the size of your TV screen.

In line 20 the computer picks a number for X between -80 on the far left edge of the screen and 79 on the right edge of the screen.

In line 30 the computer selects a random number for Y that's between -44 on the bottom edge of your screen and 43 on the top edge of your screen.



68

If you would like to know more about the Player Piano Program, LIST it and read the following section.

The A counter keeps track of how many notes are stored in the @ string.

After clearing the screen and setting the A counter to 0, the computer waits for you to enter a number on the keypad. The K counter is set to this number.

Next the computer checks to see if any words have been entered. If you enter PRINT the program goes to line 120 to play back the notes.

If you enter CLEAR the computer goes back to the beginning of the program and sets the A counter to 0. Key 30 is the erase key; and if this is pressed the A counter is reduced by one.

The word LINE is used in this program to input a new number for NT, the note time.

After checking to see if you have entered any special words, the computer adds one to the A counter. The new note is added to the @ string (line 90) and shows on the TV (line 100). GOTO 30 sends the computer back to wait for the next input from the keypad (line 30).

If PRINT is entered, the computer goes to line 120 and starts the playback process. The screen is cleared, and a FOR/NEXT loop is started. Remember that the A counter keeps track of how many notes there are. This part of the program (lines 130, 140 and 150) loops once for each note until all the notes have been written on the TV and played.

63

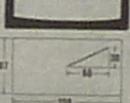
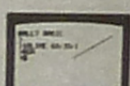
Programming Course

Lesson 6 Graphics

With only the words LINE and BOX you can draw an endless variety of graphs and graphic designs on your TV.

Here's how LINE works.

```
RESET
10LINE 60,30,1
GO
GO
GO
```

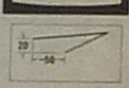
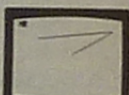


Your TV screen is 159 dots wide and 87 dots high. Zero is in the center. When you run this program, the computer starts in the center of your screen and draws a line to a point that's 60 dots to the right of the center (60) and 30 dots up from the center (30).

64

Now add these instructions to clear the screen and draw the second line.

```
50CLEAR
20LINE -50,20,1
GO
GO
GO
```

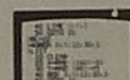


This time the computer moved to a point 50 dots to the left of center (-50) and 20 dots up from center (20) to draw the second line.

65

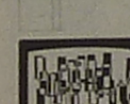
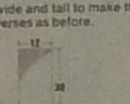
Now change your program and create "reverse" boxes all over your screen. Also change the background color (BC).

```
BC=22
40BOX X,Y,12,30,3
GO
LIST
GO
```



The random numbers X and Y position the box on the screen. The next two numbers, 12 and 30 tell the computer how many dots wide and tall to make the box. The last number, 3, reverses as before.

```
RUN
GO
```



66

Now make something different. Change the size of the boxes to look like the holes in an IBM card. Change the last number in line 40 to a 1, which will make all the boxes black. Add some computer music with line 50.

```
40BOX X,Y,2,5,1
50MU=RND(20)
50GOTO 20
GO
LIST
GO
```

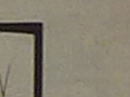


```
RUN
GO
```

67

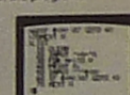
This next program draws a graph. First it asks how many numbers you have. Then it asks for each number. Finally it draws a graph that might look like this.

```
RESET
10CLEAR
20INPUT "A=";A
30FOR N=1 TO A
40PRINT N;
50INPUT " ";@N
60IF @N>87GOTO 40
70NEXT N
GO
LIST
GO
```



Enter and LIST this part of the program.

```
RESET
10CLEAR
20INPUT "A=";A
30FOR N=1 TO A
40PRINT N;
50INPUT " ";@N
60IF @N>87GOTO 40
70NEXT N
GO
LIST
GO
```



68

In line 20, the computer asks how many items will the graph have and then stores the answer in A.

