THE DESIGNER'S PENCIL™

Instructions for the Sinclair Spectrum

INTRODUCTION

The Designer's Pencil™ is a powerful but easy tool. We recommend that you simply play with it awhile. And when you feel ready, begin reading these instructions. Soon, you will be able to design thousands of pictures, as well as compose or transcribe music. Along the way, you are introduced to many important computer programming concepts and will earn their gratifying rewards.

GETTING STARTED

- Set up your computer system. Follow manufacturer's instructions.
- Be sure that the EAR socket of the Spectrum is connected to the EAR socket of the tape recorder.
- Place the cassette in the recorder and rewind to the beginning.
- TYPE LOAD "" (using the [J] key for LOAD, and the [P] key and [SYMBOL SHIFT] for the "quotes).
- Press the [ENTER] key.
- Press PLAY on the recorder.
- After several seconds, the program title should appear. After a minute or so, a full title screen will appear, surrounded by a moving, static like background, and lasting approximately three minutes. If this loading sequence does not occur, adjust the volume on the recorder and repeat this entire procedure.
- **When loading is complete, press STOP on the recorder.**

THE CONTROLS

The Designer's Pencil™ can be used with either the keyboard controls, Sinclair Interface 2, Kempston joystick interface or cursor interface.

When loading is complete the controller menu will appear. Press the numerical key that corresponds to your selection.

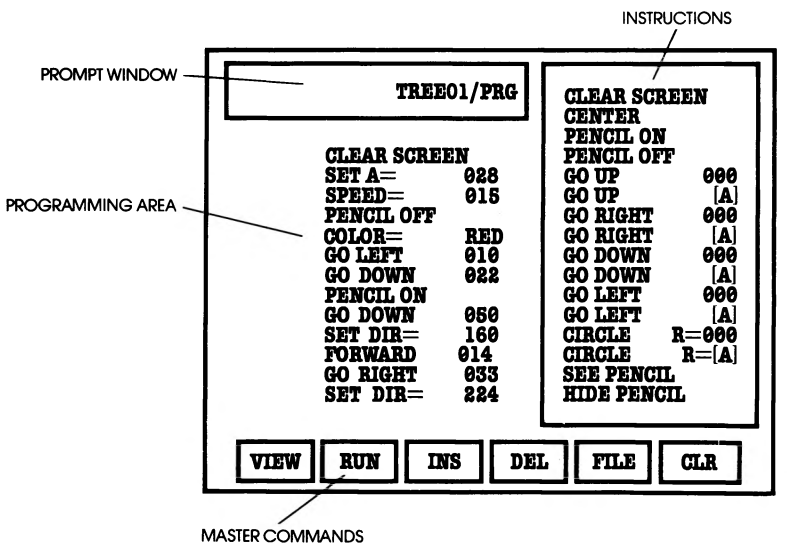
You are now looking at the **PROGRAMMING SCREEN.** All program designing is done here. The flashing arrow is your programming pointer. Right now, you can see that it is pointing at the CLEAR SCREEN instruction. Move the arrow UP, DOWN, LEFT or RIGHT with the Joystick, if using the keyboard, [2]=UP, [O]=LEFT, [P]=RIGHT, [W]=DOWN. **Try it!** Move the arrow around a bit. Then, return the arrow to the CLEAR SCREEN instruction.

Using **The Designer's Pencil**™ is just like programming except that you don't need to type or memorize any commands or instructions. **All of the program designing is done by a combination of moving the arrow to the command or instruction you desire and pressing the button.** By pressing the button, you are executing a command or initiating an instruction.

NOTE: *This manual assumes you are using a Joystick. If using the keyboard, press the* [2] *key when we refer to the button on the Joystick. Also, if you'd like to draw freehand using the Joystick, see "Instructions" section "SKIP IF J1 UP".*

THE PROGRAMMING SCREEN

The diagram below shows the PROGRAMMING SCREEN divided into its four main sections.



