ATARI® 400/800™

VIDEO EASEL™

ATARI®

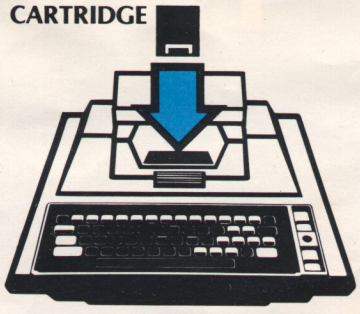
A Warner Communications Company

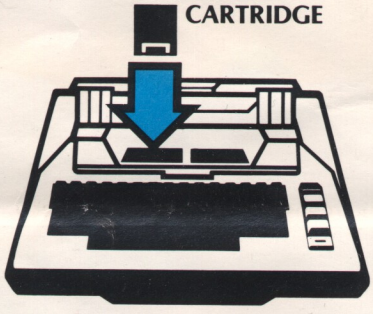
Model CXL4005
Use with
ATARI® 400™ or ATARI 800™
PERSONAL COMPUTER SYSTEMS

INSERTING THE CARTRIDGE

This cartridge runs on the **ATARI® 400™** or the **ATARI 800™ Personal Computer System.** On the **ATARI 800** system, insert the cartridge in the **LEFT CARTRIDGE** slot. Be sure the **POWER ON/OFF** switch on the right side of the console is **ON**. The **ATARI 400** and **ATARI 800** systems automatically shut off whenever the cartridge door is lifted. This prevents damage to the computer and to the cartridge.

The power indicator light on the console should be on when the power is **ON** and the cartridge door is closed, and off when the door is open.





General Information About VIDEO EASEL™

Age Range: ages 8 to adult

This cartridge encourages:

- Visual Thinking
- Experimentation/Exploration
- Creative Play

It develops skills in:

- Understanding mathematical models and games.
- Creating and identifying shapes, patterns, and "repeating cycles."
- Understanding symmetric relationships.

VIDEO EASEL may be associated with the following subject areas:
(primarily at the secondary and college levels)

- Mathematics
- Biology and other life sciences
- Art, aesthetics, visual perception
- Interdisciplinary studies
- Systems theory (especially physics, chemistry, and medicine.)

Category of Use:
- Education
- Recreation
- Simulation

Equipment required: 1-4 Joystick Controllers

Number of Users: 1-4

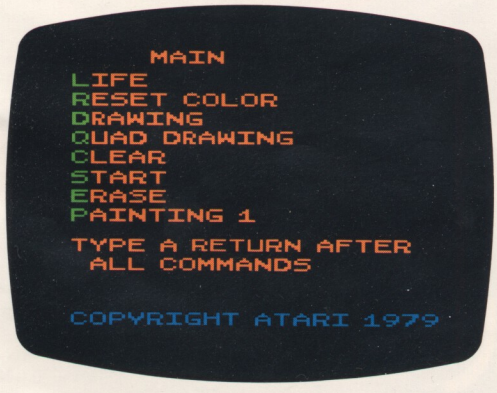
TABLE OF CONTENTS

I. INTRODUCTION

Welcome to the world of "video art," or, "computer video art," to be exact. This is your opportunity to create imaginative and colorful graphic designs. You can create a design on the screen using the Joystick and/or keyboard, then observe in amazement as the computer expands on the original pattern. Between the patterns already programmed into this cartridge and your own imagination, your possibilities are limitless.

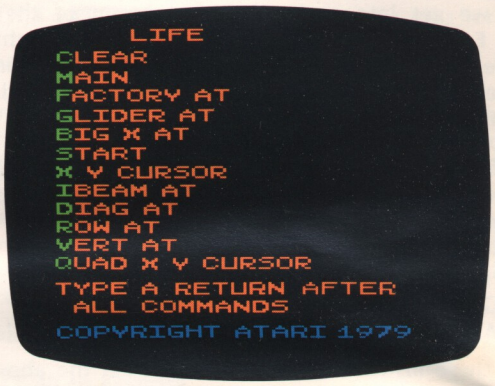
VIDEO EASEL™ is a unique combination of art and mathematics. It is also a terrific opportunity to learn about the fascinating game called "Life" (see below). You will be able to explore the nature of symmetry, while creating artistic designs which change or evolve according to certain rules or laws. You DO NOT have to be a mathematical wizard to use and enjoy this cartridge.