The FOR/NEXT loop prints the number of each item, stores the value in the string @ (N), and checks to see if the value is over 87. If it is over 87 it will not fit on the TV screen and the computer goes back to line 40 for a new input.

RUN this portion of the program

```

RUN
GO
3
GO
1
GO
21
GO
55
GO
13

```

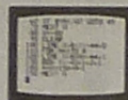


Now add the final section that draws the graph

```

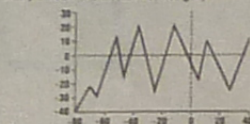
RESUME
GO CLEAR
100LINE X,@(N1)-44,0
110FOR N=1TO A
120LINE X,@(N)-44,1
130BOX X,-43,1,2,1
140X=X+150-A-1
150NEXT N
GO
LIST
GO

```



To start drawing the graph (line 80), the computer sets X = -80 (the left edge of your screen), clears the screen, and places the starting point for the series of lines that make the graph.

The number @(N)-44 is the vertical distance or number of dots above or below the center of the screen. For example, if the first number in the @ string is 0, then the computer subtracts 44 to place this point on the bottom of the graph.



There are three instructions (120, 130 and 140) in the last FOR/NEXT loop. These instructions are run once for each item in the graph.

In line 120 the computer draws a line from the last point to the next point. Line 130 places a small dot at the bottom of the graph.

Line 140 changes the X counter to move each point on the graph a short distance to the right. The graph is 150 dots wide and this distance is divided equally.

RUN the program and draw a graph with these twelve figures. Don't forget to push GO after each number.

```

RUN
GO
12
GO
15
GO
21
GO
28
GO
35
GO
42
GO
28
GO
35
GO
28
GO
39
GO
49
GO
60
GO
79

```

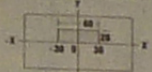


Remember, no single entry can be larger than 87, and no decimal points are accepted.

Now use your graph drawing program to make a graph of your grocery expenses, your company sales, or your favorite stock.

To expedite your order call our toll-free credit card order line 1-800-321-1534. (Note, this line for orders only.)

First the computer picks an X between -30 and 30 and then a Y between 1 and 30. These values for X and Y are in the shaded area of the diagram below.



Lines 40 and 50 cause the target to wander around the screen. In line 40 the computer adds a random number to X. This moves the target to the right or left.

The number added to X is RND(7)-4. RND(7) is a random number between 1 and 7. Subtracting 4 makes this equal to a random number between -3 and 3.

In line 50 RND(7)-4 is added to Y and this moves the target up or down.

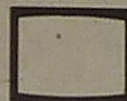
The BOX is drawn at X and Y, and the program loops.

Now RUN the program and see that it puts a 4 x 4 black box somewhere in the shaded area.

```

RUN
GO

```



Now add a second box at the bottom of the screen. You will move this box left and right with the knob.

Notice that you will replace the old line 70 with a new instruction.

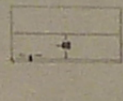
```

RESUME
GO
70K=KN(1)+2
80BOX K,-40,3,8,1
90TR(1)=GOOTO 30
GO
LIST
GO

```

In line 70 the K counter is set to the value of the knob (KN(1)) divided by two.

Line 80 draws a black box that's three squares wide and eight squares tall. The box can be moved left or right as the K counter changes. The center of the box will be at -40, near the bottom of your screen.



When you pull the trigger, TR(1)=1. In line 90 the computer goes back to 30 if the trigger is not pulled and TR(1)=0. RUN the program and see if you can move the second box with the knob.

```

RUN
GO

```

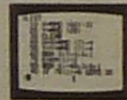


Pull the trigger and see what happens and then LIST your program.

```

LIST
GO

```



Programming Course

Lesson 7 Video Games

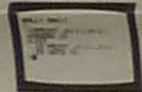
In this lesson you will learn how to use the hand controls while you are running a program. You will also build a video target game and see how larger programs are made from several small programs.

First plug a hand control into the number 1 socket (next to the power cord), and then enter this program.

```

RESUME
10PRINT JX(1),JY(1)
20GOTO 10
GO
LIST
GO

```



76

Now change your program and see what happens when you turn the knob. The knob on hand control number 1 is called KN(1).