THE MASTER COMMANDS

The six small rectangles at the bottom are your **Master Commands.** To execute one, point the arrow to the command desired and press the button. The Master Commands are:

VIEW: VIEWS the DRAW PAGE. To exit the draw page, press the button again. Exiting the draw page always returns you to the programming screen with the arrow pointed at the VIEW command.

RUN: RUNS the program that is the PROGRAM AREA of the programming screen. Your TV set will automatically flip to the DRAW PAGE, and you will see your program actually being run or "drawn". You may interrupt a RUN and return to the programming screen at any time by pressing the [ENTER] key.

INS: INSERTS a blank line at the blinking cursor in the PROGRAM AREA. (See "INSERT AND DELETE".)

DEL: DELETES the line at the blinking cursor in the PROGRAM AREA. (See "INSERT AND DELETE".)

FILE: Handles various FILING jobs. The arrow will automatically go to the PROMPT WINDOW for you to make your selections. (See "PROMPT WINDOW".)

CLR: CLEARS the PROGRAM AREA of any program, prompted by YES/NO in the PROMPT WINDOW. (NOTE: Unless your program is "SAVED", there is no way to retrieve it once the Program Area is cleared.)

THE PROMPT WINDOW

The PROMPT WINDOW is where you will SAVE and LOAD your own programs and pictures. (More on SAVE and LOAD later.)

You will normally use or enter the PROMPT WINDOW by first pointing the arrow at the FILE command at the bottom of the screen and pressing the button. The arrow automatically jumps to the PROMPT WINDOW. Then, point the arrow at the "prompted" decision you choose to make. Remember to press the button to execute your "prompted" decision.

NOTE: Normally, to enter the PROMPT WINDOW, point the arrow at the FILE command first, and press the button.

TO RUN DEMONSTRATIONS:

Supplied on the cassette are a number of demonstration programs. The twelve demonstration programs are placed after **The Designer's Pencil**™ programme on the tape. To load one of the programs try the following sequence.

1. Place the arrow at the beginning of the FILENAME which at present says, "NONAME"; press the button. The first letter of the FILENAME will turn black. Moving the joystick will change the letter, forward to go forward through the alphabet, A-Z, back to go back through the alphabet, Z-A, right to go back quickly, left to go forward quickly. When the letter is as you want it (say 'B') then press the button. The next letter will then turn black and can also now be changed. You can continue with this until all six letters are set and the FILENAME turns blue again. Set the FILENAME to "BEGINR".
2. Enter the prompt window through the FILE command as explained previously.
3. Point the arrow at FILE and press the button.
4. Point the arrow at LOAD and press the button.
5. Move the arrow to TAPE and press the button. Move the arrow to YES and press the button. Start the tape. After a short time the program will be loaded and the arrow cursor will return to the instruction window. **Stop the tape.**

6. When loaded RUN the program using the RUN command.

   To run the rest of the programs follow the same procedure but setting the FILENAME to the required program name. The twelve demonstration programs are called:-

   BEGINR
   SPIRAL
   TITLES
   TREE01
   CUBES
   MUSIC
   GEOMET
   SAILIN
   COPTER
   FAROUT
   TRAIN
   SCRIBL

BLANKING THE DRAW PAGE

When you begin to program your own designs, always blank-out the draw page first. This allows you to start with a "fresh piece of paper".

HERE'S HOW!

1. Move the arrow to the **CLR** command and press the button. The arrow jumps to the Prompt Window.
2. Execute the "**YES**" instruction. The **CLR** and **YES** combined clear the Program Area. The arrow jumps to the CLEAR SCREEN instruction.
3. Press the button to place the CLEAR SCREEN instruction in the program area. Then execute the RUN command. After clearing the Program Area, the RUN command blanks the draw page.

   Four important conditions exist once you blank the page and are ready to begin a new program:

1. The page is WHITE.
2. You can SEE the pencil, as opposed to being invisible.
3. The pencil is located at the CENTER of the page.
4. The pencil is ON the page. This means that the pencil will draw when moved about, as opposed to simply being repositioned **without drawing** when moved about.