There are two "menus" in this cartridge which cause different displays to be shown on the screen. Each item in each menu is either an activity or an editing command. Using the keyboard, you instruct the computer what to display on the screen. When the cartridge is first powered up or turned on, you will see the following screen display:



As the **MAIN "menu" for VIDEO EASEL,** it contains the titles of all items in the cartridge. To display the menu for **LIFE** on-

ly, press **L** on the keyboard. You will then see the following display:



You will learn all possible commands and displays by reading through the instructions contained in this booklet. The following diagram is a general outline of the menus in **VIDEO EASEL.**

1. Power up Cartridge
MAIN menu is displayed

MAIN

RED BOXED ITEMS ARE MENU SELECTIONS

- LIFE
- RESET COLOR
- DRAWING
- QUAD DRAWING
- CLEAR
- START
- ERASE
- PAINTING 1

BLUE BOXED ITEMS ARE EDITING COMMANDS

TYPE A RETURN AFTER ALL COMMANDS

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2. Press L on keyboard for LIFE menu

LIFE

RED BOXED ITEMS ARE LIFE MENU COMMANDS

BLUE BOXED ITEMS ARE EDITING COMMANDS

GREEN BOXED ITEM DISPLAYS MAIN MENU FOR LIFE

- CLEAR
- MAIN
- FACTORY AT
- GLIDER AT
- BIG X AT
- START
- XY CURSOR
- IBEAM AT
- DIAG AT
- ROW AT
- VERT AT
- QUAD XY CURSOR

TYPE A RETURN AFTER ALL COMMANDS

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What Can You Learn From VIDEO EASEL?

VIDEO EASEL is designed for use by children and adults alike. Depending on age, interest, and experience, each user will be able to learn something new and different. (See the bibliography at the end of this instruction booklet for a list of references to guide you in your explorations.)

"Life" is a one-person game or activity of exploration and discovery. It has been described as a noncompetitive activity which is played with simple rules. It is based on creating patterns or "colonies" and trying to predict what forms they will take as they "evolve" from one generation to the next.

"Life" is not a game in the usual sense. There are no "opponents," nor are there any "strategies" for winning. It is rather, a simulation of cellular growth and evolution. You begin as the creator and then become an observer as the computer takes over. There is potential for an endless series of symbolic patterns which appear to have a life of their own.

John Horton Conway, a British mathematician, invented the rules of "Life" with great care, basing it on a mathematical model. This model can be related to a number of areas of study, including ecology, economics, biology, chemistry, cybernetics and computer science, biochemistry and physics.

Life's popularity has much to do with use of the modern computer. The speed and accuracy of the computer are necessary for continually executing the genetic "laws of Life," which you are about to learn. Combined with high quality, color graphics, "Life" makes learning about patterns an aesthetic experience. The role of symmetry in the evolution of these patterns is of special interest. (Symmetry is defined in Webster's New Collegiate Dictionary as "balanced proportions," or, "beauty of form arising from balanced proportions.")

Life is played on a rectangular grid. A "colony" of organisms will eventualy appear on the grid as you program them. Each organism can be represented by a single symbol, such as *. The colony of organisms will be a collection of these symbols on the grid. The configuration or arrangement is up to you and the computer.

Imagine an immense gridwork or checkerboard. Each square in the checkerboard is a cell, and the entire board is a cellular space. The cells are all identical and can perform a number of specific functions. Each cell can sense its eight neighboring cells (see diagram on next page), and each cell is either alive or not alive (quiescent).

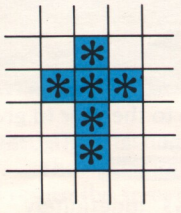
The cellular space changes with time; time advances over the entire space at once, in steps. As mentioned before, each step is called a generation (**GEN**).

The RULES of Life

Each successive generation of a colony (or cell), is reproduced according to the following "laws of Life":

1. **The Law of Survival**

   Each organism with 2 or 3 neighbors survives to the next generation. For example—

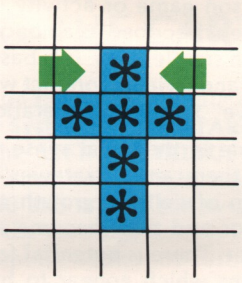


   Each organism with 4 or more neighbors dies from "overcrowding."

