A Sourcebook for ATARI Logo™

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INTRODUCING ATARI LOGO

Logo is a high-level programming language, best known for its use as a teaching tool with beginning computer programmers. ATARI Logo is an enhanced version of the popular language, created to take advantage of the special characteristics of the ST[R] Computer System and the GEM[R] Desktop.

This manual is designed as a sourcebook for ATARI Logo, showing how to use Logo in the unique environment of the Gem Desktop. It is recommended that you use this manual as a companion to the ATARI 520ST Owner's Manual. However, this Logo manual is not a general introduction to the language. The first-time programmer should refer to an introductory book on programming with Logo.

This manual is arranged for easy access to the information you need to start programming with ATARI Logo. Chapter 1, Getting Started with ATARI Logo, shows you how to make a Backup of the ST Language disk and how to load your Logo program into the ST Computer. Chapter 2, ATARI Logo and Gem, is a general introduction to Logo. Chapter 3, ATARI Logo Menus, is a detailed explanation of each Logo menu option. And the Appendices provide all the reference materials the programmer will need, from a complete list of primitives to an Error Message listing. Also, Appendix I shows sample procedures for each of the unique primitives that were developed specifically for ATARI Logo.

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CHAPTER 1
GETTING STARTED WITH ATARI LOGO

Making A Backup Disk

Before you begin programming with ATARI Logo, you should make a backup copy of the program. Having a Backup disk provides security against accidentally erasing or damaging your program language disk.

To make a Backup disk you will need a new, blank, 3-1/2 inch disk. (Disks can be purchased at any computer retailer.) Making a Backup disk is very easy, just follow the steps below and read the prompts that appear in the Dialog Boxes.

1. If you have one disk drive, insert the Backup disk into the disk drive and place the ST Language disk aside. When the ST Computer requires a disk switch, it will display the message in a Dialog Box.

Note: If you have two disk drives, insert the ST Language disk into Drive A and the Backup disk into Drive B. With two disk drives, always keep the ST Language disk in Drive A and the Backup disk in Drive B, and follow the prompts.

2. To format the Backup disk, click on the icon for Floppy Disk B and select the Format option from the File heading in the Menu Bar. Click on the left mouse button and the first Format Box will be displayed. A message warning that formatting the disk erases the information on the disk is provided. Click on the OK button and proceed to the second Format Box.

You can label the disk with the second Format Box. Type in a descriptive name, like "Logo". Make sure the option "single-sided" is shaded, then click on the Format button. You already have your Backup disk in Drive A, so continue to Step 3.

As the disk is being formatted, you will be able to watch the process in the Working Box. When the disk is formatted, a Dialog Box stating that the disk can how hold 357,376 bytes of information will be displayed. Click on the Exit button.

You will be returned to the Format Box. Click on the Exit button and return to the Gem Desktop.

Note: If the formatted disk cannot hold 357,376 bytes of information, it is a defective disk. Place a new disk in the disk drive and format it.

3. To copy the ST Language disk, insert it into your disk drive, select Floppy Disk A with the mouse pointer and drag it on top of the Floppy Disk B icon, and release the left mouse button.

A Dialog Box warning that copying Disk A to Disk B erases all information on Disk B will be displayed. Click the OK button and the Diskcopy Box will be displayed.

Click on the Copy button and follow the prompts to finish the copying process. You will be instructed to switch disks until the copying process is completed.

If you have any questions or problems making a Backup copy of your ST Language disk, refer to the ATARI 520ST Owner's Manual for detailed information.

Loading ATARI Logo

To begin using ATARI Logo, you need to load the Logo program into your ST Computer. Follow the instructions below to load ATARI Logo into your computer for either a one- or two-drive computer system.

With One Disk Drive

1. With the ST Computer turned on and the Gem Desktop on the video display screen, double-click on the Floppy Disk B icon.

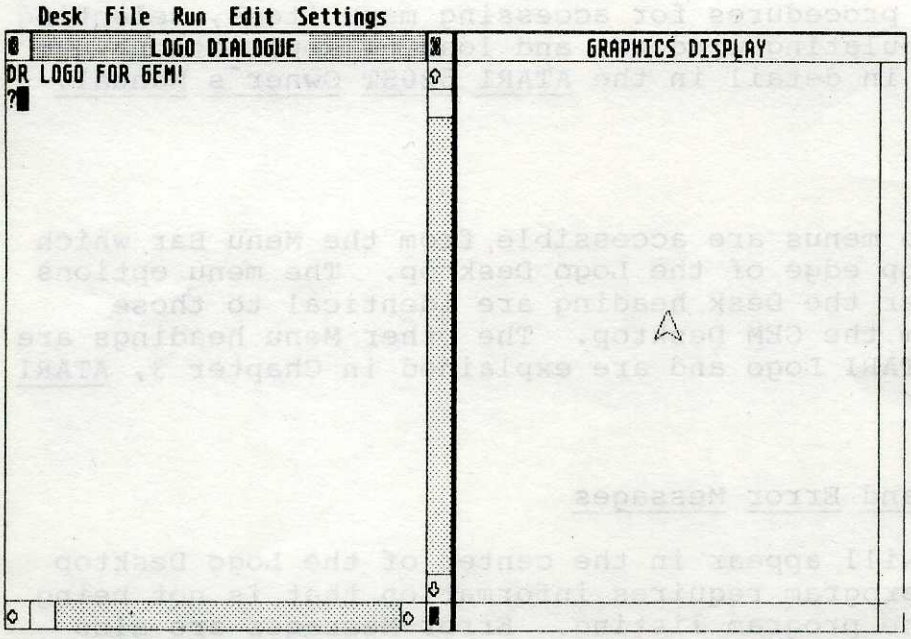
2. When the Dialog Box requests that you insert Disk B into Drive A, place the ST Language disk into Drive A and press the [Return] key.

3. When the Floppy Disk window opens, double-click on the LOGO.PRG icon and the Logo Desktop will appear on the video display screen.

With Two Disk Drives

1. With the ST Computer turned on and the Gem Desktop on the video display screen, insert the ST Language disk into Drive B and double-click on the Floppy Disk B icon.

2. When the Floppy Disk B window opens, double-click on the LOGO.PRG icon and the Logo Desktop will appear on the video display screen.



The Logo Desktop is the main point of reference for all your work with ATARI Logo. Look over Chapter 2, ATARI Logo and Gem, for information on the Logo Desktop and the Logo Windows.

CHAPTER 2
ATARI LOGO AND GEM

ATARI Logo uses the standard operating procedures of the Gem Desktop. The procedures for accessing menu items, selecting options, manipulating windows, and loading applications are all explained in detail in the ATARI 520ST Owner's Manual.

Menus

The ATARI Logo menus are accessible from the Menu Bar which borders the top edge of the Logo Desktop. The menu options available under the Desk heading are identical to those available from the GEM Desktop. The other Menu headings are specific to ATARI Logo and are explained in Chapter 3, ATARI Logo Menus.