NOTE: *Always blank the draw page when you begin programming a new design.*

CREATING A SIMPLE CIRCLE

You are now ready to create your first program. After returning the programming screen by pressing the button, you will notice the blinking cursor. **The blinking cursor marks the location of the next instruction of your program.**

TO CREATE A CIRCLE:

1. Move the arrow over to the instruction window and point to "CIRCLE R=000". (Scroll up or down through the instructions until you find this instruction.)
2. Press the button. You'll notice that your instruction is now part of your program. Because this instruction needs additional information, it is highlighted in black.
3. Move the Joystick until the number 035 appears and press the button.
4. Execute the RUN command.

Congratulations! You have just completed your first program.

TO EXPERIMENT WITH OTHER CIRCLE SIZES:

1. Point the arrow at the "035".
2. Press the button.
3. Move the Joystick to select a radius for other sizes.
4. Press the button again.
5. Execute the RUN command.

NOTE: *Instructions that are highlighted BLACK in the Programming Area require additional information, or some sort of change.*

THE PROGRAMMING AREA

As you can see, the Programming Area and the instruction Window work very closely with each other. The Programming Area is where you "build" or "create" your programs. The instruction Window is where you select the instructions.

Many instructions in your programs, like "CIRCLE R=035", can be changed once they are already in the Programming Area. Point the arrow to the right hand side of the instruction and press the button.

INSERT and DELETE

There are many occasions when writing a program when you will want to INSERT a new instruction between two existing instructions, or even DELETE an instruction. Both are very simple to do with **The Designer's Pencil!**™

Let's use your circle program to learn how to INSERT an instruction.

FIRST, DO THIS:

1. Clear the program: Put the arrow on the [CLR] box and press the button. Move the arrow to YES in the prompt window and press the button.
2. Select the following instructions from the instruction window.

   CLEAR SCREEN
   BACKGRND=GRE
   CIRCLE R=017

3. RUN the program. You should see a black circle on a green background. When you are finished admiring your work, return to the programming screen.

NOW, TO INSERT AN INSTRUCTION:

1. Point the arrow **at the beginning** of your "CIRCLE R=017" instruction and press the button. The blinking cursor should appear at the beginning of the "CIRCLE R=017" instruction.
2. Point the arrow at the **INS** command and press the button once. The "CIRCLE R=017" instruction dropped down one line. Each time you press the button, one blank line is inserted.
3. Point the arrow at the COLOR = "BLK" instruction in the Instruction Window and press the button once.
4. Change the "BLK" TO "RED".
5. RUN the program.

   Wonderful! You just INSERTED an instruction which in this case turned your circle red.

TO DELETE AN INSTRUCTION:

Point the arrow directly **at the beginning** of the instruction that you want to DELETE and press the button. Then point the arrow at the **DEL** command and press the button. Each time you press the button, you DELETE one line.

TRY THIS:

Delete the COLOR = "RED" instruction as just explained. Be certain to press the button only once! Otherwise, you will also delete your "CIRCLE R=017" instruction. Now, RUN your program.

Your circle has returned to black. The reason is that **The Designer's Pencil**™ always draws with the color black at the top of your program unless you specify otherwise.

Well, you're getting pretty good. You can move the arrow around the screen. You can execute the commands. You can draw a circle and change colors. It's time to learn each instruction in the Instruction Window.

Many of them are self-explanatory. Just by experimenting, you could probably figure them out. But, don't worry. You can't harm the system by putting in a wrong instruction. If you don't like what you have, just blank the draw page and start over.

What follows is an explanation of ALL of the instructions; even the ones that seem obvious to YOU.

THE INSTRUCTIONS

To start off, let's make it just a bit easier. You will notice that many instructions have near-duplicates; even at the start.

The 1st instruction is: "COLOR =BLK".

And the 2nd instruction is: "COLOR=[A]".