   Each organism with 1 or fewer neighbors dies from "isolation."

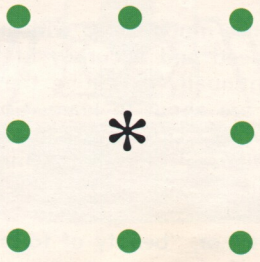
2. **The Law of Birth**

   Each empty space (cell) with exactly 3 neighbors has a birth of a new organism in the next generation. For example—



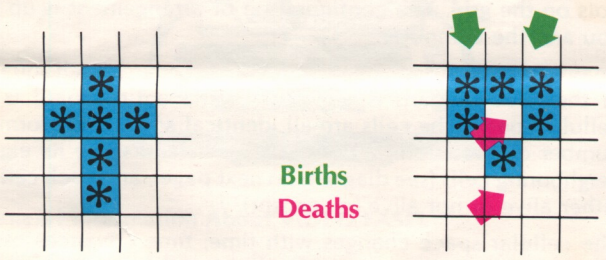
Births occur where there is optimal "nurture" or growth potential in the neighborhood.

Note that a "neighbor" is defined as an organism present in any adjoining space—horizontally, vertically, or diagonally. There are a total of eight such adjoining spaces (marked below):



The laws of Life are applied simultaneously or all at once. This means that one generation of a colony gives way to the next generation. For example:

GENeration 1: **becomes** **GENeration 2:**



Outcome

The game of Life goes through generation after generation, until one of the following outcomes occur:

1. All of the organisms die, in which case the game is over.
2. The colony reaches a stable configuration. This could occur when the pattern of organisms in one generation produces the same pattern in the next generation, or when any one of the previous patterns is repeated, which would produce periodic "cycling" of generations.

In the **VIDEO EASEL** version of Life, the **GEN**eration number continually increases regardless of what happens on the screen display. It is up to the user to give a new command to change the display when a configuration stabilizes ar dies out.

3. The colony grows indefinitely. (Although indefinite growth of a colony is theoretically possible, such a pattern has not yet been produced.)

As you will eventually see for yourself, some patterns exist which continue indefinitely, forever evolving. On the other hand, a pattern may die, leaving you with an empty display. A curious property in the evolution of many patterns is their tendency to gain symmetry. There will always be another pattern that you'll want to try in your search for unusual, unpredictable, and attractive patterns.

II. SAMPLE EXERCISES

Before we get into a detailed description of the entire **VIDEO EASEL** cartridge, some experimenting might be a good idea. Try the following exercises and keep in mind that whatever you do not understand will be explained later in these instructions.

The following series of experiments will help you get acquainted with the game of "Life." They can be done by children and adults alike.

A. **LIFE**
BIG X AT 40,40 RETURN
START RETURN

Follow these instructions, step by step, for the above program.

1. Press **L** (**LIFE**) on the keyboard.
2. Press **B** (**BIG X**).
   The screen display will show **"BIG X AT"** near the bottom left corner.
3. Type **40,40** (don't forget the comma) and hit RETURN
4. Press **S** (**START**), then hit RETURN.

A BIG X will generate beautiful patterns somewhat resembling stained glass windows. If you want to stop a pattern temporarily to take a look at it, press **M** (**MAIN**) on the keyboard. To begin the pattern again on the screen, press **S** (**START**), and RETURN

To remove the pattern from the screen, press **C** (**CLEAR**), and RETURN. Try two **BIG X's,** one at the top of the screen and one at the bottom. Using the same procedure just described, input the following information through the keyboard:

BIG X AT 80,60 RETURN
BIG X AT 80,20 RETURN
START RETURN

Note the symmetry in this exercise. It is a result of the symmetry of the **X,** and of having two **X's** on the screen, each a reflection of the other.

B. SEQUENCE OF I BEAMS

First, try a single **IBEAM,** such as:

IBEAM AT 80,50 RETURN (Press **I,** type **80,50,** hit RETURN)
START RETURN (Press **S,** hit RETURN)

How many objects are there after 10 generations? (...after 20 generations? 30 generations? 100 generations?)