RUN the program and turn the knob

```

RESUME
10PRINT KN(1)
20GOTO 10
GO
RUN
GO

```



81

With the knob all the way to the left, KN(1) = -128 and with the knob turned to the right KN(1) = 127.

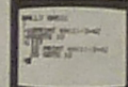
Try to dial your age. This is hard to do because the numbers are very close together on the knob.

This program spreads the numbers out and makes it easier to dial your age.

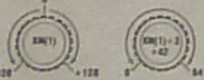
```

RESUME
10PRINT KN(1)+3+42
20GOTO 10
GO
LIST
GO

```



Here's what you have done to make it easier. KN(1) still has a range from -128 to 127. When you divide KN(1) by 3 this range is reduced to -42 on the left and 42 on the right. When the computer adds 42 to KN(1) the final range is 0 on the left and 84 on the right.



In a similar way you can write an instruction and change the numbers on the dial to match any range you would like.

82

The trigger is called TR(1) and TR(1)=1 when the trigger is pulled. Add this line to your program so you can clear the screen by pulling the trigger.

```

RESUME
40IF TR(1)=1 CLEAR
50GOTO 10
GO
LIST
GO

```



Now RUN your program, draw some lines, and CLEAR the screen with the trigger.

```

RUN
GO

```



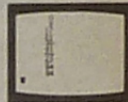
80

RUN this program and see that the knob rotates from 0 to 64.

```

RUN
GO

```



Now you can use the hand control to build your own video game. Begin with this portion of the program that makes a blinking target move around on the screen.

```

RESUME
10X=RND(60)-31
20Y=RND(20)
30CLEAR
40X=X+RND(7)-4
50Y=Y+RND(7)-4
60BOX X,Y,4,1
70GOTO 30
GO
LIST
GO

```



83

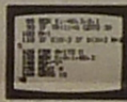
When you pulled the trigger TR(1)=1. The computer did not go back to line 30 at the end of your program. It went on to the next instruction.

Now add the next instruction and tell the computer what to do when you pull the trigger.

```

100M=1
110IF K-X<3 IF K-X+3 N=15
120FOR A=1 TO N
130BOX K,0,1,80,3
140MU="V"
150NEXT A
160GOTO 10
GO
LIST
GO

```



Remember that the X counter moves the target left and right. The phaser at the bottom of the screen is moved left and right by the K counter. If K=X when you pull the trigger, the laser and the target are lined up, and you've got a hit!

Hitting the target exactly is very hard, so line 110 allows a near miss to score. If K is within three dots either side of X, N=15.

The box in line 130 is eighty dots high and one dot wide. This forms the laser beam.

The N counter is set to 1 in line 100. If a hit is scored, N=15. Then the phaser fires N times in the FOR/NEXT loop. For a miss the beam fires once, and for a hit it fires fifteen times.

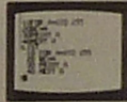
87

Here's a program that shows you all the colors in your computer and prints each color number.

```

RESUME
10FOR A=0 TO 255
20BC=A
30PRINT A
40NEXT A
GO
LIST
GO

```



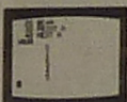
The background color (BC) can be any number you select from 0 to 255. In this program the computer begins with color number 0 (Black) and shows each color and its number.