The 2nd instruction includes the **variable** [**A**]. **Variables** are very important functions to programming, and we will discuss them as a topic themselves. (See "VARIABLES, LOOPS and LABELS".)

Also, we will skip some of the instructions as they appear in order in the Instruction Window and discuss them later.

COLOR =BLK: Changes the ink color that you draw in.

The instruction COLOR =CLR is a special instruction which erases pixels from the screen.

COLOR =[A]: This instruction allows you to set the color from a variable. It also allows changes in background color and the flash and bright attributes. The variable should be set according to the following pattern.

INK colour + Background colour + 64 if bright + 128 if flashing.
This is the same format as the ATTR instruction in Spectrum BASIC.

CLEAR SCREEN: Clears the draw screen as your program runs.

CENTER: Puts the pencil at the center of the screen. The screen contains 256 dots horizontally (X Axis) numbered 0-255 and 176 dots vertically (Y Axis) numbered 0-175. The center is at 127, 88 (X, Y).

PENCIL ON: Pencil will draw with selected color.

PENCIL OFF: Pencil will move around without drawing.

GO UP, GO RIGHT, GO DOWN, GO LEFT 000: Moves the pencil by that number and in that direction. The number ranges 000-255.

CIRCLE R=000: Draws a circle radius 000-255.

SEE PENCIL: The pencil is visible as it moves around.

HIDE PENCIL: The pencil is invisible.

KALEID ON: Sets kaleidoscope draw mode on. Anything that is drawn will be copied automatically in the other 3 quadrants of the screen. This instruction creates wonderful effects, and is best used with the pencil hidden!

KALEID OFF: Turns kaleidoscope draw mode off.

BACKGRND=BLK: Changes background color to the one selected.

FILL: Fills in an enclosed area. The pencil must be positioned **within the area** (not on the edge). Sometimes the pencil will not completely fill an area. When this happens reposition the pencil in the unfilled area(s) and turn the PENCIL OFF. Then use the FILL instructions again. "Fill" automatically puts the pencil ON the page, However, when you are through "FILL"ing, the pencil will return to its previous position, i.e. PENCIL ON or PENCIL OFF.

WRITE "A": Prints a letter A-Z, some punctuation and 0-9, i.e., any given character placed between the inverted commas. "WRITE" automatically puts the pencil ON the page. However, when you are through "WRITE"ing the pencil will return to its previous position i.e., PENCIL ON or PENCIL OFF.

NOTE: Plays a note for approximately 1/10th of a second. Instruction format is NOTE C#3...where C# is the notes pitch and 3 is the octave (1-5). To play a note longer than 1/10th of a second, repeat the NOTE instruction.

SPEED: Sets the drawing speed (0=SLOW, 15=FAST). If you don't use this instruction, the program runs at SPEED 4.

STOP: Stops the program. A blank line will also stop the program. (See "RECURSION" for additional STOP information.)

SET DIR=000: Draws diagonal lines. Pencil direction used only in conjunction with FORWARD/BACKWARD instructions. (See below.) Pick direction (angle) from 0-255. 0=UP, 64=RIGHT, 128=DOWN and 192=LEFT.

FORWARD 000: Move pencil in selected direction (see above) by amount selected. Ranges 000-255.

BACKWARD 000: Move pencil in opposite direction from FORWARD by amount selected. Ranges 000-255.

ROTATE R 000: Adds an offset to direction. "ROTATE R 064" turns a quarter of a circle to the right.

ROTATE L 000: Subtract offset from directions. "ROTATE L 064" turns a quarter of a circle to the left.

VARIABLES, LOOPS and LABELS

Variables are letters (A-Z) that store numbers. Whereas a number itself cannot ever be worth a different numeric value (3 is always equal to 3), a **variable** can store a different number at different times throughout a program.

Let's pretend that you want to hear all five octaves that **The Designer's Pencil**™ supports. That includes 60 notes; 12 notes per octave. Using a **variable** [**A**] you could hear all 60 notes by writing just four instructions.

HERE'S HOW!

