The Arcade Machine

Create your own arcade games.
No programming knowledge necessary.
For ATARI computers

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THE ARCADE MACHINE™

Atari Disk Version

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Tanks to Marty and Corey

I.
INTRODUCTION

If you have ever wished that you could design and program your own fast action arcade game but been stopped because you didn't have the programming background, then the Brøderbund Arcade Machine was built for you! The Arcade Machine and this manual will guide you step by step through the process of designing and producing your own arcade games. It will still take patience, concentration and a creative eye, but YOU DON'T HAVE TO KNOW HOW TO PROGRAM!

Even better, you are going to be able to learn each part of arcade game design and try it out in a completed arcade game instantly! You can try your hand at animation and see it on the screen two seconds later! The Arcade Machine was designed as a teaching tool as well as a creativity aid that offers quick feedback at every step of the way. Minutes after you start reading this manual you will be able to play an arcade game that has elements of your own unique design.

Ultimately, your finished games will include:

- 5 different levels of play
- Dozens of animated shapes, creatures and objects of your own design moving along "paths" you've created
- Colorful, detailed backgrounds drawn by you
- Your own arcade-style sound effects
- Scoring, rules and game options all selected by you
- A custom title page with your name and game title in large letters

- All of this on a fast-loading, professional quality "auto-boot" disk.

The Arcade Machine is not entirely free-form. However, it is extraordinarily flexible and will permit the creation of a truly astonishing variety of different games—new versions of your old favorites as well as wholly original games.

As you gain familiarity with the different options available to you and the variety of ways in which they may be used, your ability to create more and more complex and original games will grow as well.

To get you started, the Arcade Machine comes with four sample games on the flip side of the disk, as well as a test game that automatically loads into memory when you start to use the program. As you practice using the different parts of the Arcade Machine, you may find it useful to try modifying parts of the test game or the other sample games rather than designing a new game from scratch. Once you are comfortable with all of the functions, of course, there is nothing to keep you from creating games that are entirely new and original.

USING THIS MANUAL

This manual is divided into five major sections:

I. Introduction

II. Getting Started

III. Overview

IV. The Arcade Machine: Feature by Feature

V. Reference.

"Getting Started" explains how to load the program into memory and how to start playing the four sample games.

"Overview" describes how the Arcade Machine is organized, how to move from feature to feature, and how to quickly modify the test game to make it your own. Its purpose it to help you jump in and get your feet wet right away. It also describes the steps involved in designing a game.

"The Arcade Machine: Feature by Feature" then guides you through the entire program in detail. It is suggested that you complete "Getting Started" and "Overview" before moving on to this tutorial/reference section.

Finally, "Reference" materials include a glossary, a quick reference summary, and an index of functions. The purpose of these materials is to give you easy access to all of the detailed information in the previous sections.

HELPFUL HINT

Once you have a feel for the structure of the Arcade Machine, it is perfectly all right to jump around, experiment and explore the program and this manual in whatever order seems most interesting to you. If you find yourself lost or confused, however, it is recommended that you backtrack and approach it in the order presented. Many functions are interrelated and must be used in harmony with each other.

Now, without any delay, let's begin!

II.
GETTING STARTED

WHAT YOU WILL NEED

- Atari 400/800 or XL-series computer with at least 48K memory
- Disk drive
- Joystick (in controller jack 1)
- TV or monitor (preferably color)
- Blank disk(s) for saving your creations

LOADING THE PROGRAM

The Arcade Machine loads into memory the same way you load (or "boot") any Brøderbund disk:

1. Turn off the computer. Remove any cartridges.
2. Turn on the disk drive and wait for the red busy light to go off.
3. Insert Arcade Machine disk, label side up. Close disk drive door.
4. Turn on TV or monitor.
5. Turn on the computer. When loading is complete, a test game will appear on the screen.

LOADING THE SAMPLE GAMES

There are four sample games on the flip side of the disk. Each of these games was created using the Arcade Machine, and playing them is an excellent way to start getting acquainted with the program.

If you would like to play one of these sample games, you must first load the Arcade Machine program into memory. Follow these steps:

1. Start up the front side of the Arcade Machine disk, as outlined above in "Loading the Program." Starting the reverse side by itself will NOT work.

2. With the test game (aliens moving) on the screen, press RETURN. The Arcade Machine's "Main Menu" will appear:

3. PRESS KEY 6 to select "Load/Save Game." The computer will load more information from disk, and a list of "Load/Save Game" options will appear:

LOAD/SAVE GAME

(1) LOAD GAME

(2) SAVE GAME

(3) LOAD SHAPES

(4) LOAD BACKGROUND

(5) FORMAT GAME DISK

(6) RETURN TO MAIN MENU

4. Press "1" to "Load Game." You will then see this message on the screen:

PLEASE TAKE OUT THE ARCADE MACHINE MASTER DISKETTE AND INSERT YOUR GAME DISKETTE. PRESS (SPACEBAR) TO CONTINUE OR ANY OTHER KEY TO RETURN TO MENU

5. Follow these instructions by removing the Arcade Machine disk from the drive and turning it over. Put the disk back in, label side down, and close the drive door. Press the spacebar.

6. A list of the four sample games will appear. Press the appropriate number key (1-4) to select the game that you want.

7. When the "Load/Save Game" screen reappears, PRESS "RETURN" THREE TIMES TO GET TO THE GAME ITSELF. (Don't worry about any menu screens you pass by as you do this.) Use your joystick to play.

To load a different sample game, press RETURN to go back to the "Main Menu." Then repeat steps 3 - 7 above, except this time you needn't turn the disk over in step 5 since it is already turned over.

When you are through playing sample games and are ready to explore the Arcade Machine's game design features, remove the disk from the disk drive and put it back in, label side up. Press RETURN to call up the Main Menu.

If, after you have already loaded another game, you want to return to the original test game ("aliens"), you must turn off the computer and restart your system (see "Loading the Program").

III.
OVERVIEW

THE ARCADE MACHINE—ORGANIZATION

The Arcade Machine is actually a collection of programs designed to work together to give you everything you need to create your own arcade games—with no programming knowledge required. These Arcade Machine programs include:

- A Shape Creator—to let you design and animate creatures, objects and shapes
- A Path Creator—to let you direct your shapes on the screen
- A Background Creator—to let you "draw" and "paint" your own game boards, backgrounds and title pages
- A Sound Synthesizer—to let you generate customized sound effects
- Game and Level Option Programs—to let you control every aspect of game play
- Load/Save/Create Game Disk Programs—to let you save work-in-progress and to create a library of original games.

All of these features are built into the Arcade Machine, and your gateway to each of them is the Arcade Machine's "Main Menu."

THE MAIN MENU

To get the Main Menu, start up the Arcade Machine program, if you haven't done so already (see "Loading the Program"). When the

test game appears on the screen (or a sample game, if you are playing one), press RETURN. The Main Menu will appear, looking like this:

This "Main Menu," or list of main options, lets you call up each of the principal programs in the Arcade Machine with the touch of a key. To select an item, simply press the number key (1-8) that corresponds to that item. The appropriate program will quickly load into memory from disk.

Choosing any of the items from the Main Menu simply leads you to a more detailed, more specific menu for each function. And that, in turn, branches to more detail. (If you've already loaded sample games in the previous section, you've seen how this "branching" organization works.)

To get back from any of these branches, just press RETURN one or more times, once for each "step" that you want to return.

RUN GAME

One of the most important functions of the Main Menu is listed at the very end—"RUN GAME." You can test your efforts and get "instant feedback" at almost any point by typing "8" to run the game

(pressing RETURN is equally effective). Running the game does not create a disk *or* do anything at all permanent. It just lets you see how things are progressing. It's perfectly safe. In fact, try it right now, and then press RETURN to get back to the Main Menu.

HELPFUL HINT

No matter where you are in the Arcade Machine, you can almost always return to the Main Menu by pressing RETURN repeatedly. If you ever get lost, just press RETURN until you find your way back to the Main Menu. Pressing RETURN once more will run the game that's in memory.

MODIFYING THE TEST GAME

To give you some immediate practice using the Arcade Machine and to better acquaint you with its branching "menu" structure, let's make a few quick changes to the "aliens" test game. This exercise will also let you witness first-hand the "instant feedback" possible with the Arcade Machine.

NOTE: Don't look in this section for detailed explanations of all available options. Such explanations are reserved for Chapter IV, "The Arcade Machine: Feature by Feature." This is merely an introductory, "cookbook" exercise. (In Chapter IV we will take this test game much further, modifying it part by part to learn how every feature of the Arcade Machine works.)

EXERCISE: Quickly Modifying the Test Game

1. If the "aliens" test game is not up on the screen, bring it up by pressing RETURN until it appears. Or restart the disk. Play the game for a moment using joystick control.
2. When you're ready to start modifying the game, press RETURN to see the Main Menu.
3. Select "4" for "Level Options." The Level Options program will load and a "Level Options" menu will appear. Press "2" for "Miscellaneous." A number of options will appear.

4. Press "5" for "Steerable Missiles." Press "Y" five times (once for each level).

5. Do the same for item "8" — "Barriers for Bottom Tank?", pressing "Y" five times.

6. Now for the instant feedback! Press RETURN three times to return to the game. Do you notice a difference? Try using your steerable missiles!

7. Let's try some more changes. Press RETURN to go back to the Main Menu. This time select 'Game Options' ("3"). The "Game Options" program will load and the "Game Options" menu will appear. Press "1" for "Main Options."

8. Alter the following "Main Options" by pressing the corresponding number keys and then answering the questions on the screen:

   (8) — NUMBER OF BARRIERS? (Answer 3)

   (9) — RANDOM OBJECT BOMBING (Answer "2" for now, unless you prefer some other number.)

9. Press RETURN 3 times to go back to the game. There are now three barriers on the screen and aliens are dropping bombs on your player!

10. Is the game still too easy? Go back to the Main Menu (by pressing RETURN) then select "Level Options" ("4") again. Choose "Miscellaneous" ("2"). Select item "7"—"Smart Bombs?", and press "Y" five times.

11. Return to the game (by pressing RETURN three times). Now you're really facing a challenge!

You can experiment with other Game and Level Options if you want. Some are self-explanatory, others are not. Don't expect everything you try to work or make sense at this point. A number of these options must be used in conjunction with other Arcade Machine features to work.

You may also load one of the four sample games into memory and modify it in a similar way, using some of these options you now know about.

Bear in mind that this test game is merely the tip of the iceberg. The games you create need not bear any resemblance to this one. Every shape can be different and constantly changing. Each can move independently on the screen. Your player, too, can be made to move anywhere on the screen. The possibilities are virtually endless. As you'll soon discover . . .

CREATING YOUR OWN ARCADE MACHINE GAMES

As with almost every creative endeavor, there isn't an exact set of steps to be followed to create a game. In general, however, the process can be broken down into the following stages:

HELPFUL HINT

HOW TO CREATE AN ARCADE MACHINE GAME

1. Use the Shape Creator to design the shapes, creatures and objects in your game.
2. Use the Background Creator to design the background upon which they will move.
3. Use the Path Creator to define the exact movements of your shapes on the background.
4. Select Game and Level Options to maximize game play.
5. Create sound effects using the Game Options program.
6. Adjust, modify and improve all of the above, as desired.
7. When everything is the way that you want it, use the Background/Title Creator to create your title page.
8. Combine all of the above elements in a finished game disk using the Create Game Disk function.

To repeat, despite the above outline, there is no "best" or "correct" way to go about designing your games. You could just as well design your backgrounds first and make your "shapes" later. What's more, you can go back anytime to add additional features, options and shapes or to undo what you've already done.

Because of this flexibility and freedom, each game you create will be a unique case. For this reason too, the arrangement of programs in the Main Menu (and in Chapter IV of this manual) is in some respects arbitrary.