Can you predict what the pattern will look like after 200 generations? (You can stop the program at any time by pressing **S** on the keyboard. Hit RETURN to restart it.

Try placing several **IBEAM's** side by side:

IBEAM AT 20,40 RETURN
IBEAM AT 30,40 RETURN
IBEAM AT 40,40 RETURN
IBEAM AT 50,40 RETURN
etc.
START RETURN

What do you think will happen? Will the design continue to be symmetric forever?

C. SIMPLE GEOMETRIC FIGURES

ROW AT 40,40 RETURN (Press **R**, type **40,40** and hit RETURN .)
LENGTH,# 5 RETURN When the computer asks for length, press **5** and hit RETURN .
START RETURN (Press **S**, hit RETURN)

After trying this exercise, repeat it with varying lengths (2, 10, 20, etc.). How does varying the length affect how long this colony can survive? **ROWS** like this demonstrate the concept of "oscillating patterns." Oscillating patterns repeat themselves after a specific amount of generations. For example, how many patterns are in each repeating cycle for a row of 5? a row of 10? Does it make any difference whether there are an odd or even number of elements?

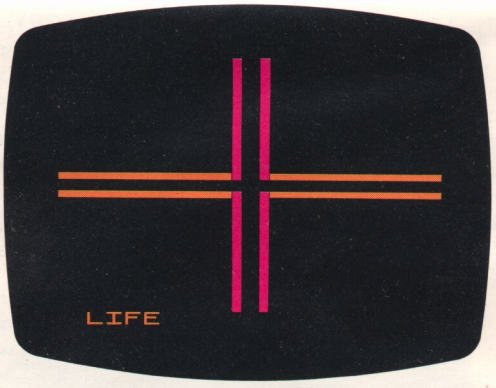
Try making a square and see what happens:

ROW AT 40,40 RETURN
LENGTH,# 10 "
ROW AT 40,49 RETURN
LENGTH,# 10 "
VERT AT 40,40 RETURN
LENGTH,# 10 "
VERT AT 49,40 RETURN
LENGTH,# 10 "
START RETURN

How long does the "square" last? Does it produce repeating or oscillating patterns?

D. FOUR-QUADRANT SYMMETRY (QUAD XY CURSOR)

If you enjoy symmetric patterns, you can take advantage of the **QUAD DRAWING XY CURSOR** mode. This mode copies designs you draw (using the Joystick and controller button), into each of the four quadrants on the screen:



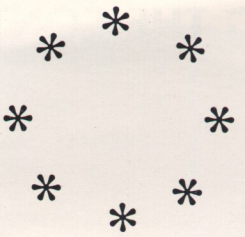
You will therefore get a design which is both horizontally and vertically symmetric, with each quadrant being a mirror image of its neighboring quadrant.

This is especially effective when mixed with other preprogrammed patterns. Remember that you can mix any number of these shapes together. Instead of pressing **S** (for **START**), after putting in a shape, use another of the menu commands for another shape. For example:

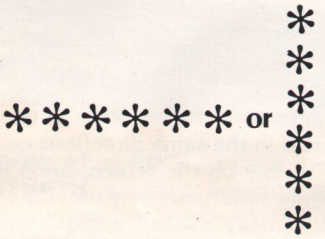
IBEAM AT 40,40 RETURN
BIG X AT 80,60 "
DIAG AT 20,20 RETURN
LENGTH 10 "
START RETURN

E. CREATE A COMMUNITY

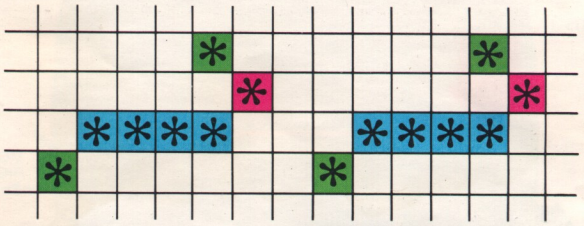
Imagine you are designing a community. Suppose you want to see the effects of setting it up in a specific way. For example, what would happen if houses were grouped like this:



instead of like this, as they are on typical streets.