1. Clear any program in memory.
2. Point the arrow at the "SET A=000" instruction and press the button. Move the Joystick and see that you can cycle through all 26 letters in the alphabet. Return to "A" and press the button again. Then, press the button again leaving "SET A=000".
3. Scroll down the Instruction Window and find the instruction "A=A+000", and press the button. (You can scroll both "A's" through all of the letters, but leave them both as "A".) Then, move the Joystick so the instruction reads "A=A+001". (NOTE: "A=A+001" is not a correct mathematical expression. That would be impossible. With computers, "A=A+001" means that the left-side "A" is now equal to itself "plus 1". This is called a "counter".
4. Put the instruction "NOTE [A]" on the next program line.
5. Find the instruction "JUMP TO L001" and press the button. ("JUMP TO L001" will be explained later.

6. Lastly, position the arrow to the FAR LEFT edge of the screen on the "A=A+001" line, and press the button. "L001" should appear. Press the button again. The FAR LEFT edge is reserved for "labels". To MOVE a "label", point the arrow at it, press the button and move the label anywhere up or down the FAR LEFT edge of the Program Area. If you want to get rid of a label, you can "hide" it under another label and it will disappear from your program. "L001" is a label. (See JUMP TO L001" for a further discussion of labels.)

YOUR PROGRAM SHOULD LOOK LIKE THIS:

```
      CLEAR SCREEN
      SET A=000
L001  A=A+001
      NOTE [A]
      JUMP TO L001
```

Now, RUN your program, Press the button after you have heard all of the notes play a couple of times.

HERE'S WHAT HAPPENED:

You set "A" equal to 0. Then you played a note equal to 0. Next, you increased the value of "A" by 1, so that "A" now equals 1. Lastly, your "JUMP TO L001" instruction sent the program back to the instruction with the "label", in this case "L001". Your program then played a note equal to 1. The process repeated itself indefinitely, increasing the value of "A" by 1 each time.

This program is said to have gone into an infinite LOOP. it will NEVER stop cycling through the infinite LOOP of playing all five octaves unless you press ENTER

Loops do not have to be infinite, however. To make your program discontinue its loop AND still hear all 60 notes, insert the instruction "SKIP IF A=060" between "NOTE CH1=[A]" and "JUMP TO L001". Then, RUN the program again.

Instructions within your programs are normally executed from top to bottom. LOOPS change this execution sequence.

INSTRUCTIONS CONTINUED

JUMP TO L001: Changes the normal program flow by jumping to its accompanying label. "JUMP TO L002" jumps to label "L002". "JUMP TO..." and its accompaning label ranges 001-255. Labels MUST be defined for JUMP TO..., JSUB TO... and RECURSE or the program will stop.

JSUB TO L001
RETURN: Jumps to a subroutine in your program. A subroutine is a section of the program that ends in a RETURN. The RETURN brings you back to the instruction AFTER the JSUB. This is useful when a task must be performed several places in the program.

RECURSE A B: THIS INSTRUCTION IS FOR THOSE OF YOU WHO ARE VERY ADVANCED USERS OF THE DESIGNER'S PENCIL™. Recursion is a complex programming technique that enables a program to "call upon itself" while it is RUNNING. The sequence is as follows:

- L001 MUST precede the RECURSE A B instruction.
- When the program reaches the RECURSE A B instruction, it is sent back to L001. This would continue forever if there was no way to specify how many "levels" of recursion you want to execute before continuing on with the program. Once the program reaches the final "level", it backtracks back to the original recursion level and then continues on with the program. The second variable "B" specifies how many levels to "recurse", and automatically increases by 1 every time the "RECURSE" instruction is executed. Therefore, by testing "B", you can decide how many levels of recursion to execute.