The only feature that must be left until last is designing your title page (see pp. 30 and 75).

The beauty of the Arcade Machine is that for the most part you're free to work on whatever aspect of your game that's of interest to you, when it's of interest to you.

In practice, you'll find yourself going back and forth between functions quite often, testing how the various parts of your game are working together. Making additions and corrections, you'll build your game layer by layer, detail by detail, feature by feature until you're ready to create your title page and generate your finished game disk.

Also, at every stage, you'll be able to save your game to disk "as is," so you don't have to worry about completing everything at one sitting. You can just load it back into memory later when you're ready to resume ("Load/Save Game," p. 73).

The important thing, of course, is that you continue to learn, to create and have fun. Now, let's look at the Arcade Machine feature by feature in detail . . .

IV.
THE ARCADE MACHINE: FEATURE BY FEATURE

OVERVIEW

This section is arranged much like the Arcade Machine's "Main Menu," though not identically. The emphasis here is on function and the creative tasks you will perform in the process of designing your games:

CREATING SHAPES 17

CREATING BACKGROUNDS/TITLE PAGES 30

MAKING SHAPES MOVE 40

USING SOUND EFFECTS 50

USING COLOR 54

USING GAME OPTIONS 55

USING LEVEL OPTIONS 62

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CREATING A GAME DISK 75

To illustrate each of these functions, we will use the Arcade Machine's test game ("aliens") as our example and modify it part by part to learn how the various features of the Arcade Machine work. After each modification you will be able to return to the Main Menu and examine your progress by running the modified game. When you are comfortable using these features you can then go on to use them creatively in designing your own games.

HELPFUL HINT

Before beginning this tutorial, it is a good idea to restore the Arcade Machine test game to its original, unmodified condition. Do this by turning off your computer and restarting. When the test game appears, press RETURN to call up the Main Menu. That done, you are ready to begin!

CREATING SHAPES

In this section you will learn how to use the "SHAPE CREATOR" program to:

- Design the moving objects in your game—"enemies," players and explosions
- Animate them
- Color them (if you have a color TV or monitor)
- Decide how many shapes and objects you will use at each level of play
- Decide which shapes and objects you will use at each level
- Decide what size they will be.

First we must call up the Shape Creator program, the first routine on the Main Menu. With the Main Menu on the screen, type "1." The Shape Creator will load into memory and the Shape Creator menu will appear:

If you type "3" right now or press RETURN you will flip back to the Main Menu. Press "1" instead and you should see something like this:

ARCADE MACHINE OBJECT SET-UP

BLOCK 1 (SML)	BLOCK 2 (SML)	BLOCK 3 (SML)	BLOCK 4 (SML)
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6

(1) SHAPES
(2) EXPLOSIONS
(3) TANKS
(4) TANK EXPLOSION
(5) RETURN TO MENU

(WARNING: Don't be put off by the columns of numbers. Actually, they're here to help you, not hinder you, as you will see in the paragraphs that follow.)

Definitions:

First, let's define some of the terms introduced in the Object Set-Up screen above:

"Shapes" are the objects that aren't controlled by the players. We might just as easily have called them the "aliens" or the "enemy." Instead we just called them "shapes."

"Explosions" refers to what happens when a "shape" and a missile try to occupy the same space at the same time.

"Tanks" are the objects controlled by you, the game player. (It's plural because the Arcade Machine can generate either one- or two-player games.)

Number of Shapes and How They are Organized

Each arcade game you create can include as many as 24 different enemy shapes on the screen, depending on their size. (The larger the shapes, the fewer the number.)

For ease of reference, these shapes are organized in four groups called "blocks," and each block consists of 6 small objects, or 3 medium-sized objects, or 2 large objects, like this:

SML MED LRG

Our sample game has all four blocks set to small, and that is why the top half of your TV screen now has four columns (one for each block) on it, each with six numbers in it. As you can see, in the parentheses, under each block heading, the blocks in our test game are set to small size (SML), and each has 6 objects.

If you go back to the test game and look at it, you will see that there are 18 aliens marching around on the screen.

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This is 3 blocks of 6 aliens each. (Note: The fourth block of 6 aliens is not being used in this game, though it easily could be.) The fact that the upper six aliens are not lined up in a single row like the lower two blocks of 6 aliens isn't important. This just happens to be the way they're set up in this particular game. (In fact, the screen position and movement of each individual shape is completely controllable by you, as we'll see later.)

The important thing to remember now is that there are up to 24 different shapes allowable in a game (depending on the size of the shapes) and that for organizational purposes, these shapes happen to be grouped in four numbered "blocks." To call up or create any particular shape, you must refer to it first by block number (1-4) and then by the shape number within that block.

To illustrate this, let's look at one of the shapes in Block 1 of our sample game. Press "1" to indicate that we want to edit a shape. The screen will then say:

Answer by typing "1." The next prompt is:

Type "1" again.

The screen will clear and then four little numbered images will appear at the top of the screen. Like this:

At the bottom you will see a square filled with a pattern of smaller square dots. If you look at the dots from a distance, you may notice that they represent an enlargement of the first of the four images.

It is important that you understand why there are four images of an alien on the screen right now, even though we are examining only one particular "shape" in one block of shapes. It is because the Arcade Machine lets you animate every shape that you use.

How Animation Works

Animation is created by rapidly substituting one picture for another, producing the illusion of one continuous motion. One of the easiest ways to animate a shape on the Atari is to substitute nearly identifical images of a shape for one another as an object moves across the screen. Therefore, the Arcade Machine lets you create four slightly different images of the same object. When the arcade game is run, it will display them one after another as the object moves on the screen.

(Technical Note: it is actually the horizontal position of the shape that determines which of the four images is drawn. If the object is plotted starting on the first vertical line on the screen, then the first image

is used; if it is plotted starting on the third vertical line, then the third image is used. After the fourth image has been used, it starts over again with the first image, and so on.)

If you examine the four images of Block 1/Shape 1 closely you may notice that some of them differ slightly from one another—if you recognize the shape from the sample game, you may remember that some part of the object wiggled as it crossed the screen. Or go back and look at it if you like (you will find yourself watching the test game if you press RETURN five times in a row); you should be able to find your way back here when you're done.

Another way of observing how Arcade Machine animation works is to freeze game play by pressing the ESC key while the game is running. Then press ESC repeatedly to step through the game frame by frame. To resume action press the spacebar.

Drawing A Shape

Now let's erase the existing shape and try drawing one of our own. Type "E" (for "Erase"). At the bottom of the screen it should say:

The large square at the bottom of the screen is considered image "5." However, since we want to erase everything, type "A." All of the images will disappear. Only the flashing cursors remain.

Moving the Shape Editor "Cursor"

You can move the shape editor cursor with the joystick or with the I-J-K-M keys on the keyboard. You can plot a dot in any position by pressing the joystick fire button or the "F" key on the keyboard. Pressing "D" (for Delete) will erase an unwanted dot. Now try it. Using keyboard or joystick control, try drawing a horizontal line. Your line should appear as part of all four images as well as in the square at the bottom. You may draw any shape that you want by plotting dots in this manner.

Adding Color to Shapes

If you're using a color TV or monitor, you may also add color when drawing your shapes.

The Arcade Machine uses the Atari computer's four different "color registers." These are like four different cans of magical paint, and their "colors" are called:

Color 1

Color 2

Color 3

Color 0

The reason we call them "magical" will be explained later (in "Creating Background/Title Pages," p. 35 . For now you just need to know that you have four color choices, and you may use these four "colors" when drawing your shapes.

Press "C" repeatedly to cycle through these four different color registers. You'll notice that the frame surrounding the enlarged square changes color each time you press "C." Color 0 makes the frame "disappear" because it is the same color as the background (color 0). The small squares or "dots" you plot using keyboard or joystick control will be the same color as the surrounding frame. You can use any or all of the colors. Just press "C" until the color you want to use in your shape appears in the frame. Then any dots that you plot will be drawn in that color.

Creating Animation

Now let's erase all of those lines and colors and get down to some serious work. Let's start by working on a very simple flip-flop, two-image shape. Press keys "2" and "4." These digits will disappear from the screen, and when we start to draw, we'll only be drawing to images "1" and "3." Now draw your best little alien. (If you want to practice on paper first, there is a worksheet provided that has just the right number of horizontal and vertical lines. You might want to make some extra copies of these forms for use later.)

Here are some variations of aliens. Now draw one of your own:

When you're done, press all of the keys from "1" through "4." The numbers that were on will go off, and the ones that were off will go on. You can erase all of the dots in the square by typing "E5" or you can use them as a reference as you draw the second image of your shape. Be sure to make some part of it different from the first image. If you put arms on your alien, draw them in a "down" position in the first set of pictures and in an "up" position in the second set.

Another command that may prove useful at this point is T for Transfer. You can transfer any of the five images to any other image by typing "T," then the source image, then the destination image.

Let's go see how we're doing. Press RETURN and the following line will appear:

SAVE SHAPE TO MEMORY? (Y/N)

If you are so disappointed in your efforts that you want to throw all of your work away, type "N." If you have already saved your work previously and just want to admire it, you can also type "N" or

RETURN when you leave. If you are saving it for the first time, type "Y." Next you will see:

SHAPE? (1-6)

This is where you decide which of the six shapes in the block you want to replace with your new shape. Since we are only using shapes #1 & #2 in the program, type either "1" or "2." Then press RETURN three times. There's your shape, in with all the others, wiggling across the screen!

By the way, in this example we used only two images and flip-flopped between them. However, if you like, all four images can be different, so very complex animation is possible. You will even learn later how to link shapes together so that more than 4 images can be displayed through use of the Shape Change command in the Path Creator.

"Shapes" Versus "Objects"

Let's digress for a moment to discuss the difference between shapes and objects. Each block can store up to six different shapes in memory. Each block ALSO controls up to six different "objects" on the screen. Think of the shapes as masks and objects as actors. Each actor, before he goes onto the stage, must select a mask to wear. There are multiple copies of each mask so, if they like, all six of the actors in a block could choose to wear the same mask, in which case the other five masks would just sit in the dressing room drawer, gathering dust and waiting for their moment to strut and fret upon the stage. By the same token, an object, in moving about on the screen, can "put on" different masks ("shapes") at different times. For instance, if a small object appears in the distance it can be made to look larger and more detailed as it gets "closer " by having it "put on" increasingly larger and more detailed masks ("shapes") at different points along its trajectory. For the time being, let's just try replacing ALL of the objects in this block with the shape that you just drew.

Return to the Shape Creator in the usual manner, requesting your shape to be displayed upon the editor (Block 1, Shape 1). When all

five images are on the screen in front of you once again, press "W." W is the command to "write" a shape, and you can write it to any of the shapes in the block. Transfer your shape to both 1 and 2 by typing "W1," "W2." Then go take another look at the game. Not bad, eh?

Caution: The "W" command erases and replaces in memory any shape that is addressed. It does not automatically put your shape into play. (Remember that only Shapes 1 and 2 in Blocks 1, 2 and 3 are used in this sample game, so write to Shape 1 or 2 in order to affect the sample game).

This diagram shows how shapes are being used in this particular sample program:

Block 3			(1)	(2)		
		(1)	(2)	(1)	(2)	
Block 2	(1)	(2)	(1)	(2)	(1)	(2)
Block 1	(1)	(2)	(1)	(2)	(1)	(2)

Shapes are represented in parentheses by their corresponding number, i.e. the bottom row consists of Shapes 1 and 2 from Block 1.