Dialog Boxes and Error Messages

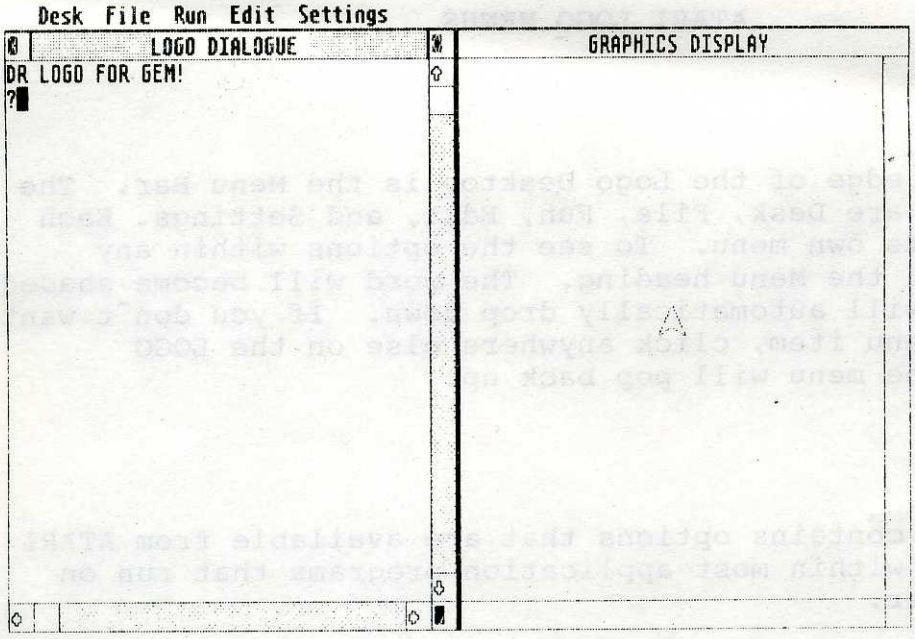
Dialog Boxes will appear in the center of the Logo Desktop whenever the program requires information that is not being provided in the program listing. Error Messages are also presented in a Dialog Box. Whenever an Error Message appears, information concerning a Logo format or procedure will be provided. For a complete listing of ATARI Logo Error Messages, refer to Appendix E.

To exit from a Dialog Box, point at one of the Exit buttons and click the left mouse button. If the Exit button has an enlarged border, you can press the [Return] key on the ST keyboard rather than using the left mouse button.

Windows

The procedures for sizing, moving, opening, closing, scrolling, and managing multiple windows are identical to the methods described in Chapter 4 of the ATARI 520ST Owner's Manual. Please refer to that manual for specific information.

The Logo Desktop is divided into two windows: The Logo Dialogue Window and the Graphics Display Window.



When you write or load a Logo program, the program listing will appear in the Logo Dialogue Window. The corresponding picture will appear in the Graphics Display Window.

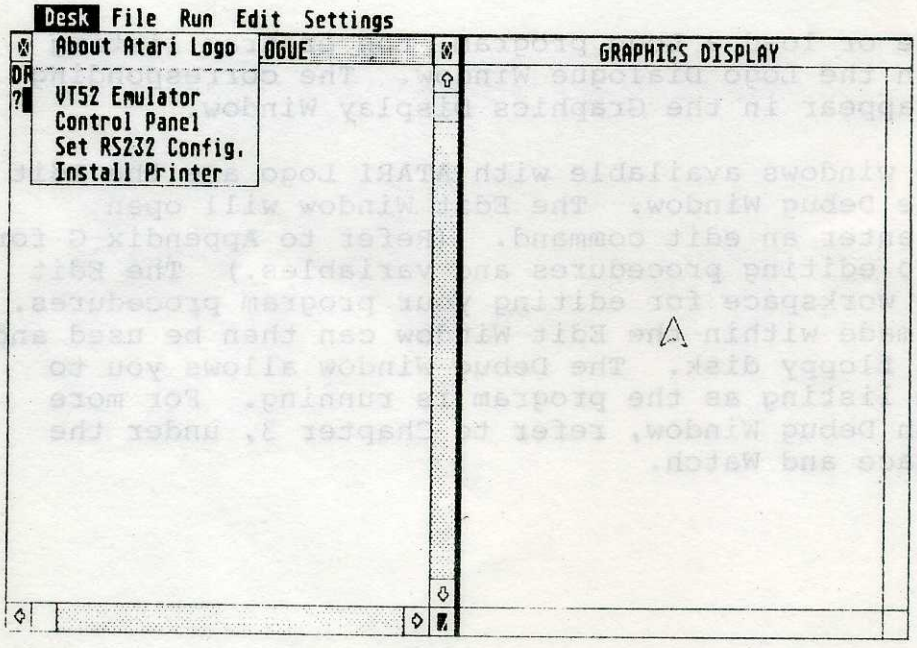
The other two windows available with ATARI Logo are the Edit Window and the Debug Window. The Edit Window will open whenever you enter an edit command. (Refer to Appendix G for a list of Logo editing procedures and variables.) The Edit Window is the workspace for editing your program procedures. Edit changes made within the Edit Window can then be used and stored on the floppy disk. The Debug Window allows you to see a program listing as the program is running. For more information on Debug Window, refer to Chapter 3, under the menu items Trace and Watch.

CHAPTER 3
ATARI LOGO MENUS

Along the top edge of the Logo Desktop is the Menu Bar. The Menu headings are Desk, File, Run, Edit, and Settings. Each heading has its own menu. To see the options within any menu, point at the Menu heading. The word will become shaded and the menu will automatically drop down. If you don't want to select a menu item, click anywhere else on the LOGO Desktop and the menu will pop back up.

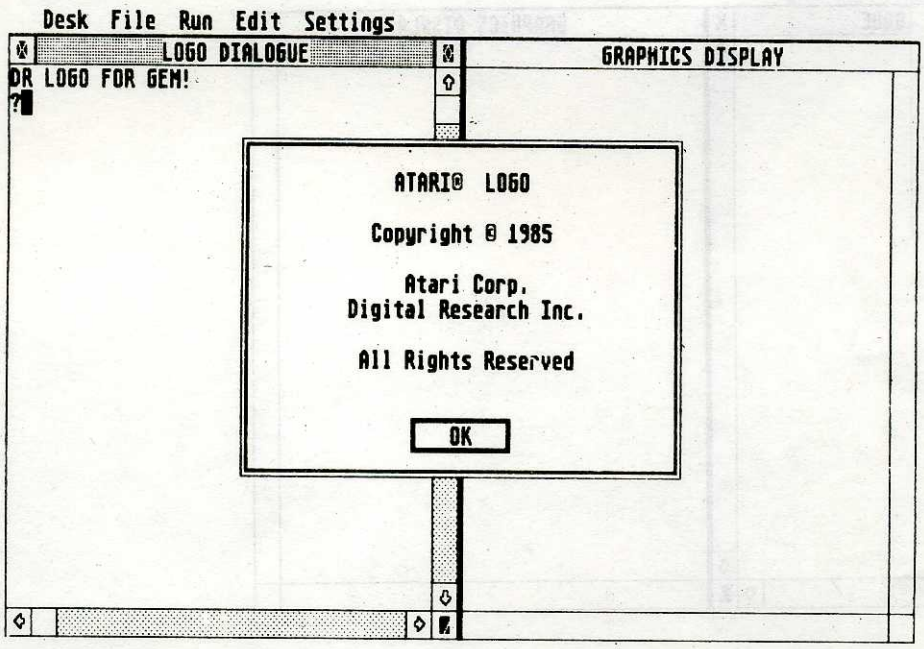
Desk

The Desk menu contains options that are available from ATARI Logo and from within most application programs that run on the ST Computer.