EXAMPLE:

The form of a recursion program.

```
        SET A=002          7 IS THE FINAL LEVEL
L001    SKIP IF B<007      ONCE B=7, STOP EACH LEVEL
        STOP               OF RECURSION
        A=A+2              THESE INSTRUCTIONS ARE
        GO UP (A)          EXECUTED ON THE WAY TO THE
        GO RIGHT (A)       DEEPEST LEVEL
        RECURSE A B        RESTART AT L001
        GO DOWN (A)        THESE INSTRUCTIONS ARE
        GO LEFT (A)        EXECUTED ON THE WAY BACK
                           FROM THE DEEPEST LEVEL
        STOP               WHEN THE FIRST LEVEL IS FINALLY
                           FINISHED, END FOR GOOD
```

Notice how for every level of recursion, the size of the box gets bigger. This is the value of (A) being incremented by 2. On the way back from the highest level. (A) contains its previous value.

See 'TREE01' and 'CUBES' in the demos for recursion examples. Also books on other languages with recursion will give applicable examples of uses of recursion.

RADIUS: Used in conjuction with the "ARC" instruction. (See below).

ARC A TO 000: Draws a portion of a circle clockwise from point "A" to point "000" with a radius set by the "RADIUS" instruction above. Points are 0-255 clockwise around a circle similar to direction.

```
EXAMPLE: SET A   =000
         RADIUS=020
         ARC A TO 128
```

This will draw the right half of a circle with a radius of 20.

SET A=000: Sets "A" equal to the value "000". There are 26 variables to choose from (A-Z). Value ranges from 000-255.

SET A=RN 000: Sets "A" equal to a random number between 0 and whichever number you place in the "000" portion of the instruction. Ranges 000-255.

SET A=PENC X: Sets "A" equal to the current numeric value of the pencil's location along the X Axis. Ranges 000-255.

SET A=PENC Y: Sets "A" equal to the current numeric value of the pencil's location along the Y Axis. Ranges 000-175.

SET A=DAT+A: (See "DATA AT L001" to follow).

SKIP IF A=,>,<: Skips the next instruction if operation is true. Otherwise, executes next instruction. > means greater than, < means less than.

SKIP IF J1=UP: Use to draw freehand by entering the following instructions.

```
      PENCIL OFF
L005  SKIP IF J1 UP
      JUMP TO L001
      GO UP 001
L001  SKIP IF J1 DO
      JUMP TO L002
      GO DOWN 001
L002  SKIP IF J1 LF
      JUMP TO L003
      GO LEFT 001
L003  SKIP IF J1 RT
      JUMP TO L004
      GO RIGHT 001
L004  PENCIL OFF
      SKIP IF B1 ON
      JUMP TO L005
      PENCIL ON
      JUMP TO L005
```

RUN the program. Then draw freehand by moving the Joystick and pressing the button. See what happens when you don't press the button.

SKIP IF B1 ON: Skips the next instruction if the button on the Joystick is pressed. (See above).

A=A +, −, X, /: Left-side "A" is equal to itself +, −, X, / the number or numeric value of the variable [A].

PENCIL X=000: Positions the pencil at any point on the X Axis. Ranges 0-255.

PENCIL Y=000: Positions the pencil at any point on the Y Axis. Ranges 0-175.

SET A=DAT+A
DATA AT L001
DATA 000: These three are used together and are for ADVANCED user's of The Designer's Pencil™. In combination, they allow the program to read data from the list of numbers in the "DATA 000" instruction(s) located at the specified label. The first "DATA 000" instruction MUST be labelled with the same label number as in the "DATA AT L000" instruction. The "SET A=DAT+A" instruction tells the program which one of the "DATA 000" instructions to get data from.

EXAMPLE:

```
      DATA AT L001
      SET B=0
      SET A=DAT+B          /Read the 1st entry-007
      SET B=4
      SET A=DAT+B          /Read the 5th entry-222

      ...
      ...
L001  DATA=007             /B=0
      DATA=001             /B=1
      DATA=023             /B=2
      DATA=034             /B=3
      DATA=170             /B=4
      DATA=222             /B=5
```

DEBUG [A]: Allows you to watch the value of the selected variable change as the program RUNS: Instructions are also displayed as the program RUNS. Display is along the bottom of the screen. The program pauses for a short time between instructions.