Designing Explosions

Although we have only talked about drawing shapes so far, drawing explosions is not very different. The same Shape Creator commands are available to you. There are a few small differences:

If, from the Object Set-Up screen of the Shape Creator, you decide to draw explosions (choice "2") you will be asked: EXPLOSIONS? (S,M,L). If the alien shapes are small (as all of ours have been to date), then type "S." The computer actually keeps in memory three sets of explosions, one for each size object. If your game uses only small objects, then the medium sized and large explosions are never used (although you can feel free to edit them if you like). Each size has two shapes and during an explosion flips rapidly between them.

The explosion animation differs from the animation produced in the Shapes in Blocks 1 through 4. Because an explosion does not move on the screen but remains in one place, its motion is caused by flip-flopping between two images rather than running through a progres-

sion of 4 images as in the case of Shapes. Your explosion then will only include two images from any of your 4 pairs of explosion images:

Shape #1 . . .	(1)	(2)	(3)	(4)
Shape #2 . . .	(1)	(2)	(3)	(4)

You can actually produce 4 different looking explosions for each shape size. Which pair is used will depend on where your shape is when it is hit.

Designing "Tanks"

If you are drawing tanks, you will be asked: TANK? (T)OP or (B)OTTOM? If you are creating a two-player game, then you will have to create a tank for each player. The "drawing" techniques are the same as those used for drawing shapes. The only difference is that tanks (unlike shapes and explosions) are always one size.

Turning Shapes and Blocks On and Off

The Shape Creator lets you control how many, which, and what size objects shall appear at each of the five different levels of your game. These factors are controlled using Part 2 of the Shape Creator—called "BLOCK/OBJECT STATUS."

Let's enter this part of the program by typing a "2" from the Shape Creator menu. The top part of the screen will look like this:

ARCADE MACHINE OBJECT SETUP
LEVEL 1

BLOCK1	BLOCK2	BLOCK3	BLOCK4
(SML)	(SML)	(SML)	(SML)
1 ON	1 ON	1 ON	1 OFF
2 ON	2 ON	2 ON	2 OFF
3 ON	3 ON	3 ON	3 OFF
4 ON	4 ON	4 ON	4 OFF
5 ON	5 ON	5 ON	5 OFF
6 ON	6 ON	6 ON	6 OFF

(L)EVEL, (B)LK STATUS, (O)BJECT ON/OFF

You will recognize the familiar test game arrangement of 4 blocks of 6 objects each. You may use as many or as few of these 24 potential objects as you like in each level of your game. The purpose of this screen is to summarize the current object status at each level.

Pressing "L" permits you to display the current set-up for the level you want and then change it if you like. Press "L" several times to see how this works.

Pressing "B" lets you change the size of the objects in one of the blocks or turn on/off the entire block. IMPORTANT: Blocks turned on/off in this way will remain on/off for all 5 levels of play. If you want to have a block's on/off status vary from level to level, you must make these changes on an individual, object-by-object basis rather than a block at a time.

To change a block of shapes, type B. You will then see:

BLOCK? (1-4)

Type the number of the block you want to affect (try typing a 1 this time). Next you will be asked:

BLOCK ON? (Y/N)

If you look at the top of the screen, you will see that the first three blocks are all turned on right now. The fourth block is turned off. (That's why our test game shows only 18 objects, not the full 24.) Just to see what happens, try turning Block 1 off and then run back to the game and see what is missing (this is one way to find out which six objects were included in Block 1). Then come back here and turn the block back on.

Choosing The Size of Your Shapes

Next, part 2 of the Shape Creator program will ask you:

```
SIZE? (S,M,L)
```

The only shapes that come in different sizes are the alien shapes (and the explosions that go with them).

Right now Block 1 contains 6 small objects. Just as an experiment, type "L." The column of numbers under Block 1 will shorten to just two numbers. As you recall, a block of data can be interpreted as 6 little objects, 3 medium objects, or 2 large objects. If you want to see what your two large objects look like, hit RETURN until you come to the game. Not very impressive, are they? You will have to go to Function 1: Create/Edit Shapes and draw a couple of new shapes, large size, to clean up what you see on the screen. (And even then the 2 shapes would be positioned too close to one another to look good on the screen. You would have to modify their starting positions, which we'll get to in "Using Level Options," p. 62)

REMEMBER, YOU CAN'T CHANGE THE SIZE OF YOUR SHAPE AFTER YOU'VE DRAWN IT. TO DRAW A SMALL, MEDIUM OR LARGE SHAPE, YOU MUST SELECT THE SIZE FIRST, USING PART 2 OF THE SHAPE CREATOR, THEN USE PART 1 TO DRAW THE SHAPE.

That's about all there is to the Shape Creator. Even if you never used another part of the Arcade Machine, this section could permit endless studies of computer graphic design and animation techniques. But we're sure you won't want to stop here . . .

HELPFUL HINT

It might be a good idea, before continuing, to boot the Arcade Machine again. We have played around with the shapes some, and the sample game probably isn't what it once was.

CREATING BACKGROUNDS

In this section you will learn how to use the "BACKGROUND/ TITLE CREATOR" program to:

- Use your TV or monitor screen as an artist's canvas to create a background (and title screen) for your game
- Draw lines, circles, rectangles and triangles "automatically"
- Use the Arcade Machine's three different drawing "modes"
- Select background colors
- Automatically fill in empty spaces with colors and patterns
- Type large text lettering.

To perform these tasks, call up the "BKGD/TITLE CREATOR" program from the Main Menu. Press "5" and you will see:

NOTE: The reason we've jumped right away to function 5 of the Main Menu is that you may work on your background throughout the game development process—and because the Background Creator is so much fun to use in its own right. The reason this function is placed near the end of the Main Menu (Function 5) is because one of its key uses, creating a title page, must ALWAYS remain the last step you perform before creating a game disk.

Press "1" now to enter the background drawing routine of the Background Creator. The screen will clear and in the center of the screen you will see a flashing crosshair. This screen is your "canvas."

The crosshair is your "brush." Along the bottom of the screen, you will see:

X = 80	Y = 80	COLR1
XO = 80	YO = 80	PLOT

These letters and numbers convey information that's useful to you, as we'll explain in a moment. But first, let's look at the crosshair.

Moving the Crosshair

All drawing is done with the crosshair, which can be moved around the screen in two ways—by keyboard control or by using a joystick.

To move the crosshair with the keyboard, use the "diamond" made up of the I-J-K-M keys to move in the four directions: up-left-right-down. The crosshair will hop nine dots in a particular direction each time you press one of these four keys. If you would like to move in smaller jumps, just press one of the number keys from 1 to 8 to set the size of the hop.

If you prefer to use a joystick, just plug it into controller jack #1. You can then move the crosshair in any of the joystick's eight directions. When you use the joystick to move the crosshair in this way, you automatically set the hop of the keyboard control to 1. This makes it easy for you to use your joystick for large moves and the keyboard for "fine tuning."

X and Y Coordinates

Note that the X and Y values displayed at the bottom of the screen change each time you move the crosshair. The screen is composed of dots: 160 dots wide and 192 dots high (although the top eight lines of the screen are restricted.). The X value tells the horizontal position of the crosshair. The Y value tells the vertical position:

Keeping track of these X's and Y's is useful in making ends meet (i.e., making the ends of lines meet) and X0 and Y0 are used as references to help you do this, as we'll see in a minute.

The Three Drawing Modes

There are three different drawing modes in the Arcade Machine—PLOT, LINE and BAND. When you first enter the Background Creator, you begin automatically in PLOT mode. The drawing mode currently in use (in this case PLOT) is indicated at the lower right corner of the screen. You can change from one mode to the next by pressing the Atari insignia key" JIL "on Atari 400/800 computers or the "◢" key on Atari XL computers. To see how this works, press it three times until you come back to PLOT mode again.

Using "Plot Mode" to Draw Lines

PLOT mode is just one method of plotting points and drawing lines with the Arcade Machine.

To see how to use PLOT mode, use keyboard control for the time being. Press the spacebar. A small dot should appear in the center of the flashing crosshair, and the values of X0 and Y0 will be reset to the current values of X and Y. Remember, X and Y are the coordinates of the crosshair. X0 and Y0 are used to keep track of the last time you pressed the spacebar when plotting a point.

(If you are using your joystick to plot points, you should press the fire button instead of the spacebar.)

Now move the cursor up and to the right. Press the "/" key (for "line"). A line will be drawn from the first position to the new crosshair position. Move the crosshair again and the type "/" again. The line will be drawn from the first coordinate (X0, Y0) to the current coordinate (X,Y). To set a new starting point, press the spacebar again (or press the joystick fire button). You can draw lines anywhere on the screen in this manner.

Using "Line Mode" To Draw Lines

A second drawing mode is "LINE" mode, which lets you draw lines continuously without resetting your starting point each time. Press the "JIL"or "◢" key once to shift to this mode. Note that the mode indicator at the lower right corner of the screen changes from PLOT to LINE when you do this.

Now whenever you plot a point (by pressing the spacebar or the joystick fire button) you will get a line from the last point to this new point automatically. Try it. Pressing ESC allows you to start a new starting coordinate.

Using "Band Mode" To Draw Lines

The third drawing mode lets you actually try a line on for size, so to speak. To see how this works, press the "⅃⅃"or "◪" key once more until BAND appears at the lower right of the screen.

In BAND mode, you plot a point by pressing the "/" key right away (rather than pressing the spacebar or fire button first as in PLOT and LINE modes). Now move the crosshair away to a different position. You should see a flashing line being drawn from the starting point and stretched to wherever you move the crosshair. This "rubber band" effect lets you see what your lines will look like before you actually plot them. If you want this band line to become permanent, just set its end point by pressing the spacebar or joystick button. If you wish to cancel the line while it is still flashing, press the ESC key and it will disappear. To get back into PLOT mode, press the "⅃⅃"or "◪" key.

Freestyle Drawing

A fourth method of drawing can be used from within any of the three drawing modes already described. (It doesn't have a mode name all its own.) This fourth method lets you use your joystick to draw continuously with freestyle lines as if you were using a pencil or pen.

To enter this function, simply press CTRL-S. Then, for as long as you hold down the joystick button while you move the crosshair around, a continuous line will be drawn on the screen. To turn off this feature, press CTRL-S again. Try using this freestyle drawing method.

You can tell you are in this CTRL-S mode when the clicking sound you normally hear when plotting a point is no longer audible. It is a good idea to turn off this feature when it isn't in use as it can interfere with some of the functions described in the next section.

Drawing Geometric Shapes "Automatically"

Using the PLOT mode described above, you may also draw circles, triangles and rectangles "automatically." These shapes can be line drawings or solids or "shaded."

First, be sure you're in PLOT mode. (Press the "JIL" or "◪" key until PLOT appears at the lower right of the screen if it's not there already.)

To draw a circle, plot a point (by pressing spacebar or joystick button) where you want the circle's center to be. Then move the crosshair to a point on the outer edge of the circle and press "O." The circle will be drawn automatically. To create a filled circle, follow the same steps but press "CTRL-O," instead of "O."

To draw rectangles in a like manner, first set one corner by pressing the spacebar or joystick button, then go to the diagonal corner and press "R" or "CTRL-R."

To draw triangles, you must first set two corners by pressing the spacebar or joystick button when the crosshair is positioned at each of them and then move the crosshair to the third. Then press "T" for a triangle or "CTRL-T" for a filled triangle. Try making all of these shapes. (Note: If you have trouble making triangles, make sure the "Freestyle Drawing" CTRL-S feature is turned off. CTRL-S interferes with this function.) Pressing ESC terminates the drawing with a triangle in mid-draw.

Again, you may use all of these features in PLOT mode.

In LINE mode, however, you may only make circles, not rectangles or triangles. (Of course, you can always draw them "manually" a line at a time, if you want.)