About ATARI Logo

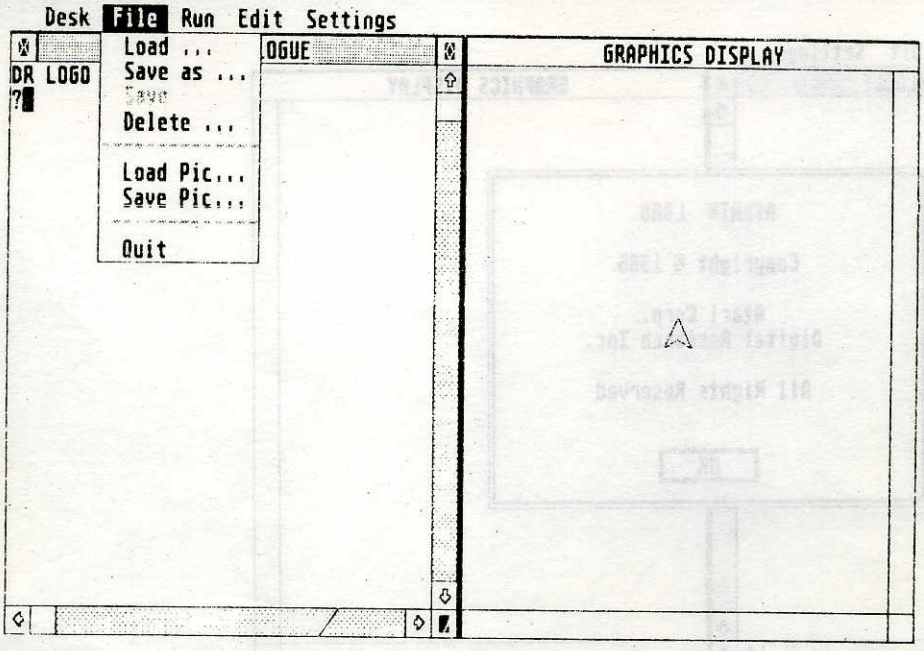
This option is the billboard for the application program. Copyright and general program information are displayed. Select the About ATARI Logo option and the following Dialog Box will be displayed:



The other options in the Desk menu--VT52 Emulator, Control Panel, Set RS232 Configuration, and Install Printer--are explained in detail in the ATARI 520ST Owner's Manual. Refer to the section on each option in Chapter 5, The Opening Menu, of that manual.

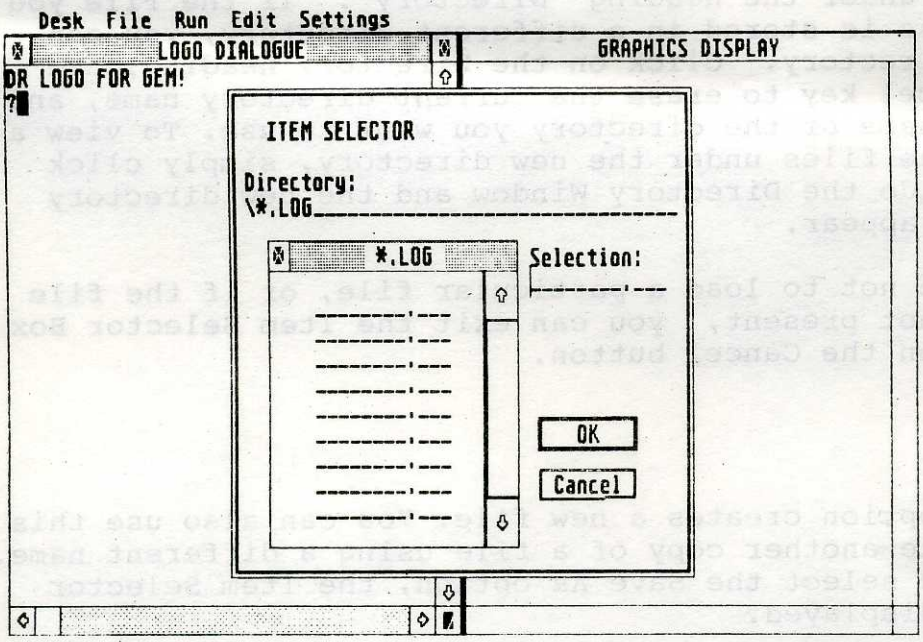
File

The File menu contains options that let you read information from and write information to the disk drive.

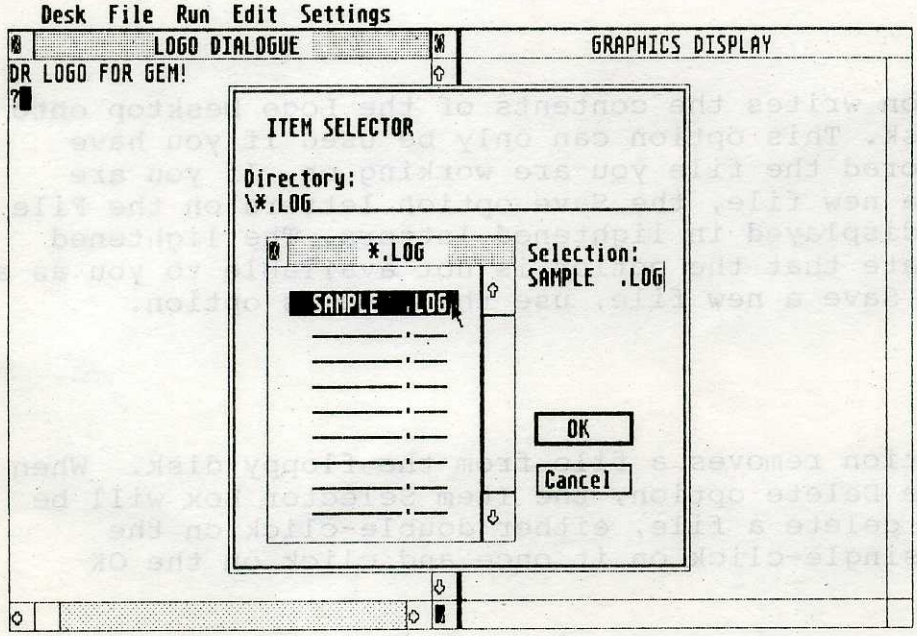


Load

The Load option reads a file that you have stored on a floppy disk. Select the Load option and the following Dialog Box will be displayed:



To select a file listed in the Item Selector Box, point at a filename and double-click the left mouse button. You can also select a file by clicking once on an item and then clicking once on the OK button.



The current directory is displayed at the top of the Item Selector Box under the heading "Directory". If the file you want to access is stored in a different directory, you can change the directory. Click on the Directory heading, use the [Backspace] key to erase the current directory name, and type in the name of the directory you want to use. To view a listing of the files under the new directory, simply click anywhere inside the Directory Window and the new directory listing will appear.

If you decide not to load a particular file, or if the file you want is not present, you can exit the Item Selector Box by clicking on the Cancel button.

Save As

The Save As option creates a new file. You can also use this option to make another copy of a file using a different name. Each time you select the Save As option, the Item Selector Box will be displayed.

To enter the filename in the Item Selector Box, type it in on the ST keyboard. To delete characters, use the [Backspace] key.

Note: You cannot use an existing filename when you name or rename a file.