Now RUN your program and see all the colors you can select from.

```

RUN
GO

```



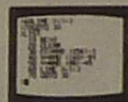
81

Now enter this program and let the computer select the color while it draws random lines on your screen.

```

RESUME
10BC=0
20CLEAR
30FC=RND(256)-1
40X=RND(160)-81
50Y=RND(85)-45
60LINE X,Y,3
70GOTO 30
GO
LIST
GO

```



First the computer sets the background color (BC) to black and clears the screen. In line 30 the foreground color (FC) is picked at random from the 256 possible choices. Then the computer draws a random line and goes back to instruction 30 to pick a new color and draws the next line.

```

RUN
GO

```



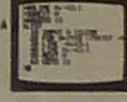
82

Now use the computer to draw a pattern of lines with this program. You will add colors later.

```

RESUME
10PRINT A: CLEAR
20FOR N=1970-79STEP-A
30LINE -N,43,1
40LINE N,-43,1
50NEXT N
60GOTO 10
GO
LIST
GO

```



The computer will ask you to input a number for A. This adjusts the spacing between the diagonal lines. Try a spacing of 3 for a start.

```

RUN
GO
3
GO

```



83

Programming Course

Lesson 8 Video Art

MU plays music like PRINT, but nothing is put on the screen.

After each shot the program loops back to the very beginning, puts a new target in a random location and then moves it around until you press the trigger again.

Now RUN your program and try your luck.

```

RUN
GO

```



This program could also be a two-player game if you use another hand control (instead of the computer) to move the target. Number 2, for example, is JX(2), JY(2), KN(2) and TR(2).

You could also add counters to keep and print the score, color the screen to show a hit, reverse the black and white for "night", and many other variations.

88

In this lesson you will learn how to use the power of your computer to create interesting and beautiful designs.



90

The computer is asking for a new A. Try a spacing of 5.

5
[GO]



Now try a spacing of 9.

9
[GO]



By just changing one number you have created three different designs. Now let the computer select the spacing. You must HALT the program before you can change it.

[H]
[LIST]
[GO]



COLOR WHEEL

Here's a color wheel you will use often because it helps you select colors and their numbers. Moving the number 1 hand control left and right selects the color. Moving it forward and backward selects the intensity. Pulling the trigger gives you a printout on the screen that shows that particular color number (0 to 31), color intensity (0 to 7) and the computer number (0 to 255). These numbers refer to the background color only. The foreground color is adjusted automatically so that you can read the numbers.

```

[LIST]
[GO]
100 C=C-1
101 C=C+1
102 C=C
103 INT=0
104 INT=7
105 INT=INT-1
106 INT=INT+1
107 INT=INT
108 INT=INT
109 PRINT C,C,INT
110 GOTO 100

```

This program uses two counters, C and I to keep track of the color number and the intensity number. Both are adjusted by the hand control. JX(1) controls color and JY(1) controls intensity.
Lines 20 and 30 keep C between 0 and 31. Lines 50 and 60 keep I between 0 and 7.
The background color is set to the color number times eight plus the intensity number.
If the trigger is not pulled, the program loops back to line 10. Pulling the trigger prints the numbers in line 100 before looping back to line 10.

ANTI-AIRCRAFT GUN

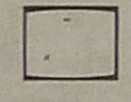
Player one moves the gun with the knob and shoots with the trigger.

Player two moves the plane right or left with JX(2) and controls the speed with the knob.

```

[LIST]
[GO]
100 X=0:Y=0:Z=0
101 X=X+1:Y=Y+1:Z=Z+1
102 X=X-1:Y=Y-1:Z=Z-1
103 X=X
104 Y=Y
105 Z=Z
106 PRINT X,Y,Z
107 GOTO 100

```



Now make the spacing random with this new instruction.

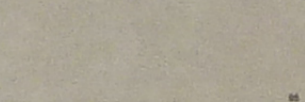
10A=RND(12):CLEAR

[LIST]
[GO]



RUN your program and let your computer change the design.

[RUN]
[GO]



PROGRAMS

Here is an assortment of programs you can enter and run immediately. Pick a short program to begin with. If you have any difficulty return to the Introduction Section, page 4, for assistance.

If you make a mistake in punctuation, (as in leaving out a comma), the computer can not run your instructions. If this happens the computer will print the instruction on the screen with a question mark in the position of your error, to show you where your mistake is.

If you are using a program designed for one player be sure to use hand control number one, if it is a program for two players use hand controls numbers one and two only.