To create "shaded" figures, press the "JIL" or "◪" key until BAND appears at the lower right of the screen. In BAND mode, you may draw filled circles and triangles with interesting shaded effects. Rectangles appear as normal, though transparent, solids, if drawn over existing images. Use "CTRL-0" to draw circles and "CTRL-T" to draw triangles, as above. See the difference BAND mode makes?

In BAND mode, you may also "undraw" background shapes just

drawn by retyping the same command (O, T, R, CTRL-0, CTRL-T, CTRL-R) as soon as it's drawn. Try it.

Are you beginning to get a sense of the versatility and power of the Background Creator?

Using Color

So far, we have only used one color. Remember, the Atari computer uses four different "color registers," and we can make use of them all (of course, it helps to have a color TV or monitor!) These color registers are not absolute colors, and because of this you have a lot of control over color, as we'll explain in a moment.

You can think of these four different color registers as four separate paint containers (numbered 0, 1, 2 and 3) that can hold any four colors of paint. Even better, the paint can be changed by "remote control" even after it's painted!

First we will use the four colors that are immediately available. (Up until now we've been using COLR1 only.) You can change the color register you are using by typing "C." The COLR1 at the bottom right of the screen will change to COLR2, indicating we are now using paint can (i.e. "color register") number 2. Press "C" again to change to COLR3. As you can see, each time you press "C" you change color registers and the number of the color register in use is displayed on the screen.

Now try drawing some new lines and geometric forms using COLR2 and COLR3 instead of COLR1 as before. Then try using COLR 0. Notice that lines drawn using COLR0 don't show up against the background. That's because the background is already COLR0. To get back to COLR1, press "C" again.

Filling Empty Spaces With Colors & Patterns

By now you likely have a number of criss-crossing lines and shapes on the screen. You can fill any blank (COLR0 or background) space on the screen by moving the crosshair to the middle of the "blank" area and then pressing "F" (for "fill"). The area will fill automatically, to the best of the command's ability. If you don't like the particular color or pattern that appears, just press "F" again and it will unfill the area. "F" once more will fill it with the next of a sequence of colors and patterns. You may try out as many as you like until you move the crosshair again; once you move the crosshair, the pattern on the screen becomes permanent. Note: If an "odd" or irregular space doesn't fill in completely, reposition the crosshair over the remaining unfilled fragments and press "F" again. It will fill up the remaining spaces with the same color or pattern.

Adjusting Colors Already Painted

So far we have used the preset values of the color registers. All four of these values can be changed (and different!) for each level of your game. To make these changes you must leave the Background Creator by pressing RETURN until you are back in the game test mode (playing the game).

With the test game on the screen, type "C" repeatedly. One of the four color registers will change its color. Try typing "L" repeatedly. That same color register will change its brightness or luminescence. When you have that color register at a color and brightness you like (pressing "C" and/or "L" repeatedly), type "R" (for Register) and you will be working on the next color register. You can change the color setup for each of the five levels of play in your game. To switch levels just type the number of the level you wish to work on (1-5). Note: While actually in the Background/Title Creator you can type a shifted 1 through 5 to "bring in" the colors you have set up for each of the corresponding five levels.

Clearing the Screen

If you want to clear the screen or fill the screen with a certain color (which "clears" it by covering it over), type "C" until the correct color number is shown after COLR. Be sure to use COLR0 if you want to use

automatic "fill' routines later. Now type "CTRL-B" (for Background). You will be asked "Are you sure?" Answer "Y" if you don't mind erasing or covering over what you have on the screen. If you have the mode selector in BAND mode, you will get a switching of colors rather than a clearing.

Clearing the Text Window

If the text window at the bottom of the screen gets in your way, you can eliminate it by typing "CTRL-F" (For Full Screen). You can toggle the window back into view by pressing "CTRL-F" a second time.

Adding Text or Lettering

You may add large typed lettering to your backgrounds (and title pages) by shifting into text mode. To shift into text mode, position the crosshair approximately where you want your first letter of text to appear and then press "INSERT." A flashing cursor will appear where the first letter will print. Type using the letter and number keys.

To leave text mode, press "ESC."

To toggle between upper and lower case while in the text mode press the "CAPS/LOWR" key. (Sorry, shifted symbol keys cannot be used.)

To toggle inverse lettering on/off press the "JIL" or "◢" key.

To change color of lettering, exit by pressing "ESC," then change color register by pressing "C" and return to text mode to type in the new color.

To correct errors, remember that the backspace key doesn't work. Correct errors by exiting the text mode and redrawing the background color over the error. You may do this using small rectangles just large enough to cover the mistake.

For interesting 3-D lettering effects, try this: Before going into text mode, press "8" to set the keyboard cursor jumps to a setting that's equal to one screen letter wide. Then go into text mode and type your lettering. ESC to exit and press "J" to backspace over your letters. Then reset cursor movement to fine tuning by pressing "1" and move the cursor down and to the right slightly, one or two spaces. Change to

a different color (by pressing "C") and go back to text mode (INSERT) and retype the same words. You can use variations of this technique to add dramatic highlights to your title pages and backgrounds.

3-D

Creating "Bouncing Bomb" Backgrounds

COLR2 and COLR3 have special functions in the Arcade Machine. Function 1.6 under Game Options permits you to select BOUNCING BOMBS. With this option turned on, bombs will bounce off the sides of the screen. They will also reverse their vertical direction if they strike a background object drawn in COLR2 and will reverse their horizontal direction if they strike a background object drawn in COLR3. In other words, if you draw a box on the screen whose top and bottom are COLR3 and sides are COLR2 and if an object releases a bomb inside that box, the bomb will bounce around forever.

(Technical note: There is one qualification to this rule, quite a complicated one. In order for the Arcade Machine to recognize this color, the entire screen byte must be drawn in the same color. A screen byte is a horizontal row of four dots, starting at an X coordinate which is a multiple of four, plus 1 (in other words, 1, 5, 9, 13, 17 and so forth). This isn't much of a problem when you are drawing horizontal lines, since most of the middle part of a line is bound to be okay and only the bits at the end are a concern. But if you are trying to draw a vertical wall, it will have to be at least four dots wide, and it will have to fill a whole column of screen bytes. This means that your vertical lines will have to be thick for the bouncing-bombs function to work with them.)

HELPFUL HINT

Before going on to the next section of the tutorial, clear the screen by rebooting the disk or by covering it over with COLR0 (see "Clearing the Screen," p 36).

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MAKING SHAPES MOVE

In this section you will learn how to use the "PATH CREATOR" program in conjunction with the "GAME OPTIONS" and "LEVEL OPTIONS" programs to:

- Make your animated shapes move on the screen
- Plan and create different paths for different objects
- Control their relative speeds
- Tell objects when to drop "bombs"
- Make objects "mutate" or change shape as they move on the screen
- Disappear from the screen and return.

The Path Editor Screen

To use the Path Creator, type "2" from the Main Menu. The Path Editor screen will appear:

You will see two rectangles, one inside the other. In the center of the smaller rectangle you will see a small crosshair and, next to it, a little alien. Think of the smaller rectangle as representing the entire TV screen. The position of the crosshair in relation to this rectangle is the same as the position of the alien in relation to the actual screen. To understand this, try the following experiment: Press "K" three times. Each time you press "K" the crosshair moves to the right. However, the little alien moves even further to the right. When the crosshair reaches the edge of the inside rectangle, the alien should be disappearing off the edge of the screen. The alien moves across the screen exactly as he's seen during the game. The crosshair, however, moves relative to the diagram.

Creating Path Tables

What you are doing in the exercise above is constructing a "path table." Your computer is recording each move and storing this growing list of moves, step by step, in memory. Then, this list or "table" of moves can be called up later to be replayed anytime. Let's work with this some more.

Keep pressing the "K" key until the crosshair and alien wrap around to their initial position (if you aren't sure where that is, keep your eye on the X and Y coordinates in the lower left-hand corner of the screen; when the X equals 118 you are almost back where you started, and you won't be able to get any closer until you learn some other commands, so consider that good enough for the time being).

To end your path table type "E" for End (actually, paths never end; they just start over again at the beginning—so the path table you just wrote would work just as well if you only pressed "K" once before ending it). Then press RETURN enough times to get to the game and watch the aliens follow the new path you laid out for them. Around and around . . . But we can do better than that! Back to the Path Creator!

Understanding the Path Creator Text Window

Take a look at all the text at the bottom of the screen. The first thing you see is PATH NUMBER 1. You can create up to ten different path tables for your creatures to follow. Each path table can be up to

254 instructions long. This prompt is just to tell you which path table you are working on.

To the right of that you should see: PATH POINTER 1. The path pointer is designed to tell you how far along on your path the little alien is at that particular moment. Since your paths, with all their multitudes of instructions, can get very complex, it is important that you know exactly where you are at any particular moment (this is also the reason that your Arcade Machine comes with worksheets to help you lay out your paths—if you don't keep track of your efforts on paper, you may find it hard to find the precise spot where your path is fouling up).

To the right of the path pointer is: SPEED 1. It is not necessary that all of the creatures in your game move at the same speed, or even that a particular creature always move at the same speed. SPEED is an index. A speed index of "1" means that a creature on this path is going about the same speed as everyone else on all other paths. On the other hand, an index of "3" means that anything on this path will be moving a lot faster than shapes moving on part of a path that has a speed rating of "1." (If you give all of your paths a speed rating of 3, however, everything will move at exactly the same speed, and that speed will be precisely the same as if you had given all of the paths a speed rating of "1"—the numbers mean speed RELATIVE to the other objects on other paths.)

On the bottom line are four more important pieces of information. The X and Y values give you precise information about the location of your shape on the screen. The way they work is this: The X value tells you how far you are from the left side of the screen. An X value of 1 means that you are on the left edge. A value of 240 means that you are on the right edge. The Y tells you how far from the top of the screen you are. Again, these numbers run from 1 to 240.

The Relative Nature of Paths

The path table you just wrote, above, didn't say "Start at coordinate 120,120 and then go right 3 times." All it really said was, "Starting wherever you happen to be at the moment, go right three times." That's why all of the aliens moved to the right (since they were all on the same path) but moved in formation, not on top of one another

(since they all started from a different spot). We will talk about setting up the starting positions of your objects a little later. Right now let's just talk about how to move them.

How To Move Objects

To the right of the X and Y values at the bottom of the screen you will find the word LENGTH, followed by the number 14. LENGTH can be set to any value between 1 and 14. (We'll explain how in a minute.) This number represents the number of dots in a particular direction that a shape will move each time we press a direction key. For example, when we pressed "K," the alien took 14 steps to the right, since "K" is the direction key for right.

There are eight direction keys. At the bottom right-hand corner of the screen is a two-letter code representing the direction in which a shape is moving. If you call the direction toward the top of the screen North and toward the right East and so forth, the eight points of the compass are represented by the following keys:

Northwest	North	Northeast
U	I	O
West J		K East
N	M	
Southwest	South	Southeast

Try the following test. Re-enter the Path Creator (if you are in it right now, exit by pressing RETURN and then enter again). Now try to design a path that takes the shape in a circle, eventually returning to the point where it starts. Don't forget to type "E" to end the path. Then exit and take a look at the game. That's not so hard, is it?

Reviewing a Path Table

If you would like to examine your path table step by step, there is a procedure for single stepping through it. Return to the Path Creator and press the right arrow. Each time you press it, the path pointer will advance by 1 and the little alien will move in the manner indicated by the next command in the path table. If you would like to back up, you can use the left arrow. So if you made a mistake somewhere in the path table, you can step through it until you find the error and then enter the correct instructions from that point.

*

Using Numerical Path Commands

In addition to the command keys we have described so far, each of the ten numerical keys had a function. Here is a description of each:

"1" Set Path Number (1-10)—You can create up to 10 different paths. Use this to change the number of the path on which you wish to work. It is a good idea not to use PATH #1 for one of your permanent paths, since the program is automatically set to PATH #1 every time you enter the PATH NUMBER function.