Save

The Save option writes the contents of the Logo Desktop onto the floppy disk. This option can only be used if you have previously stored the file you are working on. If you are working with a new file, the Save option letters on the File menu will be displayed in lightened letters. The lightened letters indicate that the option is not available to you as a new file. To Save a new file, use the Save As option.

Delete

The Delete option removes a file from the floppy disk. When you select the Delete option, the Item Selector Box will be displayed. To delete a file, either double-click on the filename, or single-click on it once and click on the OK button.

Load Pic

The Load Pic option loads the graphic design stored in your file into the Graphics Display Window. When you select the Load Pic option, the Item Selector Box will be displayed. To load a file, select the filename by either double-clicking the left mouse button or single-clicking the mouse button and then clicking on the OK button.

Note: The Graphics Window will automatically size itself to the dimensions of the picture that is being loaded. The saved file must be in the same resolution as you are currently working in or an Error Message will be displayed.

Save Pic

The Save Pic option lets you store pictures that you have created with Logo. The picture that is currently in the Graphics Display Window is placed into a file on the floppy disk.

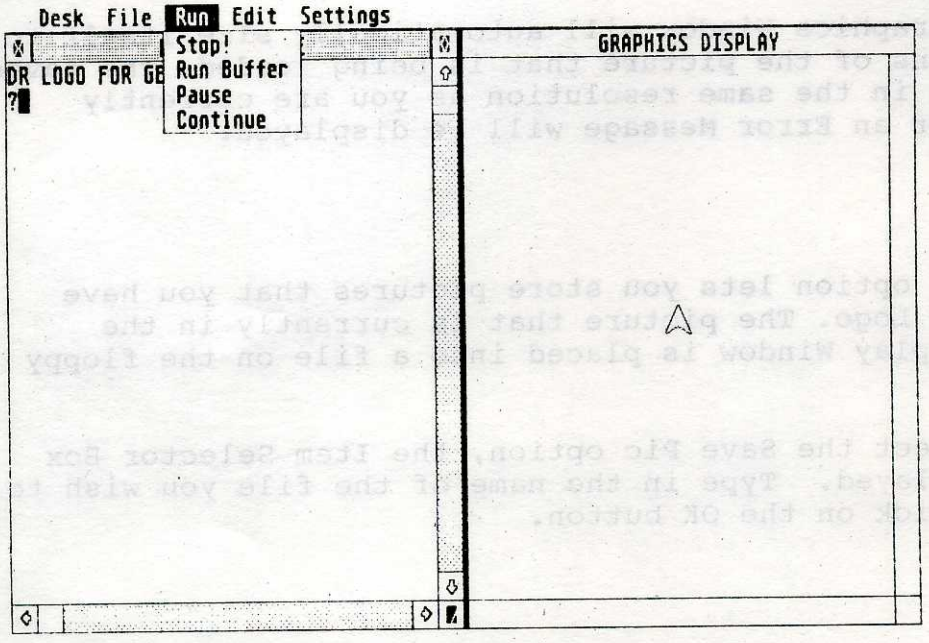
When you select the Save Pic option, the Item Selector Box will be displayed. Type in the name of the file you wish to save, and click on the OK button.

Quit

The Quit option lets you exit ATARI Logo. Before returning to the Logo Desktop, you will be asked if you have saved all of your work. If you have not, you may click the Cancel button and then save any files you wish. If you don't want to save any of your work, click on the OK button and you will be returned to the Desktop.

Run

The Run menu provides options that are used to control the starting and stopping of the procedures you use with ATARI Logo.



Stop

The Stop command will terminate whatever procedure you are running or editing, and return you to the Logo Desktop. The Stop option has the same effect as pressing [CONTROL] [G] on the ST Computer keyboard.

Run Buffer

Each time you enter a command or set of commands into the ST Computer, Logo stores that command line in a memory buffer. When you select the Run Buffer option, Logo runs that command again. For example, if you type the command:

FD 100 [Return]

the turtle will move forward the specified distance. Selecting the Run Buffer option will make the turtle move that distance forward again.

Pause

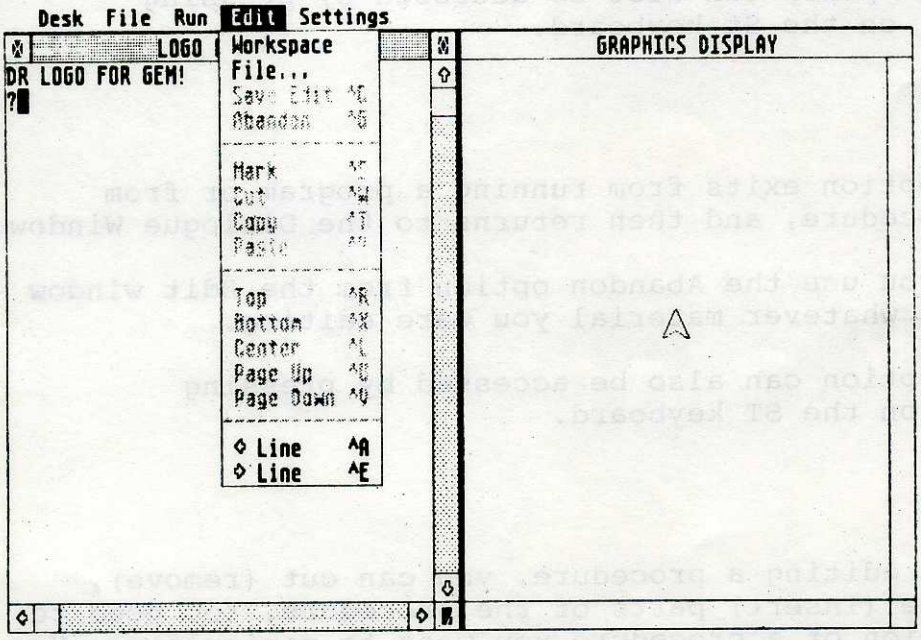
The Pause option temporarily halts a procedure that is currently running. Using the Pause option allows you to enter information with the keyboard onto the Logo Desktop. After you have entered the information you want, you can return to your procedure by entering the keyboard Command CONTINUE, or its abbreviation, CO.

Continue

When you select the Continue option, a procedure that was temporarily halted with a PAUSE command will continue to run. This option serves the same purpose as the keyboard command CONTINUE(CO).

Edit

The Edit menu controls all of the editing capabilities of Logo.



Workspace

The Workspace option places all of the procedures that you have entered into the ST Computer into the Edit Window so you can edit them.

File

The File option lets you load a file from the floppy disk and place it into the Edit Window. When you select the File option, the Item Selector Box will be displayed and you can choose the file to be loaded. After being edited, this file can be discarded with a [Control] [G] or saved to disk with a [Control] [C].

Save Edit ^C

The Save Edit option transfers the material you are editing onto the Logo Desktop.

The Save Edit option can also be accessed by pressing [Control] [C] on the St keyboard.

Abandon ^G

The Abandon option exits from running a program or from editing a procedure, and then returns to the Dialogue Window.

Warning. If you use the Abandon option from the Edit window you will lose whatever material you were editing.

The Abandon option can also be accessed by pressing [Control][G] on the ST keyboard.

Mark ^S

While you are editing a procedure, you can cut (remove), copy, or paste (insert) parts of the procedure. You need to mark the section of a procedure you want to manipulate. Use the Mark option to mark the beginning and end of a section.