VIEW X/Y: Displays the changing horizontal and vertical values of the pencil along the bottom of the screen as the program instructions are executed.

This ends our discussion of the instructions. The intent is not to learn all of them at once. Nor is the intent to learn ANY of them by just reading about them.

The best method of learning is DOING. Select the ones that you understand best and EXPERIMENT with them. Write short and simple programs first. Add new instructions and SEE what effect they have on your designs. You'll be surprised how easy most of the instructions are to use and how quickly you'll understand the others.

Another good way to learn is to watch the DEMO programs in action. Study them. Change their SPEED instruction(s) to slow them down. Add your own instructions. It won't be long before you'll be designing programs that are just as good...or BETTER!

SAVE AND LOAD

Your "computer programs" and "designs" can be SAVED to microdrive or tape. This is important because once you turn your computer OFF, you lose your program and design. By SAVING, you can later LOAD your program or design back into the computer as though you had never turned the computer off.

HOW TO SAVE YOUR PROGRAMS AND PICTURES

The upper right corner of the Prompt Window is where you "name" your programs and pictures. All of the programs and pictures that you want to SAVE must have unique names. Give them each a name that helps you remember what they are. For example, if you want to SAVE a program of a house, then you might name your program "HOUSE". If you wanted to SAVE another picture of a house, then you might name the second house, "HOUSE1". Just remember: DO NOT NAME TWO PICTURES OR TWO PROGRAMS WITH THE IDENTICAL NAME. If you do, you will lose your first picture or program.

To NAME a program or picture:

1. Point arrow at the current "FILENAME" and press the button.
2. Move the Joystick until the first letter you want in your "new" name appears. Then press the button.
3. Continue changing the rest of the letters until the arrow automatically points at "PRG". Move the Joystick to the right and "PRG" changes to "PIC". "PRG" is for saving your programs, whereas "PIC" is for saving your pictures.

To SAVE your program or picture:

1. Execute the FILE command.
2. Execute "FILE".
3. Execute "SAVE".
4. Execute "MDRV" or "TAPE", whichever applies.
5. Execute "YES" or "NO".

- If you selected "MDRV" AND "YES", then your program or picture will automatically SAVE to microdrive.
- If you selected "TAPE" AND "YES", follow further instructions at the bottom of the screen.

NOTE: If you accidentally try to save to tape and do not have a tape player, you will have to hit "CAPS SHIFT" *and* "BREAK" *to terminate execution.*

- If you selected either "MDRV" or TAPE" and then chose "NO", the arrow will jump to the top of the instruction window and you will have to start the SAVE procedure again.

  When SAVING to TAPE, write down the FILENAME of your program or picture AND the beginning counter number of your tape player on a piece of paper. If you don't, you will NOT know the FILENAME or where to position the tape when you try to LOAD the program or picture back into the computer.

  It is not necessary to write down FILENAMEs on a piece of paper when SAVING to microdrive.

To LOAD from microdrive:

1. Execute FILE command.
2. Execute "FILE".
3. Execute "LOAD".
4. Execute "MDRV".

- The FILENAMEs of the programs and pictures that you had previously SAVED automatically LOAD into the computer and you can cycle through the list with the Joystick. When the FILENAME that you want appears, press the button, execute "YES", and the program or picture will LOAD.

To LOAD from tape:

1. Change the FILENAME line until the program or picture FILENAME that you want is exactly as you had previously SAVEd it.
2. Position your tape at the starting point for the program or picture that you wish to LOAD.

3. Execute steps 1., 2. and 3. as described above for microdrive.
4. Execute "TAPE".
5. Execute "YES", being certain that the FILENAME and position of tape in the tape player are accurate.
6. Press "PLAY" on tape.

- Your program or picture will begin LOADING.