"2" Set Path Pointer (1-254)—This allows you to jump directly to any point in a path table (much faster than pressing the arrow keys repeatedly to get there). However, the computer will not know the correct X and Y coordinate for the alien if you move to a point in your table this way; you will have to enter the information manually.

"3" Set X & Y Coordinates (1-240, 1-240)—You can use this command to set the coordinates of the alien on the screen; a setting of 120, 120 will put the shape back in the middle of the rectangle. This will not affect your actual path positions during game play, but is useful for aligning paths during set-up.

"4" Set Length (1-14)—Typing 4 will permit you to set the length of movement each directional keystroke will take you. Initially this is set to 14. If you type "K," for example, the alien shape will move 14 spaces to the right. (You will find that moving up and down always goes in multiples of 2; therefore, if length is set to 14 and you can move one keystroke downwards, the Y coordinate will change by 28. There's a reason for this. We just can't remember what it is.)

These four commands are editing commands. However, the next six digits actually insert commands into your path table, which are acted upon whenever an object following that path reaches the point where you inserted them.

"5" Drop Bomb—If you type 5, a marker will be left in your path. Whenever an object strikes that marker it will release a bomb. Whenever you give a DROP BOMB command you must follow it with a direction. Here are your choices:

*

Northwest U	North I	Northeast O
Randomly north J		K Randomly south
N Southwest	M South	Southeast

You can drop bombs "Up" because it is possible to construct two-player games where one of the player's tanks is at the top of the screen. If you type "5K," then each time an object reaches that point in the path table, it will release a bomb in a random downward direction.

"6" Set Speed (1-3)—You may wish objects to speed up at some point on a path. This command will permit you to make some parts of a path slow (1) and others faster (2 and 3). Remember, however, that these speeds are not absolutes but only in relation to the other objects, so if you gave all parts of all paths a rating of 3, objects would move no faster than if you gave them all identical ratings of 1.

"7" Shape Change—When an object strikes this marker it mutates to the next higher numbered shape in its block. For example, if it was shape #1, it will mutate to shape #2 (if it was shape #6 it will mutate back to shape #1).

"8" Jump To Another Path Table—This command must be followed by the number of the path to which the objects are expected to jump. When the jump occurs, the objects will jump to the beginning of the path table jumped to. If you then want to return to the former path table, inserting a CTRL-R will cause a return to the exact point of departure, plus 1. So, for example, if the tenth command in path #1 is JUMP TO PATH 2, then the next command that shape will execute will be the first command in Path 2. If Path 2 contains a CTRL-R (RETURN) command, when the shape hits that command it will return to the eleventh command in Path #1 and continue on from there.

"9" Delay (1-30)—This is an extremely valuable command. It permits an object to wait in one place while other objects perform up to 30 additional instructions. This can be particularly useful if you want one object to break away from a pack, perform some

independent actions, and then return to its previous position in the pack. Timing the return to the exact position in the pack can be a little difficult, and this command makes it much easier. Each cycle in the delay corresponds to 1 unit in length, so that if Object 1 has a delay of 10 cycles, Object 2 can move a length of 10 units in the same amount of time (or 10 lengths of 1 unit, etc.)

"0" Jump On Tank Position—This is what is known as a conditional jump. When an object is given this command, it compares its position on the screen with the tank at the bottom of the screen. If it is to the left of the tank, command will pass to the same position on the next higher numbered path table; if it is to the right, it will stay on the same path table.

If you learn no other commands, you can still write perfectly good path tables with these. However, the Arcade Machine does include a number of other commands designed to make your job easier. Here they are:

Using Editing Commands

S - Save—If you are working on a complicated path, you will often want to run the test game to see how the path looks. It can be a nuisance getting back to the exact place where you left off. If you press "S" right before exiting the Path Creator, your current position will be stored in memory and can be retrieved when you are ready to continue work. (Warning: if you load in another function from the Main Menu, your place in the Path Creator will be lost.)

R - Retrieve—If you press "R" as soon as you enter the Path Creator, it will recall which path number, path pointer, x,y coordinates, and length you saved (see previous command, S - SAVE).

C - Clear Path—Pressing "C" will fill an entire path with End statements. This permits you to build the path bit by bit without the bother of adding on an End statement every time you go to test your effort and then deleting it upon return.

W - Which?—If you want to work on the motions of one of your objects, this command will bring in the X,Y coordinate, path number and starting path pointer position of any object in any block at any game level.

CTRL-T - Transfer—If you want to transfer all or part of any path table to another path table or another point in the same path table, this command will permit you to do so. (CTRL stands for the Control key on the left side of the keyboard. If you hold the CTRL key down and then press T, as you would with the shift key on a typewriter, you have typed CTRL-T.)

ESC—The ESCape key allows you to see the full graphics screen by removing the text window at the bottom of the screen. You can restore the text data by pressing ESC a second time.

CTRL-I - Insert—This command shifts each higher numbered instruction above the path pointer up one position. Pointer 10 becomes Pointer 11, etc. with Pointer 254 becoming Pointer 255 (nonexistent and hence lost), permitting you to insert an instruction. You must type CTRL-I before each command that you intend to insert. Remember that this command will move EVERYTHING in the path table after the path pointer, which can be a real nuisance if you have charted out your path usage very carefully. If you add to a path without using the INSERT command you will simply replace the previous command at the same pointer. Remember that if you replace or insert a command you may cause drift. (See explanation of drift at the end of this unit.)

CTRL-D - Delete—This command works in a similar fashion. Each higher numbered instruction above the path pointer is shifted down one position. The command at the path pointer is lost. This may be confusing at first. Look at the following diagram representing the bottom portion of the screen in the Path Creator section:

Path Number 1 Path Pointer 4 Speed 1

Bomb Release So

X,Y (120,120) Length 14 Direction So

This does not mean that the command "Bomb Released So(uth)" is at Path Pointer 4, but rather that "Bomb Released So" is executed by Path Pointer 3 and Path Pointer 4 awaits your next command. To delete Bomb Released So you must step back to Path Pointer 3 with the left arrow, then press CTRL-D.

CTRL-F - Find—This command allows you to find quickly the first occurrence of a command in a path table. You can only search

*

for the six numerical commands. For example, if you typed CTRL-F5, the Path Creator would search forward until it found the first DROP BOMB command in the path table. (If it encounters an END statement before it finds the command you are looking for, it will stop. Pressing any key will also stop it. You may also use this command to automatically run through your path—from beginning to end—by searching for a command that isn't used in the path.

B - Blank Background—If you have drawn a background, it will ordinarily appear while you work on your path tables. This permits you to see how your shapes will interact with the background as they move. If you want to turn the background off while you work on your shapes, however, just press "B."

Setting Starting Positions of Objects

There are two important concepts we have not discussed yet and they are essential to having your paths work correctly in relation to your backgrounds. The first is the STARTING POSITION of each object—this refers to the X,Y coordinate where each object begins its journey. The second is the STARTING PATH POSITION of each object. it is not necessary that each object start receiving commands at the beginning of a path table. One might start with the first command, another with the sixth, and the third with the eleventh. This, in fact is how you get shapes to follow one another about.

The first of these factors, starting position, is controlled using "LEVEL OPTIONS," Function "4" of the Main Menu (see p. 68). The second, starting path position, is controlled using "GAME OPTIONS," Function "3" of the Main Menu (see p. 59).

Remember, the paths you create are RELATIVE paths—that is, they indicate where you should go relative to wherever you are at the moment. If you start three objects on the same path but from different starting positions, they will move in formation. If your path is a circle, each object will move in a circle, BUT IT WILL NOT BE THE SAME CIRCLE. If you want the three objects to follow one another around in a circle, you will have to design a path that goes through the starting positions of each shape and then start each shape at a different point on that path.

Controlling Drift

One of those items that we mentioned briefly but which we probably should stress is that when objects come to the end of a path table, they start over again at the beginning of that path. As a result, it is usually advisable to end path tables at the same X,Y coordinate where they began. Otherwise, you may get a gradual drift of objects across the screen. As an example, go to the Path Creator and type "K" until the X,Y coordinates wrap around to 118, 120. Then type "M" to move downward and then "E" to end the path. Try running the game. As you can see, each time the objects circle the screen, they also move downward and in little time, the game gets completely unplayable. You can use this drift factor in your games if you like, of course, but you should be aware of why it happens.

Using Path Table Worksheets

A Path Table worksheet is included in the Arcade Machine package because it is crucial that the actions of objects on different paths be properly coordinated. This is far easier to do on a sheet of paper which graphically displays all of the activity on all of the paths than it is on the computer, which can only deal with one path at a time. Therefore, we suggest that you use a copy machine to make copies of that sheet (or make up a scheme that's more to your liking) so that you can track the activities of ALL of your objects simultaneously.

Summary: The Path Creation Process

In general, creating a path for an object requires the coordination of these four factors:

1. Creating the Path Table—i.e. the sequence of commands that make up the object's individual (or shared) step by step sequence of movements and behaviors. This is created using the "Path Creator" (Function "2" of the Main Menu, p. 40).

2 & 3. Setting the Starting Position and Path Number of the Object—i.e. where exactly it begins its path on the screen and which path number to follow. These are controlled using "Level Options" (Function "4" of the Main Menu, p. 68).

4. Setting the Path Pointer Start Values—i.e. determining how far along the path table's step-by-step sequence of commands the object should begin executing the path table's remaining orders. This is controlled using "Game Options" (Function "3" of the Main Menu, p. 59).

The Path Creator is probably the most complicated part of the Arcade Machine. However, it is also the most flexible and powerful part. After you get used to using the commands, you should have little difficulty making your shapes go where and when you want them to go.

𝄞 USING SOUND EFFECTS

In this section you will learn how to use the Arcade Machine to:

- Create sounds of missiles, bombs, collisions and explosions
- Control pitch, tone, volume, length and cycles of sounds
- Get instant feedback of sound modifications you make
- Create short musical sequences

To create or modify sounds using the Arcade Machine's sound synthesizer, return to the Main Menu and select Function "3"—"GAME OPTIONS." The "Game Options" menu will appear. When it does, press key "2" to select "SOUND." You will then see the following screen:

These are the sounds you can change, and you can do so with a wide range of freedom. Choose the sound effect that you would like to modify by typing a number from 1 to 5. The screen will clear and you will see something like this: (Note: The numbers will vary depending on which sound you choose. That's because it is actually these numbers that make one sound different from another.)

	1	2	3	4	5	6	7	8
PITCH	1	5	10	16	21	32	48	69
TONE	0	0	1	1	1	1	1	1
VOLUME	8	8	8	8	8	4	2	1
LENGTH	4	3	3	2	1	1	0	0
CYCLES	1							

PLEASE CHOOSE (P,T,V,L,C,H) (RETURN)

The sound variables you control are listed in the column to the left—Pitch, Tone, Volume, Length and Cycles. The 8 columns of data you see to their right represent a single sound effect broken down into 8 component "mini" sounds (which heard quickly one after another make up the one "sound effect" being created). By changing these numerical values, which define these 8 component notes, you can produce different sound effects.

To hear the sound currently being displayed, press "H" (for Hear). Try it now. This "instant feedback" is useful. Every time you change any of these numbers, you can listen immediately to the results of your changes by pressing "H."

Changing Sound Variables

To change any of these variables, press the first letter of the variable you'd like to change, as the bottom of the screen indicates. You will then be asked to enter 8 numerical values, pressing RETURN after each number entered. The range of numbers allowed in each case will be displayed at the bottom of the screen. Let's see how changing these variables affects the sounds you can make:

"P" for Pitch—Lets you control how high or low the sound will be. The lower the number the higher the pitch.