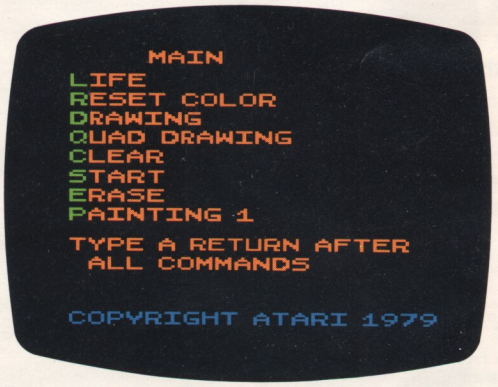
Or imagine that parallel lines are freeways. Place a factory here and there. Put a few gliders or spaceships like those shown below.



Now give your community life by **START**ing it. Watch it grow. Does the placement of objects change? Will the freeway stay the same? Here's where your imagination can run rampant.

III. CONSOLE/KEYBOARD CONTROLS

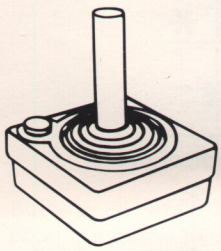
When the cartridge is first powered up your screen display will show the following menu of commands:



The above display is the **MAIN** Listing for all items contained in **VIDEO EASEL.** The SYSTEM RESET button on the keyboard console will return the screen display to this listing at any time when pressed. Any designs or patterns stored in the computer are NOT lost, but rather retained in the computer's memory when SYSTEM RESET is pressed.

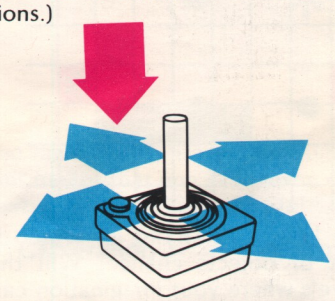
The OPTION , SELECT and START buttons have no effect in **VIDEO EASEL.** Your most important tools for instructing the computer will be some of the letter and number keys and the RETURN key on the console keyboard. Each item in the **MAIN** (menu) Listing may be accessed and displayed on the screen by pressing the FIRST letter of that item. (e.g. Press **L** for **LIFE**; press **R** for **RESET COLOR,** etc.)

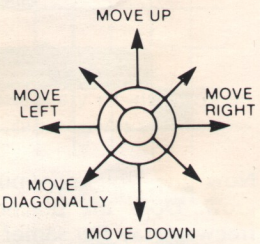
IV. USING THE CONTROLLERS



Be sure the Joystick cables are firmly plugged into the **CONTROLLER JACKS** at the front of your computer console. Joysticks are used for **LIFE, DRAWING,** and **QUAD DRAWING.** In **Life**, a Joystick is used to control the **XY CURSOR** and the **QUAD XY CURSOR,** which are similar, but not identical, in **DRAWING** and **QUAD DRAWING.**

Move the Joystick in the directions shown in the diagram to move the dot or cursor in the same directions on the screen. To make or "draw" a line on the screen, press the Joystick controller button while simultaneously moving the Joystick. Release the button to move the dot without making a line. The cursor can be moved anywhere but will not "draw" until the button is pressed once. From that point on, releasing the button "erases." (This procedure of moving the dot or cursor to erase is explained in more detail later in these instructions.)





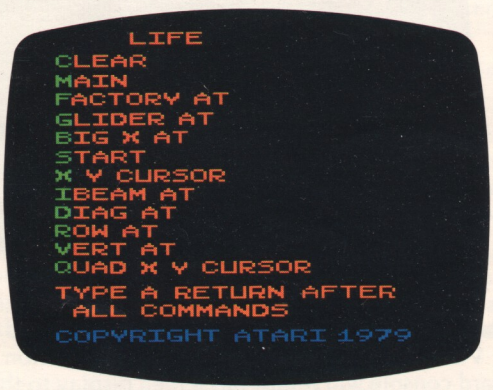
NOTE: There is more information on Joystick usage in general in Section V. **MAIN** LISTING.