NOTE: If you accidentally try to LOAD from a tape and do not actually have a tape player hooked-up, press "CAPS SHIFT" *and* "BREAK" *to terminate execution.*

PRINTING

The Designer's Pencil™ allows you to **PRINT** your programs or pictures. Of course, you must have a printer to enjoy this capability.

To PRINT:

1. Execute the FILE command.
2. Execute PRINT. Your program or picture will then print.

ERROR MESSAGES

The message "**IO ERROR**" may appear in the upper left corner of the Prompt Window. This is a warning to you that something is not behaving as expected. Examples of causes are:

- Microdrive, Printer or Tape Player is not connected to your computer or is not turned on.
- Wrong FILENAME is used.
- Microdrive cartridge or tape are destroyed.
- Tape is not positioned properly.
- Incompatible printer.
- Microdrive, Printer or Tape Player are not functioning.

CHART FOR DIRECTIONS AND ARC VALUES (0-225)

000 = UP
032 = 45 DEGREES
064 = RIGHT
128 = DOWN
192 = LEFT

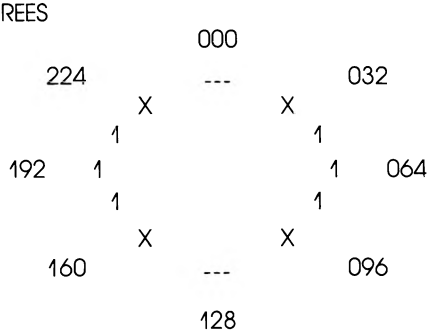


CHART FOR NOTE VALUES WHEN USING NOTE C #3

Number In Var	Note	Number In Var	Note
0	REST	31	F# 3
1	C 1	32	G 3
2	C# 1	33	G# 3
3	D 1	34	A 3
4	D# 1	35	A# 3
5	E 1	36	B 3
6	F 1	37	C 4
7	F# 1	38	C# 4
8	G 1	39	D 4
9	G# 1	40	D# 4
10	A 1	41	E 4
11	A# 1	42	F 4
12	B 1	43	F# 4
13	C 2	44	G 4
14	C# 2	45	G# 4
15	D 2	46	A 4
16	D# 2	47	A# 4
17	E 2	48	B 4
18	F 2	49	C 5
19	F# 2	50	C# 5
20	G 2	51	D 5
21	G# 2	52	D# 5
22	A 2	53	E 5
23	A# 2	54	F 5
24	B 2	55	F# 5
25	C 3	56	G 5
26	C# 3	57	G# 5
27	D 3	58	A 5
28	D# 3	59	A# 5
29	E 3	60	B 5
30	F 3		

Values > 60 Wrap Around, i.e., 61=0, 62=1,...

CHART FOR CHARACTERS WHEN USING WRITE (A)

Number In Var	Char	Number In Var	Char
0	SPACE	32	@
1	!	33	A
2	"	34	B
3	£	35	C
4	$	36	D
5	%	37	E
6	&	38	F
7	´	39	G
8	(	40	H
9	)	41	I
10	*	42	J
11	+	43	K
12	,	44	L
13	–	45	M
14	.	46	N
15	/	47	O
16	0	48	P
17	1	49	Q
18	2	50	R
19	3	51	S
20	4	52	T
21	5	53	U
22	6	54	V
23	7	55	W
24	8	56	X
25	9	57	Y
26	:	58	Z
27	;	59	[
28	<	60	/
29	=	61	]
30	>	62	↑
31	?	63	_ (Underscore)

Values > 63 Wrap Around, i.e., 64=0, 65=1,

CHART OF THE 8 SINCLAIR COLORS WHEN USING COLOR 1=(A)

000	=	BLK	=	BLACK
001	=	BLU	=	BLUE
002	=	RED	=	RED
003	=	MAG	=	MAGENTA
004	=	GRE	=	GREEN
005	=	CYN	=	CYAN
006	=	YEL	=	YELLOW
007	=	WHT	=	WHITE
		CLR	=	ERASES PREVIOUSLY SET PIXELS

NOTES

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