To mark a section of a procedure, move the cursor so it is positioned just before the section you want to mark and select the Mark option. Then move the cursor to the end of the section you want to mark and select the Mark option again.

The Mark option can also be accessed by pressing [Control] [S] on the St keyboard

Cut ^W

The Cut option deletes a section of a procedure after the section is marked. If you delete a section and change your mind, you can put that section back (if you haven't selected another section) by selecting the Paste option.

The Cut option can also be accessed by pressing [Control] [W] on the ST keyboard.

Copy ^T

The Copy option places a copy of the marked section into the procedure.

The Copy option can also be accessed by pressing [Control] [T] on the ST keyboard.

Paste ^Y

The Paste option places the cut section into the procedure.

The Paste option can also be accessed by pressing [Control] [Y] on the ST keyboard.

Top ^R

The Top option moves the cursor to the top of the procedure in the Edit Window.

The Top option can also be accessed by pressing [Control] [R] on the ST keyboard.

Bottom ^X

The Bottom option moves the cursor to the bottom of the procedure in the Edit Window.

The Bottom option can also be accessed by pressing [Control] [X] on the ST keyboard.

Center ^L

The Center option scrolls the line indicated by the cursor to the center of the Edit Window.

The Center option can also be accessed by pressing [Control] [L] on the ST keyboard.

Page Up ^U

The Page Up option scrolls the procedure in the Edit Window up one window full of text.

The Page Up option can also be accessed by pressing [Control] [U] on the ST keyboard.

Page Down ^V

The Page Down option scrolls the procedure in the Edit Window down one window full of text.

The Page Down option can also be accessed by pressing [Control] [V] on the ST keyboard.

<= Line ^A

The <= Line option moves the cursor to the beginning of the line.

The <= Line option can also be accessed by pressing [Control] [A] on the ST keyboard.

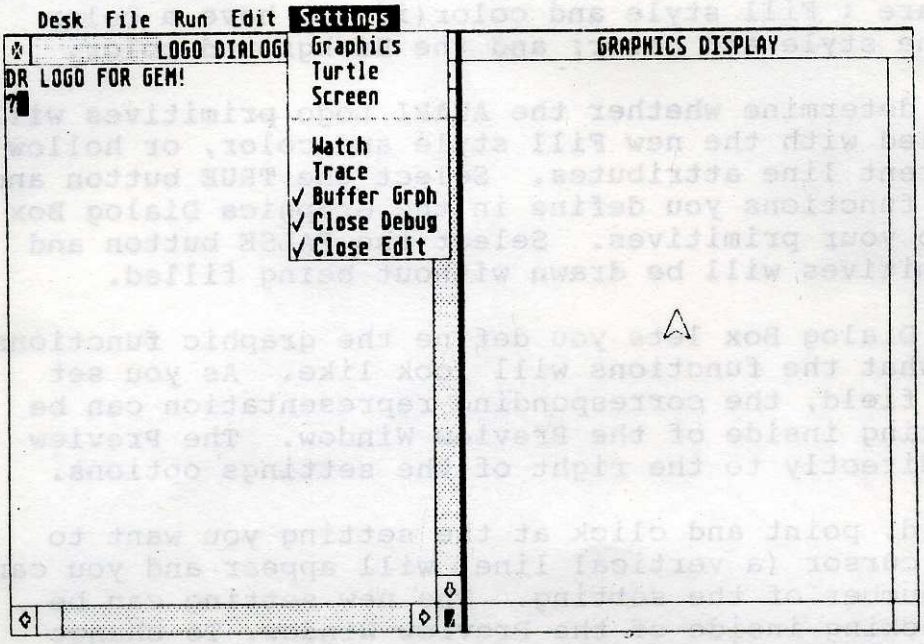
=> Line ^E

The => Line option moves the cursor to the end of the line.

The => Line option can also be accessed by pressing [Control] [E] on the ST keyboard.

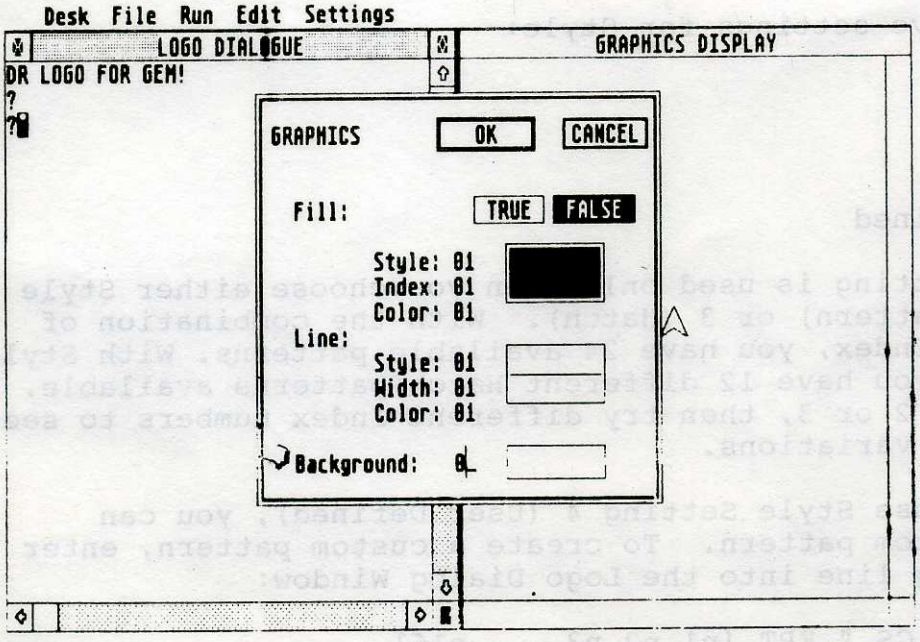
Settings

The Settings Menu options control many of the major operating options of ATARI Logo. With these menu options you can change the line and fill patterns, determine which windows open and close, and define the movements of the turtle.



Graphics

Select the Graphics option and the Graphics Dialog Box will be displayed:



The three graphics functions that you can customize with this menu option are : Fill style and color(if you have a color monitor); Line style and color; and the Background color.

You can also determine whether the ATARI Logo primitives will be drawn filled with the new Fill style and color, or hollow with the current line attributes. Select the TRUE button and the graphics functions you define in the Graphics Dialog Box will apply to your primitives. Select the FALSE button and the Logo primitives will be drawn without being filled.

The Graphics Dialog Box lets you define the graphic functions and preview what the functions will look like. As you set the graphics field, the corresponding representation can be seen by clicking inside of the Preview Window. The Preview Windows are directly to the right of the settings options.

To set a field, point and click at the setting you want to change. The cursor (a vertical line) will appear and you can type in the number of the setting. The new setting can be viewed by clicking inside of the Preview Window. To change the setting, type in a different number. To change a different settings option, point at the setting and click the mouse button. The cursor will move to the new setting.

To integrate your new graphics functions into the Logo program, select the OK button. To cancel your new settings, select the CANCEL button.

Fill The Fill characteristics can be defined by Style, Index, and Color.

There are five settings for Style:

0=Hollow
1=Solid
2=Pattern
3=Hatch
4=User Defined

The Index setting is used only when you choose either Style Setting 2 (Pattern) or 3 (Hatch). With the combination of Style 2 and Index, you have 24 available patterns. With Style 3 and Index you have 12 different Hatch patterns available. Choose Style 2 or 3, then try different Index numbers to see the possible variations.