"T" for Tone—Lets you control the clarity of tone, the degree of distortion. For pure tones, set these values to "5." For increased versatility use pure tones.

"V" for Volume—Lets you control volume within a particular sound effect, soft to loud. The maximum loudness is 15, although it is suggested that you use lower settings.

Note: if the total of all volume settings in a sound effect is more than 32, some distortion and even a reduction in volume can occur. So, use settings of 15 sparingly.

"L" for Length—Lets you control the duration of each component sound—from shortest (0) to longest (15).

"C" for Cycles—Lets you control number of times the effect is repeated each time it's called. Cycles can vary from 1 to 4. You will find that a high cycle number and long durations can produce sound effects that interfere substantially with the game, so try to keep them reasonably short. Again, here as elsewhere, the key to success lies in experimentation. Try all sorts of combinations and keep records on the ones that you like.

Creating Musical Sequences

In addition to making hair raising "explosion" sounds, you may also use pure musical tones in your games. Musical phrases, of course, are limited to eight notes each, though they may be repeated by using multiple CYCLES. To start experimenting with musical notes, set all TONE values to 5, and LENGTH values to 15. Then use the following PITCH values, as desired. (Later you may vary the LENGTH settings to add rhythm):

TABLE OF PITCH VALUES FOR THE MUSICAL NOTES

HIGH NOTES	C	29
	B	31
	A♯ or B♭	33
	A	35
	G♯ or A♭	37
	G	40
	F♯ or G♭	42
	F	45
	E	47
	D♯ or E	50
	D	53
	C♯ or D♭	57
	C	60
	B	64
	A♯ or B	68
	A	72
	G♯ or A♭	76
	G	81
	F♯ or G♭	85
	F	91
	E	96
	D♯ or E♭	102
	D	108
	C♯ or D♭	114
MIDDLE C	C	121
	B	128
	A♯ or B♭	136
	A	144
	G♯ or A♭	153
	G	162
	F♯ G♭	173
	F	182
LOW NOTES	D	193
	D♯ or E♭	204
	D	217
	C♯ or D♭	230
	C	243

While running the game, press a number key (1-5) to shift from one game level to the next. Color changes will automatically be saved to memory.

In general, as you step through the color variations by pressing "C" repeatedly, the colors change in the following sequence:

GRAY

LIGHT ORANGE (GOLD)

ORANGE

RED-ORANGE

PINK

PURPLE-BLUE

BLUE

LIGHT BLUE

TURQUOISE

GREEN-BLUE

GREEN

YELLOW-GREEN

ORANGE-GREEN

LIGHT ORANGE

These colors will vary depending on luminescence and monitor settings.

??? USING GAME OPTIONS

In this section you will learn how to use the "GAME OPTIONS" program to:

- Control a number of "game play" variables that affect all 5 levels of play
- Set scoring values

- Set path pointer start values
- Order shapes to "mutate" or change form when hit

This function is actually a collection of five smaller utilities that allow you to set up a variety of substantially different games. (Note: We've already described one of these utilities, "SOUND," in a previous section "Using Sound Effects," p. 50)

To use these "GAME OPTIONS" type "3" from the Main Menu. You will see the following Game Options Menu:

Main Options

Press "1" from the Game Options Menu. The following screen will appear:

```
(1) NUMBER OF PLAYERS? ONE

(2) NUMBER OF TANKS TO START GAME? 3

(3) TIME LIMIT? NO

(4) BOMB/MISSILE COLLISION SCORE? 0

(5) GAME DELAY? 0

(6) BOUNCING BOMBS? NO

(7) EXPLODING OBJECT OPTION? NO

(8) NUMBER OF BARRIERS. 1

(9) RANDOM OBJECT BOMBING? 0
```

Let's go through them one at a time:

(1) Number of Players—Press "1" to change the number of players from one to two. Press "1" again, and the word "Special" will appear after the option. The special one player option permits the bottom tank to move vertically as well as horizontally (the top tank cannot be used in this configuration). If you press "1" a third time, this option will cycle back from "Special" mode to "One player" mode.

(2) Number of Tanks To Start Game—You may set the number of tanks (extra players) that each player begins the game with. That number can vary from 1 to 9.

(3) Time Limit?—You may add a time limit to the game. If you answer this yes, you will be asked the number of minutes and seconds and may respond with any number from zero to 60 for each. (You must supply values for both minutes and seconds even if one of them will be zero and you must press RETURN after typing each of these numbers.) The larger the number, the longer the time before the game automatically ends. Fifteen seconds before a game ends, the "SHIPS" sign at the top of the game screen will begin to flash.

(4) Bomb/Missile Collision Score—If you want to award points for successfully shooting down bombs, you will turn on number four. The score awarded can vary from 10 to 990 points (ten times the number you type in, since the ones column on the scores is a dummy).

(5) Game Delay—This may be used to slow a game down. If you have finished your game and decide that it just plays too quickly, add a delay number here between 0 and 100. The larger the number, the slower the game will play.

(6) Bouncing Bombs—This turns on/off an option in which falling bombs bounce off the side of the screen, off horizontal background objects drawn with COLR2 and vertical background objects drawn in COLR3 (although the vertical lines have to be at least seven dots thick). See "Creating Backgrounds" p. 38 for details of how to create these backgrounds.

(7) Exploding Object Option—Number seven causes all alien shapes to explode when they hit the bottom of the screen. You may want to create a game in which you try to prevent shapes from reaching the bottom of the screen. This option permits you to reward or punish the player for failing to catch the falling shapes.

(8) Number of Barriers—This refers to the number of Invader-like barriers that you would like to set up at the bottom of the screen. This number can vary from 1 to 3. (You actually turn the barriers option on and off in Function 4: Level Options. See p. 66.)

(9) Random Object Bombing—Number nine provides for random downward bombing, an alternative to placing "bomb" instructions in the path tables. When this option is set to 0, it is turned off. You can turn it on by changing the setting to a number from 8 (frequent bombs) to 1 (very few random bombs).

Setting Scores

The third menu item under Game Options is SET SCORES. This routine permits you to decide how many points to give for the destruction of each shape in each block. When you type "3" you will see:

SHAPE SCORES

	BLOCK 1 (SML)	BLOCK 2 (SML)	BLOCK 3 (SML)	BLOCK 4 (SML)
#1	1	1	3	7
#2	1	1	3	7
#3	1	1	3	7
#4	1	1	3	7
#5	1	1	5	7
#6	1	1	5	7

(B)LK, SHAPE (1-6), RETURN TO EXIT

Pressing "B" lets you select the block you wish to work on. You then type the shape number and enter the number of points you wish to award a player for hitting that shape. Points run from – 99 to 99. The actual scoring is whatever number you choose times ten. If you want to make an object immune to missiles, give it a point value of zero. During game play, the game will move on to the next level once all positive numbered shapes have been destroyed. Shapes with negative scores can still be left on the screen.

Incidentally, scores are attached to SHAPES, not to OBJECTS. This gives you a great deal more flexibility—in effect, you can change the point value of an Object merely by mutating it to another Shape.

Setting Path Pointer Start Values

The fourth function under Game Options is one that we alluded to in "Making Shapes Move" (p. 48). It is used in conjunction with the Path Creator. Press "5" and you will see:

PATH POINTER START VALUES
(LEVEL 1)

	BLOCK 1 (SML)	BLOCK 2 (SML)	BLOCK 3 (SML)	BLOCK 4 (SML)
#1	1	1	1	1
#2	1	1	1	1
#3	1	1	1	1
#4	1	1	1	1
#5	1	1	1	1
#6	1	1	1	1

(B)LK, (L)EVEL, SHAPE (1-6)

This table refers to the point in their particular path table at which each object will start to follow its instructions. In the example above, each object starts with the first instruction. If, however, you were designing a winding path in which objects followed one another, each object might start at a different path pointer number.

Note also the reference to LEVEL 1. All games are designed to have 5 levels, although all levels may be identical. You may design your game so that each level is substantially different. One way to do that is to use different parts of the path tables for different levels in a game (See p. 71). Other ways of making levels different are explored in the fourth function of the Main Menu, called "Level Options" (See p. 62).

Ordering Objects to Mutate

The final function under Game Options is the MUTATE OPTION. Press "5" and you will see:

OBJECT STATUS FOR MUTATE OPTION

	BLOCK 1 (SML)	BLOCK 2 (SML)	BLOCK 3 (SML)	BLOCK 4 (SML)
#1	NO	NO	NO	NO
#2	NO	NO	NO	NO
#3	NO	NO	NO	NO
#4	NO	NO	NO	NO
#5	NO	NO	NO	NO
#6	NO	NO	NO	NO

(B)LOCK, OBJECT (1-6), RETURN

This function permits you to make some of the objects in your game mutable while others are not. If the mutate option for the Level you are playing is turned ON (see "Using Level Options," p. 67), then all those objects whose Mutate Status is YES will mutate when hit by a missile. Those objects which are Shape 1 will become Shape 2, Shape 2 will become Shape 3 and so forth. However, once objects reach the highest numbered shape in their block, they will explode the next time a missile strikes them (note that this differs from the Shape Change function in the Path Creator—Shape 6 would become Shape 1 when it hit a shape change marker).

HELPFUL HINT

Remember, a number of these "Game Options" must be used in conjunction with other parts of the Arcade Machine in order to work:

BOUNCING BOMBS must be used in conjunction with color selections in the Background Creator (p. 38).

NUMBER OF BARRIERS must be used in conjunction with "Barriers for Bottom Tank?" question in Level Options (p. 67).

PATH POINTER START VALUES are used in conjunction with the Path Creator (p. 40) and "Edit Path Data" function of Level Options (p. 68)

MUTATE OPTION is used in conjunction with the Shape Creator, with which you design the various mutating shapes.

SET SCORES to zero if you want any particular shapes to remain on screen even after being "hit" by missiles.

314 25 USING LEVEL OPTIONS

In this section you will learn how to use the "LEVEL OPTIONS" program (Function 4 of the Main Menu) to:

- Control a number of "game play" options that you may vary from level to level
- Control speed, score, movement and accuracy of "tanks"
- Control speed, number, and movement of missiles
- Select bomb speed, type and accuracy
- Turn on invader-type barriers
- Mutate objects when hit
- Set screen positions, starting shapes and path numbers of all moveable objects—level by level

- Set level pointers to create even greater path variations

To use these features, press "4" from the Main Menu. The following screen will appear:

These largely unrelated utilities are grouped together because they can be used to make the five levels of your game different from one another (although they can be used for a good many other purposes as well).

Main Options

Let's take a look at the first menu item, "Main Options." Press "1." The screen will clear and will fill with this:

(0)	STAR MOVEMENT	2	2	2	2	2
(1)	STAR SPEED	2	2	2	2	2
(2)	STAR DENSITY	2	2	2	2	2
(3)	TANK SPEED	2	2	2	2	2
(4)	TANK SCORE	1	1	1	1	1
(5)	TANK ACCURACY	1	1	1	1	1
(6)	BOT L. LIMIT	1	1	1	1	1
(7)	BOT R. LIMIT	142	142	142	142	142
(8)	TOP L. LIMIT	1	1	1	1	1
(9)	TOP R. LIMIT	142	142	142	142	142
(A)	MISSILE SPEED	4	4	4	4	4
(B)	MISSILE TYPE	2	2	2	2	2
(C)	MISSILE NUMBER	1	1	1	1	1
(D)	MISSILE DRIFT	1	1	1	1	1
(E)	BOMB SPEED	1	1	1	1	1
(F)	BOMB TYPE	1	1	1	1	1
(G)	LRG. SHP. ACC.	1	1	1	1	1
(H)	MED. SHP. ACC	1	1	1	1	1
(I)	SML. SHP. ACC.	1	1	1	1	1

PLEASE CHOOSE (RETURN) TO EXIT

The numbers following these eighteen variables represent their current setting for each of the five levels of the game. To alter any of them, type the number or letter preceding the description and then enter five values, one for each level. Although many of the descriptions may be self-explanatory, here is a brief description of the purpose of each:

(0) Star Movement—If you type 0, a new line will appear at the bottom of the screen:

1—NO STARS 2—SCROLL 3—STATIONARY

You may use stars whether or not you choose to add a background to your game. If you choose stationary stars, they will all stay in one place and flicker. If you choose scrolling stars, they will always move from the top of the screen downwards.