If at any time you wish to see your program, press LIST and your computer will show you what you have entered, up to that point.
You can change these programs any way you like. Change the instructions to make the computer do something different or add instructions to it. When you add instructions to your program, number the new line to fit between the existing lines. For example, if you want to add an instruction after line 30 and before line 40, number your instruction line 33 (or any number between 31 and 39).

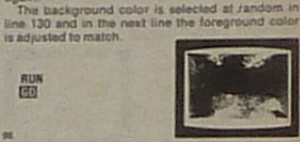
Complete your design and color it with these additional instructions.

```

100 FOR N=4720-42STEP-A
101 LINE 79,N,1
102 NEXT N
103 FOR A=1 TO 500
104 NEXT A
105 CLEAR
106 BC=RND(256)-1
107 FC=BC+4+RND(32)+8
108 GOTO 10

```

Lines 60, 70, 80, and 90 draw the second half of the design.
A slight pause is added in lines 100 and 110. This lets you see the pattern clearly before it changes again.
The background color is selected at random in line 130 and in the next line the foreground color is adjusted to match.



Computer Games

PHASER PHUN

Try your skill as the computer moves the target. The first player's knob moves the phaser left or right and the trigger shoots.

```

100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
125 BY (25)B RND(10)
126 BY (26)A RND(10)
127 BY (27)0 RND(10)
128 BY (28)9 RND(10)
129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
133 BY (33)4 RND(10)
134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
152 BY (52)5 RND(10)
153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```

You can make this a two-player game by changing these lines:
45X=X-JX(2)+3
50Y=Y-JY(2)+3
Player two controls the target while player one shoots.

ROCK/SHEAR/PAPER

Enter 1, 2, or 3 to select Rock, Shears, or Paper. Press GO and see if you beat the computer at this classic guessing game.

```

[LIST]
[GO]
100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
125 BY (25)B RND(10)
126 BY (26)A RND(10)
127 BY (27)0 RND(10)
128 BY (28)9 RND(10)
129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
133 BY (33)4 RND(10)
134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
152 BY (52)5 RND(10)
153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```

COLOR WAR

One player tries to fill the screen with colored boxes, while the other tries to erase the pattern. The trigger is the secret. If your trigger is in the same position as your opponent's, the screen turns off. If your trigger is in the opposite position, the pattern begins erasing itself. The two knobs control the colors of the pattern and background.

```

[LIST]
[GO]
100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
125 BY (25)B RND(10)
126 BY (26)A RND(10)
127 BY (27)0 RND(10)
128 BY (28)9 RND(10)
129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
133 BY (33)4 RND(10)
134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
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153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```



```

[LIST]
[GO]
100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
125 BY (25)B RND(10)
126 BY (26)A RND(10)
127 BY (27)0 RND(10)
128 BY (28)9 RND(10)
129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
133 BY (33)4 RND(10)
134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
152 BY (52)5 RND(10)
153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```



PLAYER PIANO

```

[LIST]
[GO]
100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
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126 BY (26)A RND(10)
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129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
133 BY (33)4 RND(10)
134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
152 BY (52)5 RND(10)
153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```

See the electronic music section for complete details. Your controls for this program are:
PRINT to play the notes you entered.
ERASE to back up and remove notes from the screen.
LINE to enter a new note line. (Press GO after you enter the number.)
CLEAR to clear the notes from memory so that you can enter new music to be played.

PLAYER PIANO