When you choose Style Setting 4 (User Defined), you can create a custom pattern. To create a custom pattern, enter the following line into the Logo Dialog Window:

```
PPROP "GRAPHICS ".FPT [n1 n2 n3 ... n16]
```

The numbers n1 through n16 determine the actual pattern. These numbers can be any whole number between 0 and 65535. The pattern will be made up of the binary representation of the numbers used.

As an example, enter the following version of the custom pattern. To modify the pattern, experiment by changing the numbers.

```
PPROP "GRAPHICS ".FPT [0 0 128 448 992 2032 4088 8188 16382
8188 4088 2302 992 448 1280]
```

The Color Setting is either 1 (black) or 0 (white) with a monochrome monitor. With an ATARI RGB Color Monitor, you can choose four colors (0-4) or 16 colors (0-15) depending on the resolution you are working with. To adjust the colors, you can use the Logo SETPAL command or the Control Panel. Refer to the section on the Control Panel in Chapter 5 of the ATARI 520ST Owner's Manual for more information.

Line The Line Characteristics can be defined by Style, Width, and Color.

The Style Setting has seven different styles available (1-7). When you choose Style 1 you have 39 available line widths. Choose Style 1, then select a Width from 1-39.

Line Style 7 is the user defined setting. To create a custom line pattern, enter the following line into the Logo Dialogue Box:

```
PPROP "GRAPHICS ".LPT n1
```

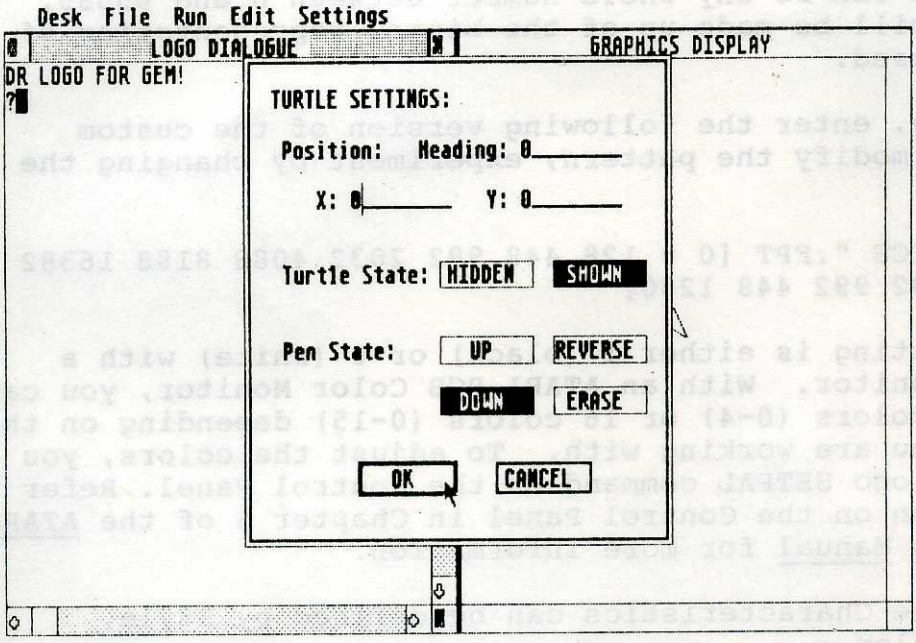
Experiment by changing the number to create different patterns.

The Color Setting for Line is set exactly the same as for Fill.

Background The Background Setting establishes the color of the background. The Color Setting is either 1(black) or 0(white) with a monochrome monitor. With an ATARI RGB Color Monitor, you can choose four colors(0-3) or 16 colors(0-15) depending on the resolution you are working with. To adjust the colors, refer to the section on the Control Panel in Chapter 5 of the ATARI 520ST Owner's Manual.

Turtle

When you select the Turtle option from the Settings Menu the Turtle Settings Box is displayed.



The Turtle Settings Box allows you to control the Position and State of the Turtle, and the Pen State. You can also refer to this Dialog Box to view the current status of the turtle.

To set a function in the Turtle Settings Box, point and click at the setting you want to change. The cursor (a vertical line) will appear and you can type in the number of the setting.

Turtle Heading To change the Turtle's Heading (direction), enter a number into the space following "Heading". The number 0 will instruct the turtle to head straight upwards. Other numbers will indicate different directions.

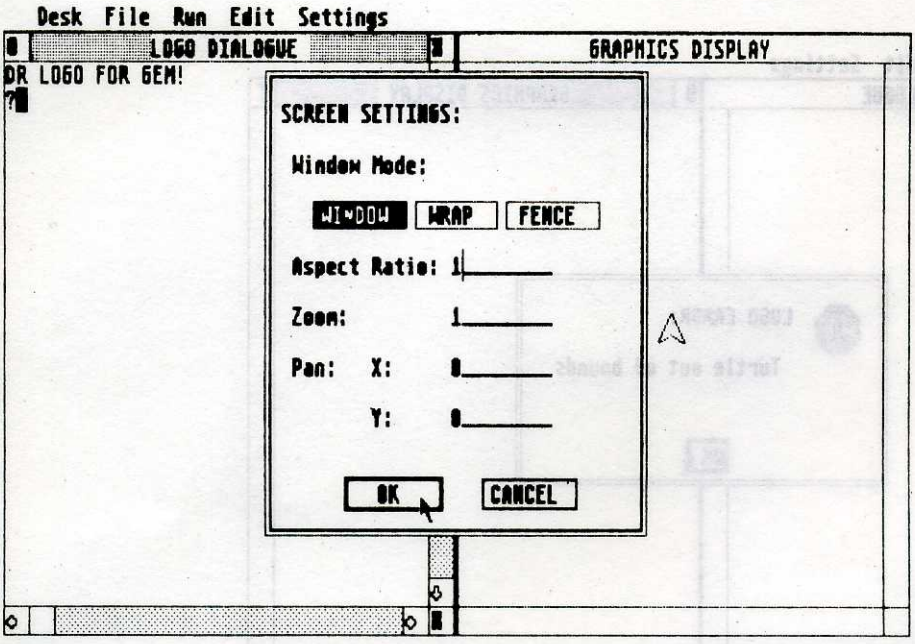
Turtle Position To set the Turtle's Position, enter numbers in the X and Y coordinate positions. The coordinates 0,0 are at the center of the Graphics Window.

Turtle State and Pen State To set the Turtle State and Pen State, select the setting you want by clicking on the button for the setting.

When you have established all the settings, select either OK to confirm your selections, or CANCEL to disregard them.

Screen

Select the Screen option from the Settings Menu and the Screen Settings Box will be displayed.