(1) Star Speed (1-3)—Varies from 1 (slow) to 3 (fast).

(2) Star Density (1-3)—Varies from 1 (crowded) to 3 (very few).

(3) Tank Speed (1-3)—One is slow, three fast.

(4) Tank Score (1-99)—In a two player game, this is the score you get when you hit the opposing player. Can be set from 1 to 99 (which represents 10 to 990, as usual).

(5) Tank Accuracy (1-3)—How direct a hit is necessary to destroy a tank. One means that a flank hit counts. At 3 a direct center hit is necessary.

(6)-(9) Top & Bot Limits (1-142)—These are the left and right limits for the two tanks. One is the left margin, 142 is the right. If you want to restrict tank mobility to a smaller part of the screen, adjust these numbers. In the "Special" one player mode (p. 57) the top tank's limits will become the vertical limits.

(A) Missile Speed (1-4)—One is slowest, four fastest. Missiles are the projectiles fired by the tanks, not the ones fired by the alien shapes.

(B) Missile Type (1-4)—There are four standard types. Pick your favorite.

(C) Missile Number (1-8)—This determines how many missiles can be on the screen at one time. The larger the number, the easier it is to destroy alien shapes.

(D) Missile Drift (1-3)—If you select steerable missiles in the MISCELLANEOUS function of "Level Options" (p. 67), then the missiles you fire will drift in the same direction you were moving. One means little drift, three means a lot.

(E) Bomb Speed (1-3)—One is slow, three fast.

(F) Bomb Type (1-4)—Pick the type you like. Same choice as in missile types.

(G)-(I) Ship Acc(uracy) (1-3)—These settings, like item 5, determine how accurate a shot is needed to destroy a shape. A setting of 1 means that a glancing blow will destroy the shape. A setting of 3 requires a direct center hit and makes the game much harder.

If you would like to test each level of your game (or one of the sample games) after making modifications you can press RETURN until you are in game play. Pressing any of the numbered keys from 1 to 5 will immediately jump you to that level of play.

"Miscellaneous" Options

The second section under "Level Options" is called "Miscellaneous," and rightly so. Here you have a choice to add a number of unusual features to your game if you wish. Type "2" and you will see:

```
(1) SHOULD SCORE INCREASE WITH LEVEL?
YYYYY

(2) SHOULD OBJECTS SPEED UP AT THE END?
NNNNN

(3) SHOULD OBJECTS MUTATE WHEN HIT?
NNNNN

(4) FREE TANK AT EACH LEVEL?
NNNNN

(5) STEERABLE MISSILES?
NNNNN

(6) SHOULD MISSILES STOP AT COLR2?
NNNNN

(7) SMART BOMBS?
NNNNN

(8) BARRIERS FOR BOTTOM TANK?
NNNNN

PLEASE CHOOSE          (RETURN) TO EXIT
```

Each Yes/No question has a setting for each of the five game levels. This is what these miscellaneous option questions will do:

(1) Score Increase With Level—If this switch is set to Yes, then the score for hitting each alien will be multiplied times the level number. In other words, if you get 20 points for hitting an alien in Level 1, you will get 40 points for hitting it in Level 2 and 60 points for hitting it in Level 3. Negative scores are also multiplied.

(2) Objects Speed Up At The End?—If this setting is Yes, then the fewer aliens there are on the screen, the faster they will move.

(3) Objects Mutate When Hit?—This is a Mutate command with a difference. If this option is set to Yes, each mutable object will mutate to the next higher shape number until it reaches the top number (6 for small shapes, 3 for medium and 2 for large). Then if it is hit once more, it will explode. Whether or not a specific object is designed to mutate is set in Game Options, Function 5 (p. 60).

(4) Free Tank At Each Level?—Provides both players with a free tank at the beginning of each game level.

(5) Steerable Missiles?—If this option is set to Yes, the tank controls will also control missiles after they have been fired, allowing them to be guided toward their targets.

(6) Missiles Stop At Color2?—If this is set to Yes, missiles will be stopped by any barriers made of COLR2 on the screen. (Remember, missiles and bombs aren't the same.) The invader-style "barriers" offered in "Game Options" (p. 58) can be gradually eaten through unless this is set to Yes. Areas drawn as part of your background cannot be destroyed by missiles—either they will pass harmlessly through them (if this option is set to No) or they will be stopped (if this option is set to Yes).

(7) Smart Bombs—If you want to make the game very difficult, turning this option on turns all the bombs into smart bombs, i.e. bombs that will actually seek out your tank.

(8) Barriers For Bottom Tank—This item allows you to include barriers at the bottom of the screen on some or all levels. It will put a hole near the bottom of any background you draw using the Background Creator.

How To Edit Path Data

The third function in the "Level Options" menu is EDIT PATH DATA. This function is used to set up 1) the starting screen position, 2) the starting shape number, 3) and the path number of each moving object for each of the five different levels of play. It is here that the shapes you created using the Shape Creator are put together "formally" with the paths you created using the Path Creator. It is here where you tell your objects which particular shape to take, how to move, and exactly where to begin their movements on the screen.

All of this "path data" is conveniently summarized on the Edit Path Data screen. Unfortunately at first glance it looks much more complicated than it actually is. So, take a deep breath, press "3" and don't panic when the following screen appears:

12345 ARCADE MACHINE LEVEL 1 DATA

	BLK1		BLK2		BLK3		BLK4	
OBJ.	79	85	79	75	87	65	79	95
#1	1	1	1	1	1	1	1	1
OBJ.	87	85	87	75	95	65	87	95
#2	2	1	2	1	2	1	2	1
OBJ.	95	85	95	75	103	65	95	95
#3	1	1	1	1	1	1	3	1
OBJ.	103	85	103	75	111	65	103	95
#4	2	1	2	1	2	1	4	1
OBJ.	111	85	111	75	95	55	111	95
#5	1	1	1	1	1	1	5	1
OBJ.	119	85	119	75	103	55	119	95
#6	2	1	2	1	2	1	6	1

(L)EVEL, (B)LK, OBJECT (1-6), (S)ET WRITE

Path Data Screen

Notice above that each object in each block has four numbers associated with it. These numbers are arranged in a square. For exam-

ple, the first object in Block 1 is associated with the following block of numbers:

79	85
1	1

Just look for the intersection of the rows next to OBJECT #1 and the columns beneath BLOCK 1. The top two numbers stand for the starting position of Object 1 in Block 1 (the X and Y coordinates, as we called them earlier). Directly below the X coordinate is the number of the shape to be drawn to that object, and below the Y coordinate is the number of the starting path table for that object. This entire screenful of numbers is composed of rectangles of the following form:

X coord	Y coord
Shape #	Path #

If you examine the X and Y coordinates of the six objects in Block 1 of the sample game, you will see that all of the Y coordinates are the same (85), but that each of the X coordinates differs from the ones on either side of it by 8. This means that the six objects in Block 1 will all start in a row on the screen, spaced 8 dots apart.

If you look at the lower left-hand corner of each rectangle of numbers for these six objects, you will see that half of them are Shape #1 and half are Shape #2. Take a quick look at the test game if you want to refresh your memory about how this works. And finally, note that all six are on the same path, Path #1. This means that when one Object moves left, they all move left; when one moves down, they all move down. They do not follow one another—they are in the same position in the same path table, just moving from different starting positions.

You can ignore the numbers underneath Block 4 in the sample game. Since that block isn't being used, these numbers are irrelevant. Remember, blocks and objects are turned on and off in function 2 of the Shape Creator. See "Turning Shapes and Blocks on and Off," p. 27.

If you want to have some fun with this path data editor even before you fully understand it, just try plugging in some different X and Y values, shape numbers and path numbers for a number of objects, then run the test game to see the results. For complete instructions, read on . . .

How To Enter Or Modify Path Data

The data in the Edit Path Data screen shown above is actually a display of the Level 1 Path Data, as the top line of the screen indicates. If you would like to see the path data for the other four levels, you can do so. Look at the prompt line at the bottom of the screen. It looks like this:

(L)EVEL, (B)LK, OBJECT (1-6), (S) WRITE

If you type "L" for Level, the screen will clear and immediately be replaced with data for the next higher level. Try this, watching the top line of the screen. Don't be surprised if the new data looks exactly like the data you just saw. In the test game, all five levels are exactly the same. When playing the game, you move on to the next level each time you destroy all of the alien shapes on the screen with positive values.

Now let's try modifying a little of the data. Press "B." You will note that the Block marker at the top of the screen jumped one column to the right. Continue to press "B" until Block 1 is marked once again. Then type any number from 1 to 6. A new prompt line will appear at the bottom of the screen.

X(1-240)

You can now type in a new coordinate. Hitting RETURN lets you go on to the next prompt. The acceptable range for each number is listed in parentheses in the prompt line.

If you would like to try a little experiment, leave all the numbers the same except the Y coordinate. Add 20 to that when you retype it. Then exit to the test game and see what your change has done. With a little experimentation you should be able to change all of these numbers with predictable results. If you want to restore everything to

its original, dull but predictable pattern, just turn off the computer and re-boot the program. The test game is never permanently changed.

Set Write: Path Data For All Levels

Now take a look at the upper left corner of the screen. You should see five digits there: 12345. This shows which levels you are currently "writing" to. It is designed to permit you to write identical data to all five levels if you wish. Say, for example, that you wanted the test game to be used as levels 2, 3 and 5 in your finished game but you wanted to create an entirely different game for levels 1 and 4. You would want to be able to turn off writing to levels 2, 3 and 5. To do this, type "S" (for Set write) followed by these three numbers, then press RETURN. The appropriate numbers in the upper left corner will turn off, leaving only the 1 and the 4. This means any data you now enter will only be written to Levels 1 and 4. Let's try it.

Change all six objects in Block 1 by adding 20 to the Y coordinate. In other words, change the 85 to a 105 but leave the other three numbers the same. Then press RETURN until you are playing the test game. The bottom row of shapes should be positioned even lower on the screen. Play the game until you have destroyed all of the aliens. LEVEL 2 will appear on the screen and then another batch of aliens. This time the bottom row of aliens will be in its original position.

HELPFUL HINT

EDIT PATH DATA looks very complicated at first, and it is very important. But actually it is pretty simple to manipulate, once you get used to it. You will have to use copies of the special graph paper provided with the Arcade Machine to plot out the starting position of each shape and the paths they will take. Then this section of the Arcade Machine will provide quick access to all the starting information on all of your shapes.

Setting Level Pointers

The final section in "Level Options" is SET LEVEL POINTERS. When you type "4" from the Level Options Menu you will see:

```
LEVEL POINTERS    1    1    1    1    1
LEVEL 1 (1-254)   (RETURN)
```

This section is designed to permit you to move the aliens in different ways at each of the five levels of the game. As you recall, the Arcade Machine permits you to construct up to 10 different path tables, each up to 254 instructions long. As a practical matter, most of your path tables will not be anywhere near that long. Therefore, this option allows you to divide each path into 5 separate mini-paths, one for each level of the game. You do this by selecting a different starting point in the paths for each level. For example, type in the following 5 numbers so the screen looks like this:

```
LEVEL POINTERS    1    51    101    151    201
LEVEL 5 (1-254)
```

The aliens in the test game all use Path #1. Path #1 consists of 7 instructions—move right (3 times), move left (3 times), end. We have now modified the game so that when you get to Level 2, the computer is going to look to position #51 in Path #1 for instructions on how to move the aliens. We had better put something there. Go back to the path editor and move the path pointer to 51 (type "2" "51" to do this). Then enter a short path (different from the back and forth path that starts at path pointer #1). When you are finished, try the game and see if the aliens don't follow your new mini-path when you go to Level 2.