```

[LIST]
[GO]
100 CLEAR
101 BY (1)X RND(10)
102 BY (2)Y RND(10)
103 BY (3)Z RND(10)
104 BY (4)W RND(10)
105 BY (5)U RND(10)
106 BY (6)V RND(10)
107 BY (7)T RND(10)
108 BY (8)S RND(10)
109 BY (9)R RND(10)
110 BY (10)Q RND(10)
111 BY (11)P RND(10)
112 BY (12)O RND(10)
113 BY (13)N RND(10)
114 BY (14)M RND(10)
115 BY (15)L RND(10)
116 BY (16)K RND(10)
117 BY (17)J RND(10)
118 BY (18)I RND(10)
119 BY (19)H RND(10)
120 BY (20)G RND(10)
121 BY (21)F RND(10)
122 BY (22)E RND(10)
123 BY (23)D RND(10)
124 BY (24)C RND(10)
125 BY (25)B RND(10)
126 BY (26)A RND(10)
127 BY (27)0 RND(10)
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129 BY (29)8 RND(10)
130 BY (30)7 RND(10)
131 BY (31)6 RND(10)
132 BY (32)5 RND(10)
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134 BY (34)3 RND(10)
135 BY (35)2 RND(10)
136 BY (36)1 RND(10)
137 BY (37)0 RND(10)
138 BY (38)9 RND(10)
139 BY (39)8 RND(10)
140 BY (40)7 RND(10)
141 BY (41)6 RND(10)
142 BY (42)5 RND(10)
143 BY (43)4 RND(10)
144 BY (44)3 RND(10)
145 BY (45)2 RND(10)
146 BY (46)1 RND(10)
147 BY (47)0 RND(10)
148 BY (48)9 RND(10)
149 BY (49)8 RND(10)
150 BY (50)7 RND(10)
151 BY (51)6 RND(10)
152 BY (52)5 RND(10)
153 BY (53)4 RND(10)
154 BY (54)3 RND(10)
155 BY (55)2 RND(10)
156 BY (56)1 RND(10)
157 BY (57)0 RND(10)
158 BY (58)9 RND(10)
159 BY (59)8 RND(10)
160 BY (60)7 RND(10)
161 BY (61)6 RND(10)
162 BY (62)5 RND(10)
163 BY (63)4 RND(10)
164 BY (64)3 RND(10)
165 BY (65)2 RND(10)
166 BY (66)1 RND(10)
167 BY (67)0 RND(10)
168 BY (68)9 RND(10)
169 BY (69)8 RND(10)
170 BY (70)7 RND(10)
171 BY (71)6 RND(10)
172 BY (72)5 RND(10)
173 BY (73)4 RND(10)
174 BY (74)3 RND(10)
175 BY (75)2 RND(10)
176 BY (76)1 RND(10)
177 BY (77)0 RND(10)
178 BY (78)9 RND(10)
179 BY (79)8 RND(10)
180 BY (80)7 RND(10)

```

45	×1000000	
60606545	6054100	
60606545	2000050	
60606545	7050520	
60606545	3033040	
60606545	5000020	
60606545	4234050	
60606545	6000000	
60606545	1000040	
60606545	6054100	
60606545	2000050	
60606545	7050520	
60606545	3033040	
60606545	5000020	
60606545	4234050	
60606545	6000000	
60606545	1000040	
60606545	6054100	
60606545	2000050	
60606545	7050520	
60606545	3033040	
60606545	5000020	
60606545	4234050	
60606545	6000000	
60606545	1000040	
60606545	6054100	
60606545	2000050	
60606545	7050520	
60606545	3033040	
60606545	5000020	
60606545	4234050	
60606545	6000000	
60		

Graphs and Charts

These programs draw line and bar graphs. Enter the number of items you wish to graph, then enter the value of each item.

```

1 GRAPH
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 LINE GRAPH
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



112

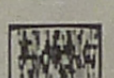
Video Art

COLOR WHEEL
Move hand control number one left or right to select the color. Forward or backward to select the intensity. The trigger gives you a printout of the color (0 to 31), the intensity (0 to 7) and the color number (0 to 255).

```

1 COLOR WHEEL
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 VIDEO WALLPAPER
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```

113

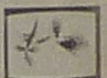
LASER DUEL

Two players cooperate or compete in forming designs as they each move one end of the reverse line.

```

1 LASER DUEL
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 RND BOX 2
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



114

NEW! TOLL FREE ORDER NUMBER (800) 521-1524

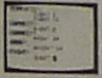
This line is staffed with order takers only. Information calls cannot be handled on this line. In Michigan call (313) 994-3200.