V. MAIN LISTING

This section will provide you with a breakdown of all items contained in the **MAIN** (menu) Listing for **VIDEO EASEL.**

A. LIFE

Press **L** on the computer keyboard. The screen display will show the following new menu of commands:



The following descriptions include all items in the command menu for **LIFE.**

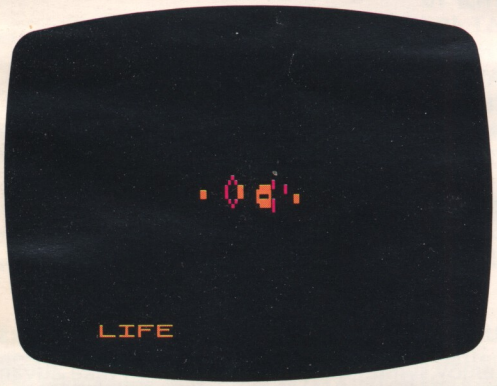
1. **CLEAR.** Use this command whenever you want to permanently clear the screen. Press **C** on the keyboard, then hit RETURN.

   NOTE: The **CLEAR** function for **LIFE** works differently than the **CLEAR** function described in Subsection E of this section.

2. **MAIN.** Press **M** on the keyboard to bring up the **MAIN** display in your **LIFE** program. It is also possible to use this function to stop the computer without taking the design off the screen. It is not necessary to hit RETURN after pressing **M** for **MAIN.**

3. **FACTORY AT.** A **FACTORY** is a special preprogrammed design. To display a **FACTORY** on the screen you must press **F** on the keyboard, and then select a set of coordinates for its location. The screen contains an invisible grid of horizontal and vertical coordinates. The horizontal or **X** coordinates range from 0 to 159. The vertical or **Y** coordinates range from 0 to 95.

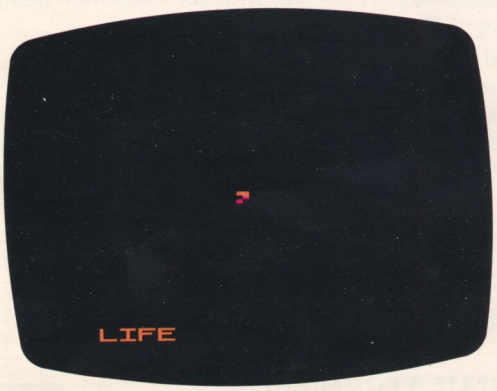
   After pressing **F,** use the number keys and select two sets of numbers or coordinates for **X** and **Y.**



You might select for instance, **FACTORY AT 25,35.** Be sure to separate each set of numbers with a comma. Then hit RETURN and a **FACTORY** will be displayed on the screen in the location you have selected. To **START** the **FACTORY,** press **S** and hit RETURN. This will signal the computer to take over. The **GEN**eration number will be displayed at the bottom, left side of the screen.

A **FACTORY** will create a **GLIDER** (explained next) every 28 **GEN**erations. Many **LIFE** patterns die rather quickly (within 100-200 generations). A **FACTORY** therefore, may be added to the display to supply new "life" into dying patterns.

4. **GLIDER AT.** This is another preprogrammed design. A **GLIDER** moves on a diagonal path. **GLIDERS** were so named because of the way they move, which is called glide reflection, or reflection from a diagonal line. Every four generations, a **GLIDER** moves one square up and to the right.

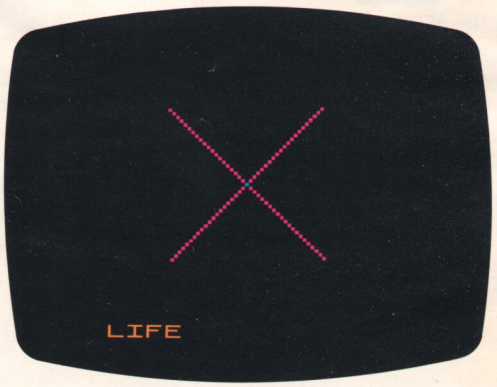


Another way to look at it is to say that every four generations, the **GLIDER** produces a replica of itself, facing the same direction but displaced one

square diagonally. After two generations, it is a copy of itself pointing 90 degrees from its original position. There are really only two unique patterns in the life history of the **GLIDER** but it takes four generations for the orientation to match that of the original pattern.