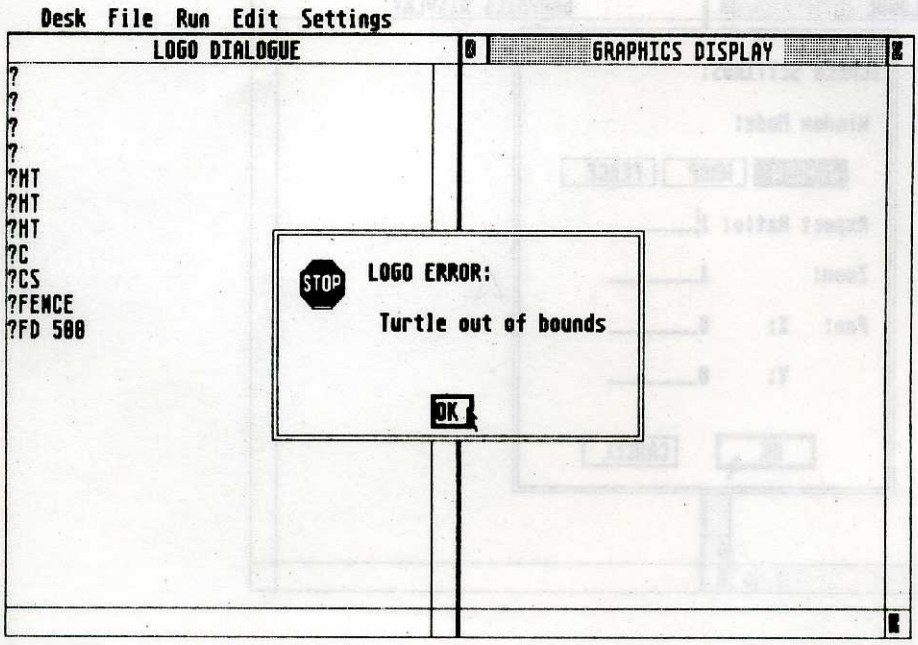
The Screen Settings Box allows you to control the Window Mode, the Aspect Ratio, and the Zoom and Pan values.

To set a function in the Screen Settings Box, point and click at the setting you want to change. The cursor (a vertical line) will appear and you can type in the number of the setting.

Window Mode There are three settings for Window Mode: WINDOW, WRAP, and FENCE. To select one of the settings, simply click on the appropriate button.

The WINDOW setting lets the turtle draw beyond the edge of the window.

The WRAP and FENCE settings constrain the turtle to the screen in different ways. The WRAP setting will allow the turtle to draw off the edge of the screen area by making it reappear on the opposite side of the screen. When you use the FENCE setting, entering a command that sends the turtle off the edge of the screen gives you the following Error Message:



Aspect Ratio Changing the Aspect Ratio affects the shape of the objects you draw. For example, if you choose an Aspect Ratio of 1 and draw an ellipse in the middle of the screen, and then change the Aspect Ratio to .5, the ellipse will be flattened. Changing the Aspect Ratio to 1.5 will change the shape of the ellipse in the opposite direction.

Zoom The Zoom function changes the size of the pictures drawn by scaling down the values of x and y. For example, the standard Zoom value is 1. If you draw a circle in standard Zoom mode and change the Zoom setting to 2, the next time you draw a circle, the proportions will be twice as large. Changing the Zoom setting to .5 will change the proportions by one half.

Pan The Pan Function changes the location of the picture in relation to the center of the screen. Setting the Pan coordinates establishes the starting point for any picture you draw within the Graphics Window.

Watch

The Watch option on the Settings Menu opens the Debug Window. Within the Debug Window, the steps of your procedure are displayed as they are executed.

Trace

The Trace option on the Settings Menu also opens the Debug Window. By viewing the Trace Window, you can determine what values are being assigned to your variables at any time while your program is running.

Buffer Grph

Whenever you draw something in the Graphics Display Window, that image is saved in a buffer. If you open another window over the Graphics Window and then close the window, the image in the Graphics Window will be redrawn. If Logo cannot find enough memory for a buffer, it will send the graphics to your floppy disk. Sending the graphics to the floppy disk is a time consuming operation, so you may consider turning off the Buffer if this happens. You can turn off the redrawing procedure by selecting Buffer Grph. The Buffer Grph is off when there isn't a check mark in front of the option.

Close Debug

The Close Debug option lets the Debug Window remain open after the debugging procedure is completed. The Close Debug option is selected when a check mark is visible in front of the option on the menu.

Close Edit

The Close Edit option lets the Edit Window remain open after the editing procedure is completed. The Close Edit option is selected when a check mark is visible in front of the option on the menu.

APPENDIX A
LOGO CONTROL CHARACTER COMMANDs

Use the Control Character Commands to control the screen display and cursor movements. To enter a Control Character Command, hold down the Control key and press the indicated letter key.

Character		Effect
Ctrl-A		Moves the cursor to the beginning of the line.
Ctrl-B		Moves the cursor one position to the left.
Ctrl-C	*	Exits the text editor and updates the Logo workspace with the definitions of all the procedures and variables in the text editor's buffer.
Ctrl-E		Moves the cursor to the end of the line.
Ctrl-F		Moves the cursor one position to the right.
Ctrl-G		When outside the text editor, [Control][G] immediately terminates the current procedure. When inside the text editor, it exits the text editor without updating the Logo workspace and discarding any changes made during the text editing session.
Ctrl-H		Deletes the character to the left of the cursor.
Ctrl-I		Moves the cursor to the next tab setting (column 5, 9, 13...) and inserts up to 4 spaces in the current line.
Ctrl-K		Deletes all characters to the right of the cursor. Deleted characters are stored in a buffer and can be restored with a [Control][Y].
Ctrl-L	*	When inside the text editor, [Control][L] readjusts the display so that the line currently indicated by the cursor is positioned at the center of the window. If the cursor is less than 12 lines from the beginning of the buffer, the text editor redisplays the window when [Control][L] is pressed.
Ctrl-M		Generates a carriage return and enters information into the computer.

Ctrl-N		Moves the cursor to the next line in the text editor. The cursor moves down one line towards the end of the buffer.
Ctrl-O	*	Opens a new line in the text editor. It is equivalent to pressing [Enter] followed by [Control][B].
Ctrl-P		Moves the cursor to the previous line and the cursor moves up one line towards the beginning of the buffer.
Ctrl-Q		Generates the quoting character # that makes Logo treat a delimiter character as a literal character. Delimiter characters are: [ ] ( ) " : ; = < > + / ~.
Ctrl-R	*	Positions the cursor at the beginning of the text editor's buffer.
Ctrl-S	*	Marks block.
Ctrl-T	*	Copies block.
Ctrl-U	*	Displays the previous page of text in the text editor's buffer.
Ctrl-V	*	Displays the next page of text in the text editor's buffer.
Ctrl-W	*	Deletes (cut) block.
Ctrl-X	*	Positions the cursor at the end of the text editor's buffer.
Ctrl-Y		Redisplays the line most recently stored in the buffer by an [Enter], or [Control][K], or cut/copy.
Ctrl-Z		Interrupts the current procedure and displays a pause prompt to allow interactive debugging. Enter CO to continue the execution of the interrupted procedure; enter THROW "TOPLEVEL to exit to the outer most level; enter STOP to exit to the prior level.

* Indicates the character is valid only within the text editor.

APPENDIX B
LOGO SYSTEM PRIMITIVES

An ATARI Logo system primitive is preceded by a period and allows the user to look at memory locations or manipulate lists.