There is one complexity here that you should be aware of. Function 4 of under "Game Options" was called "Path Pointer Start Values." That section allowed you to set a different starting position in the path table for each of your aliens. These starting values are actually an "offset." In other words, they are added to the Level Pointer to determine the starting instruction for a particular alien. Thus, in our example above, if a particular shape was given a PATH POINTER START VALUE of 4, then on Level 1 it would start by executing the

fourth instruction in the path; however, at Level 2, it would begin at instruction number 54, and so forth.

This path pointer feature lets you add an almost limitless variety of movement to your games.

LOADING & SAVING GAMES

In this section you will learn how to use the "LOAD/SAVE GAME" program (Function 6 of the Main Menu) to:

- Save work-in-progress to disk
- Load it back into memory
- Transfer shapes and backgrounds from one game to another
- Prepare new data disks

The load game procedure has already been described in chapter 2 of this manual (see "Loading the Sample Games," p. 7). To use any of the "LOAD/SAVE" functions, press "2" from the Main Menu. The following screen will appear:

Loading A Game

As described on page 8 of this manual, press "1" to select the LOAD GAME option, then simply follow the screen prompts. Once loading is complete and your disk drive stops making noise, press RETURN repeatedly until the game appears on the screen.

Saving A Game

Saving a game is no more difficult. Remember, however, that games are saved on separate data disks, not the Arcade Machine master disk itself. If you are using a disk for the first time, the first thing you need to do is format it using Command 5—FORMAT GAME DISK. THIS WILL ERASE ANYTHING ON THE DISK, INCLUDING OLD ARCADE MACHINE GAMES. But it is necessary to prepare your new disk to receive data. Each game disk can then store 4 games.

Once you have a formatted "game diskette," press "2," and the list of games stored on the inserted disk will appear (or EMPTY if you haven't stored four games yet). Choose a number (or press RETURN if you decide that this was a big mistake) and the program will ask: "NAME." Now enter a name up to 30 characters in length—your game title.

Loading/Saving Shapes & Backgrounds

Occcasionally you may want to pass shapes or backgrounds from one game to another. Options 3 and 4 of the "Load/Save Game" menu permit you to take the shapes or background from one game and merge them with the one in memory. In this manner you can develop a library of shapes that can be passed from one game to the next.

Exiting Load/Save

When you are ready to return to the Main Menu, press RETURN. You will then see:

PLEASE TAKE OUT YOUR GAME DISKETTE

AND INSERT THE ARCADE MACHINE

MASTER DISKETTE

PRESS ANY KEY TO CONTINUE

Do as you are asked, and the Main Menu will reappear on the screen.

HELPFUL HINT

It is advisable to "save" your game regularly while you are creating it. After all, it is far better to have extra copies of partially completed games lying around than to lose it all because of an unfortunate power surge moments before completion.

CREATING A GAME DISK

In this section you will learn how to put all the pieces of your game creation together. You will:

- Create your title page
- Create the finished product, your own "auto-boot" game disk

This is what it's all about. If you like what you've done, have tested it a thousand different ways, and have decided that your creation deserves to be preserved for posterity, then it's time to create your title page and your finished game disk.

Creating Your Title Page

First, call up the BACKGROUND/TITLE CREATOR (Function 5) and select item "2" for CREATE TITLE PAGE. This is your opportuni-

ty to design a custom title page for your game, complete with your name and game title in bold lettering. The Title Creator works in exactly the same way as the Background Creator, with one exception: TITLE PAGE CREATION MUST ALWAYS BE THE FINAL STEP BEFORE YOU CREATE YOUR GAME DISK.

(Technical note: The reason for this is that the title page sits on the high resolution page of memory and will be erased by any routine that makes use of this page, such as the Shape Creator or the Path Creator.)

For instructions on how to use the Title Creator, see "Creating Backgrounds," p. 30.

Creating Your Game Disk

Now that you've drawn all your shapes, designed all the paths, created your background and your title page (don't forget that title page!), you're ready to create your game disk.

This game disk will be different than the data disk on which you "saved" your Arcade Machine games. The disks "created" with this function can be booted up all by themselves, just like professional software!

To create a game disk, make sure your game and title page are in active memory, then put a new, blank disk in your drive and press "7" from the Main Menu. (Note: You don't have to format the disk; the Arcade Machine will do that for you automatically in this case.)

Minutes later you will have a complete, auto-boot game disk of your own creation in your hands. (Be patient, it takes time for this process to finish.)

What Next?

Turn off the computer and insert your new game. Then turn it on and watch that title page come up. Then bring over your friends and sit them down to play . . . ALIEN MISTAKE! (or whatever you choose to call it).

Give your friends the disk. After all, there are new worlds to conquer, new games to make (and besides, you can always make another copy as long as you SAVED your game before you turned off the com-

puter). And when you have finally written the most complex, graphically sophisticated game you will ever be able to write (until you learn to program), then send a copy to us. We are always looking for creative, artistic people. Even if you don't win one of the prizes in our ARCADE MACHINE CONTEST, we'll have your name in our files. And who knows what that might lead to.

V.
REFERENCE

GLOSSARY

BLOCKS—One of four areas of memory reserved to save SHAPES in. Each block can hold 6 small shapes, 3 medium sized shapes or 2 large shapes.

BOMB—Small destructive object fired by SHAPES at TANKS.

BOOT—A computer term that means to load in a disk's operating system, usually by putting a disk in a disk drive and then turning on the computer.

COLOR REGISTER—A memory location that determines what colors appear on the screen. There are four different color registers in the Atari—COLR0, COLR1, COLR2, and COLR3—and they may be adjusted independently for luminescence and hue.

COLR0—One of the 4 color registers. COLR0 is the background color upon startup. COLR0 spaces may be filled using "F" in the Background Creator.

COLR2—One of the 4 color registers. There are functions in the program that permit you to control whether or not bombs and missiles can penetrate background objects drawn in this color.

COLR3—One of the 4 color registers. Functions in the program permit you to control whether or not bombs can penetrate certain vertical surfaces drawn in this color.

CTRL—A key on the left side of the keyboard. To type a control code such as CTRL-I, you must first press the CTRL key and hold it down. Then, while the CTRL key is being held down, you must press the I key. In this manner it is similar to the shift key on an ordinary typewriter.

CYCLES—A counter describing the number of times something is to be repeated. In the Sound routines, if you set Cycles to 3, the sound you have created will be repeated three times.

FORMAT—What you have to do to a new disk before you can write any programs or data to it. The Arcade Machine has a FORMAT command in the Load/Save Game section. NEVER use this command unless the disk you intend to format is blank or has nothing on it that you want to save.

IMAGE—The term used in the Arcade Machine to describe each of the four individual pictures which you must draw for each SHAPE. These pictures can be different and are flashed on the screen one after another whenever a shape moves horizontally across the screen. The differences in the images will animate the shape.

LEVEL—The term used for each of the five phases built into all games created on the Arcade Machine. The games are designed to move from one level to the next as soon as all of the shapes on a level have been destroyed. You may design games in which all levels are essentially the same or ones in which each level represents a substantially different game. You may examine each level of your game during testing by pressing a key from 1 to 5 to indicate the level at which you want to play.

LEVEL POINTERS—These are five numbers that will tell your program at what point in each PATH TABLE to start receiving instructions to move your shapes, depending on which LEVEL is being played.

MENU—The word used to describe any list of options. The first list that you see when you BOOT the disk and leave the test game by pressing Return is the Main Menu.

MISSILE—Small destructive object fired by TANKS at SHAPES.

MUTATE—The term used when an OBJECT changes shape. There are two forms of mutation permitted in the Arcade Machine. One is caused by a marker in a PATH TABLE and never causes the

destruction of the object that is mutating. The second occurs when a mutable object is struck by a missile, in which event it will mutate to the next numbered shape. However, if it is already the highest numbered shape in its block, it will explode.

OBJECT—The term used to describe each of the individual items that can be moved about on the screen on PATH TABLES. These items are distinguished from the objects controlled by the players with joysticks and which are called TANKS.

PATH POINTER—This is a number from 1 to 254 that tells you which of the 255 instructions in a PATH TABLE will be executed next.

PATH POINTER START VALUE—This is a number representing the first instruction in a PATH TABLE that a particular object will start with. It is not necessary for all objects to start with the same instruction, even if they are all using the same PATH TABLE.

PATH TABLE—One of ten lists of instructions stored in the computer's memory. These lists control the movement of objects about the screen as well as certain other functions of the objects, such as the positions at which they start bombing, change shape, or change speed.

SHAPE—A series of six different pictures that can be displayed on the screen by any object, similar in this respect to an animated mask worn by an actor. The actor is an OBJECT; the mask is a SHAPE.

SMART BOMBS—Bombs which track the movement of a tank and which are very hard for a player to dodge.

TANK—The object at the bottom or top of the screen which is controlled by the player. It does not use PATH TABLES at all but is controlled by the joystick.

SUMMARY OF COMMANDS

(1) SHAPE CREATOR

Blocks (1-4)
Shapes (1-6) (1-3) (1-2)
SML MED LRG

DRAWING SHAPES

Move cursor ..... I-J-K-M or joystick
Draw ..... F or joystick button
Undraw ..... D
Erase ..... E
Change color C
Transfer images ..... T
Turn images on/off 1,2,3,4,5
Write a shape ..... W
Size: use BLOCK/OBJECT STATUS

(2) PATH CREATOR

CREATING PATHS

Move crosshair ..... I U O J K N , M

End path ..... E
Set path number 1
Set path pointers 2
Set X&Y coordinates 3
Set length 4
Drop bomb 5
Direction of bombs ..... U,I,O,N,M,J
Randomly north - N
Randomly soluth — K
Set speed 6
Change shape 7
Jump path tables 8
Delay 9

PATH COMMANDS

Reviewing a path ..... (←→)
Save ..... S
Retrieve ..... R
Clear path C
Which? ..... W
Transfer ..... CTRL-T
Full screen on/off ..... ESC
Insert ..... CTRL-I
Delete ..... CTRL-D
Find ..... CTRL-F
Blank Background ..... B

RELATED FUNCTIONS

Set starting path position of object
(LEVEL OPTIONS)
Set path and shape numbers
(LEVEL OPTIONS)
Set starting path position in path
(GAME OPTIONS)
Set path level pointers
(LEVEL OPTIONS)

(3) GAME OPTIONS

MAIN OPTIONS

Number of players 1
Number of tanks 2
Time limit 3
Bomb/Missile Collision score 4
Game delay 5
Bouncing bombs 6
Exploding object option 7
Random object bombing 9

SET SCORES - – 99 to 99 (times 10)

SOUND EFFECTS

Hear (Listen) ..... H
Pitch (1-254) ..... P
Tone (0-15) ..... T
Volume (1-15) V
Length (0-15) L
Cycles (1-4) C

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ARCADE MACHINE SHAPES
ATARI VERSION

SMALL (8×7)

MEDIUM (10×10)

LARGE (15×12)

TANK (13×10)

Broderbund Software

ARCADE MACHINE PATHS

(1,2) PATH # _____ (240,2)

(1,240) (240,240)

THE ARCADE MACHINE CONTEST!

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