To display a **GLIDER,** press **G** on the keyboard, select coordinates, then follow the same procedure described for **FACTORY AT.**

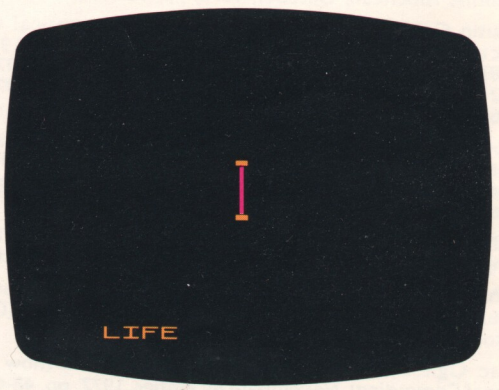
5. **BIG X AT.** This is yet another preprogrammed design or pattern. To display a **BIG X** press **B,** select coordinates, then follow the same procedure.



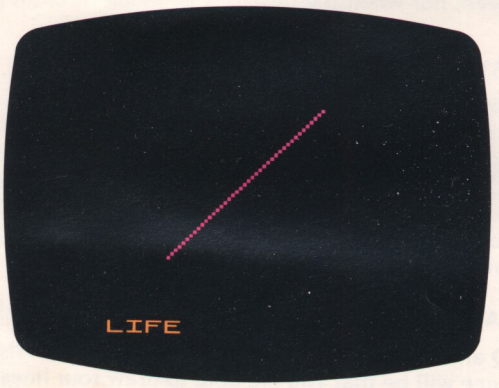
6. **START.** This command instructs the computer to START a design. Press **S** on the keyboard (**START** will be displayed at the bottom, left side of the screen), then hit RETURN.

7. **XY CURSOR.** This is your opportunity to create your own design. Press **X,** then hit **RETURN.** A cursor will appear in the middle of the screen. Using one or more Joysticks, draw something on the screen. When you want the computer to take over the design, press **S** (**START**), and hit RETURN.

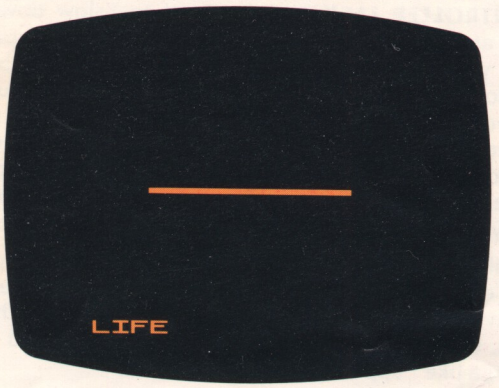
8. **IBEAM AT.** An **IBEAM** is another preprogrammed design. Press **I,** then follow the procedure described for **FACTORY AT.**



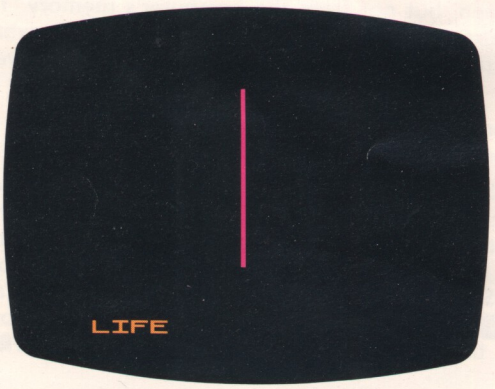
9. **DIAG AT.** Although a **DIAG**onal is a preprogrammed design, there is an additional step in the procedure for displaying it on the screen. Press **D,** select coordinates, then hit RETURN. The computer will then ask you to select **LENGTH,#.** Using the keyboard number keys, select a random length number. Once this has been done you can **START** the design by pressing **S** and RETURN.



10. **ROW AT.** A **ROW** also requires the selection of a **LENGTH** number. Follow the same procedure described for **DIAG AT,** with the exception of pressing **R** instead of **D** to begin.



11. **VERT AT.** Press **V** and since a **VERT**ical also requires a **LENGTH** number, follow the **DIAG AT** instructions.



12. **QUAD XY CURSOR.** This is the same as the **XY CURSOR,** except that four lines are drawn on the screen instead of one. Press **Q,** hit RETURN, etc.

NOTE: To stop a design on the screen, press **S** or **M** on the computer keyboard. To return to the **MAIN** Listing for **LIFE** at any time, press **L.** You may display the various items in **LIFE** individually or all at once.