MATH QUIZ

```

1 MATH QUIZ
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

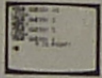
```



```

1 NUMBER MATCH
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



115

Terms and Symbols

Computer Words

BOX X,Y,A,B,1

means draw a black box that's centered at the point X,Y. The box is A dots wide and B dots high. You can draw:
BOX X,Y,A,B,1 black box
BOX X,Y,A,B,2 white box
BOX X,Y,A,B,3 reverse box
BOX X,Y,A,B,4 no box

CLEAR

means clear the screen.

ERASE

means forget the last key you pushed. This doesn't work if the last key was RUN, H, or GO.

FOR/TO/NEXT/STEP

These words all work together to make a loop. 10FOR A=1 TO 10STEP 1
20PRINT A
30NEXT A
This loop prints 1, 4, 7, 10, 13, 16.

GO

means go. Press GD after each instruction.

GO + 10

means go to the next line and add 10 to the line number.

GOTO 20

means go to line number 20 and continue running the program.

116

Inputs, Outputs, and Controls

JX(I)

is a number that matches the position of the number one hand control.
Left JX(I)=-1
Center JX(I)=0
Right JX(I)=1

JY(I)

is a number that matches the position of the number one hand control.
Forward JY(I)=1
Center JY(I)=0
Back JY(I)=-1

TR(I)

is a number that matches the trigger on the number one hand control.
Pulled TR(I)=1
Not Pulled TR(I)=0

KN(I)

is a number that matches the position of the knob on hand control number one.
A=KP
means wait until you press a key on the keypad. Each key has a number and the number of the key you press is stored in the A counter. You can see what key you pressed with the instruction, TV=A.

117

Control Words

The following control words are used with the Billy Audio Tape Interface Accessory.

:PRINT

means tape print on record data from memory.

:INPUT

means tape input or playback data from tape to memory.

:LIST

means tape list or playback data on the screen.

:RETURN

means tape return or end record or playback mode.

Error Messages

WHAT?

The computer says WHAT? when it doesn't understand you.

HOW?

The computer asks HOW? when it understands what you want but can't figure out how to do it.

SORRY!

The computer says SORRY! when there isn't enough room in its memory to do what you want.

118

PERSPECTIVE BOX

```

1 PERSPECTIVE BOX
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 RANDOM LINE
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



118

SCROLL ONE

These three programs are like paintings. The images evolve slowly and the visual experience changes over time.

```

1 SCROLL ONE
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 SCROLL TWO
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



119

SCROLL THREE

```

1 SCROLL THREE
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

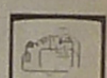
```



```

1 SCRIBBLER
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



120

ELECTRIC DOLLY

```

1 ELECTRIC DOLLY
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 RUBBER BAND
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



```

1 COLORING BOX
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```



119

RUBBER BAND

Draw a connect-the-dots pattern on the screen. Moving the knob controls direction of the line. Rotating the knob to the right draws a line and rotating the knob to the left leaves a space. The trigger prints each section of the line.

```

1 RUBBER BAND
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```

```

1 COLORING BOX
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```

120

Learning Skills

This learning program becomes easier or more difficult, to match the player's skill.

```

1 LETTER MATCH
2 INPUT "NO. OF ITEMS TO GRAPH:" N
3 FOR I=1 TO N
4   INPUT "VALUE OF ITEM #": V
5   GOTO 4
6 NEXT I
7 GOTO 40

```

120

The comma means continue. In PRINT A, the comma after A means continue printing on the same line.

The semi-colon means the same thing as a line number.

10PRINT A, GOTO 30

is the same as

10PRINT A

20GOTO 30

You can use the semi-colon to put two or more instructions on the same line.

> means "is greater than," as 5>3.

< means "is less than," as 6<12.

= means "is equal to."

A=5

means put the number 5 in the A counter.

means "not equal to."

* means "REMARK to follow";

it will not affect the program

121

118

119

120

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