B. RESET COLOR

To change the colors on the screen display, use a Joystick plugged into the number **2 CONTROLLER JACK**. Move the Joystick when the design is stopped, and the colors will change on the screen. To return to the original screen display colors (after changing them), press **M** (**MAIN**), hit RETURN, then press **R** (**RESET COLOR**) and hit RETURN.

NOTE: You cannot change the colors when the cursor is on

the screen, nor when the design is evolving through generations.

C. DRAWING

Press **D** on the keyboard, and hit **RETURN.** Using one or more Joysticks, draw something on the screen. When you have what you want on the screen, press **S** (**START**) and hit **RETURN** . The computer will repeat your pattern over and over in different locations on the screen.
To elaborate or continue the same design, press **D** (**DRAWING**) and repeat the same procedure.

D. QUAD DRAWING

Press **Q** and use the same steps explained in **DRAWING.** The difference will be that you are able to draw four lines on the screen at once, rather than one, as in **DRAWING.** You may use more than one Joystick.

NOTE: In **DRAWING** and **QUAD DRAWING,** it is possible to use different **CONTROLLER JACKS** to do different things on the screen. For example, a Joystick plugged into the number **1 CONTROLLER JACK** may be used to "slow down" the speed at which the computer repeats and/or expands a design you have drawn. Pull the Joystick straight back to slow down your design on the screen. This procedure will show you how such visual effects are created on the screen. To speed up the process again, push and hold the Joystick forward. Whether speeding up or slowing down, this process takes a few seconds to complete, so it is necessary to hold the Joystick in one of the positions (forward or backward).

You will notice that since the computer is simply repeating and/or expanding whatever you put on the screen, the design will have a tendency to fill up the screen quickly. When this occurs, the graphics tend to become cluttered and have a "garbage-like" appearance.

One way to get around this effect and make more interesting designs is to "erase" part or all of whatever you draw on the screen. Do this by going over the lines with the cursor only (controller button released), and they will be "erased" from the screen, but not from the computer's memory. Try this procedure once, then **START** the design and see what happens. Erasing usually leads to a much more effective drawing.

(This procedure should not be confused with the **ERASE** function described below and in Subsection G.)

You will find that the same design from a different Joystick and jack may cause different results on the screen when the computer takes over. To see how this works, draw something simple on the screen and instruct the computer to run it (press **S** and hit **RETURN**). Then **ERASE** (press **E** and hit **RETURN**) the design from the computer's memory and repeat the same design using a different **CONTROLLER JACK.**

The final position of the cursor on the screen before you **START** a design also greatly affects a drawing. Leaving the cursor at the end point of a design will produce a different result than moving the cursor back to the center of the screen. Keep in mind that simple drawings usually look the best, and are easiest to reproduce later.

E. CLEAR

Unlike the **CLEAR** function in LIFE, this one only clears the screen temporarily. It does not **ERASE** a design from the computer's memory, but rather clears the screen until the design is **START**ed again. It allows you to **CLEAR** the screen and draw something else without losing the original design.

To use the **CLEAR** function, press **C** and hit **RETURN** .

F. START

The **START** command instructs the computer to begin repeating and/or expanding a design on the screen. Press **S** and hit **RETURN** .

START is used for **LIFE, DRAWING, QUAD DRAWING,** and **PAINTING (PAINTING 1).**

G. ERASE

This function permanently **ERASE**'s whatever is on the screen from the computer's memory. Press **E** and hit **RETURN** .

H. PAINTING (PAINTING 1)

PAINTING (PAINTING 1) actually consists of six different preprogrammed graphic designs. Whenever **P** is pressed on the keyboard, **PAINTING 1** will appear at the bottom of the screen. Hit **RETURN** and **PAINTING 1** will be displayed and run on the screen.

To display the other **PAINTING** designs, press **P** and the number 2, 3, 4, 5, or 6 key, then hit **RETURN** . The **CLEAR** and **ERASE** commands both eliminate **PAINTING** designs from the computer's memory.

PAINTING designs, as well as **DRAWING, QUAD DRAWING,** and **LIFE** designs or patterns may be displayed on the screen simultaneously. In other words, if you do not **ERASE** a design from the screen, it will appear again whenever you **START** another design or pattern.

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