Primitive	Inputs	Definition and Example
.CONTENTS		Displays the contents of the ATARI Logo symbol space. ?.CONTENTS
.DEPOSIT	n1 n2	Puts n2 into the absolute memory location specified by the first input number. ?.DEPOSIT 2051 7
.EXAMINE	n	Displays the contents of the absolute memory location specified by the input number (byte value). ?.EXAMINE 2051 7
.REPLACE	item n varlist object	Replaces the specified item in the list with the object. The list must be the value of a variable. ?MAKE "VARLIST [A B C D E F] ?.REPLACE 4 :VARLIST [1 2 3] ?:VARLIST [A B C [1 2 3] E F]
.REPTAIL	item_n varlist object	Replaces all items following the specified item in the list with the object. The list must be the value of a variable. ?MAKE "VARLIST [A B C D E F] ?.REPTAIL 4 :VARLIST [1 2 3] ?:VARLIST [A B C D 1 2 3]

APPENDIX C
LOGO SYSTEM VARIABLES

Variables	Definition and Example
ERRACT	When TRUE, causes a pause when an error occurs.
FALSE	System value.
GFILL	If TRUE, graphic objects are filled using current fill attributes.
GRAPHICS	Holds property lists defining user fill and line type patterns. PPROP "GRAPHICS ".FPT [<16 integers>] PPROP "GRAPHICS ".LPT <integer>
PD	Value of turtle's pen state meaning PENDOWN.
PE	Value of turtle's pen state meaning PENERASE.
PU	Value of turtle's pen state meaning PENUP.
PX	Value of turtle's pen state meaning PENREVERSE.
REDEFP	When TRUE allows redefinition of primitives.
TOPLEVEL	Interpreter's prompt (?). When ATARI Logo is at TOPLEVEL a question mark displays, there are no procedures on the stack, and the level number is zero. A THROW will exit all pending procedures.
TRUE	System value.

APPENDIX D
LOGO SYSTEM PROPERTIES

Property Name	Property Value
.APV	Associated Property Value. The value of a global variable.
.BUR	When TRUE, package is buried.
.DEF	Definition of a procedure.
.ENL	End of a procedure line that is broken by a carriage return and spaces.
.FMT	Beginning of a procedure line that is broken by a carriage return and spaces
.FPT	Identifies user-defined fill pattern.
.LPT	Identifies user-defined line type.
.PAK	Name of package to which this object belongs.
.PKG	When TRUE, the object is a package name.
.PRM	Identifies a primitive.
.REM	Remark or comment.
.SPC	Space.

APPENDIX E
LOGO ERROR MESSAGES

Message

Number too big
No file selected
(symbol) is a primitive
Can't find LABEL (symbol)
Can't (symbol) from the editor
I'm having trouble with the disk
Disk is full
Can't divide by zero
File is not open
File already exists
File not found
Can't find CATCH for (symbol)
I'm out of space
(symbol) is not true nor false
Not enough inputs to (procedure)
Too few items in (list)
Turtle out of bounds
I don't know how to (symbol)
(symbol) has no value
)without(
I don't know what to do with (symbol)
Primitive not implemented
Disk is write-protected
(procedure) doesn't like (symbol) as input
(procedure) didn't output
The word is too long
I don't have enough buffer space
IF wants [ ]'s around instruction list
(symbol) isn't a parameter
I can't (symbol) while loading
The file is write-protected
I can't find the disk drive
No PAN with FENCE or WRAP
Error messages for picture files

APPENDIX F
LOGO PRIMITIVES

The Logo primitive and its input(s) are listed alphabetically followed by a definition. Primitive names are entered in uppercase characters.

Primitive	Inputs	Definition and Example
ABS	n	Outputs the absolute value of the input number. ?ABS -3 3
AND	expression, expression...	Outputs TRUE if all input exressions are true. Otherwise it outputs FALSE. ?AND (3<4) (7>4) TRUE
ARC	[x y radius begin_angle end_angle]	Makes ATARI Logo draw an arc at the x- and y- coordinates with the input radius, using the input beginning and ending angles.
ARCTAN	n	Outputs the arc tangent (inverse tangent) of the input number. Outputs are in degrees. ?ARCTAN 2 63.434953
ASCII	word	Outputs the ASCII value of the first character in the input word. ?ASCII "GREEN 71 ASCII "G 71
BACK BK	distance_n	Moves the turtle the input number of steps in the opposite direction of its heading. ?BACK 50

BOX	[x y width height]	Makes Logo draw a box at the x- and y- coordinates with the input width and height.
BURY	pkgname | pkgname_list	Hides the specified package(s) from work space management commands: EDALL, EDNS, EDPS, ERALL, ERNS, ERPS, GLIST, POALL, PONS, POPS, POTS, PPS, SAVE. ?BURY "PLAY.PACK
BUTFIRST BF	object	Outputs all but the first element in the input object. ?BUTFIRST "SMILES MILES ?BF [1 2 3] [2 3]
BUTLAST BL	object	Outputs all but the last element in the input object. ?BUTLAST [1 2 3 4] [1 2 3]
BYE		Exits current session of Logo and returns you to the Desktop. ?BYE
CATCH	name instr_list	Traps errors and special conditions that occur during the execution of the input instruction list. >CATCH "ERROR [DO.IT.UNTIL] >PRINT [I CAUGHT AN ERROR]
CHANGEF	new fname old fname	Change File. Changes the name of a file in the disk directory. ?CHANGEF "NEWFILE "OLDFILE
CHAR	n	Outputs the character whose ASCII value is the input number. ?CHAR 83 S
CIRCLE	[x y radius]	Makes Logo draw a circle at the x- and y- coordinates with the input radius.
CLEAN		Erases the viewport without affecting

the turtle.

```
?CLEAN
```

CLEARSCREEN
CS

Erases the viewport and puts the turtle at [0 0] heading 0 (north) with the pen down.

```
?CLEARSCREEN
```

CLEARTEXT
CT

Erases all text in the text window then positions the cursor in the upper-left hand corner of the text window.

```
?CLEARTEXT
```

CO <object>

COntinue. Ends a pause caused by PAUSE, a [Control][Z] keystroke, or ERRACT.

```
TO SQUARE
REPEAT 4 [FD 50 FT 90]
END

Pausing... in SQUARE: [PAUSE] SQUARE
?CO
```

COPYDEF new_procname
old_procname

Makes a copy of a procedure definition with another name within the computer's memory.

```
?COPYDEF "SQUARE "BOX
```

COPYOFF

Stops echoing text at the printer.

```
?COPYOFF
```

COPYON

Starts echoing text at the printer.

```
?COPYON
```

COS degrees_n

COSine. Outputs the cosine of the input number of degrees.

```
?COS 60
.5
```

COUNT object

Outputs the number of elements in the input object.

```
?COUNT "six
3
?COUNT [0 1 2 3]
4
```

DEFINE	procname defin_list	Defines a new word--similar to TO but must be one line. ?DEFINE "SAY.Hi ?SAY.Hi Hi!
DEFINEDP	object	Outputs TRUE if the input name identifies a defined procedure. Otherwise it outputs FALSE. ?DEFINEDP "SAY.HI TRUE
DEGREES	radians_n	Outputs the number of degrees in the input number of radians. ?DEGREES 25 1432.394742
DIR	<fname>	Outputs a list of Logo file (.LOG) names on the default or specified disk and accepts an ambiguous file name. ?DIR [STARS.LOG] ?DIR "B: [B:AVERAGE.LOG B:TOOLS.LOG]
EDALL	<pkgname | pkgname_list>	Loads all the procedures and variables in the workspace or the specified package(s) into the text editor's buffer. ?EDALL
EDF	fname	Loads the specified disk file into the text editor's buffer or creates a new file. ?EDF "STARTUP
EDIT ED	<name | name_list>	Loads the specified procedure(s) and/or variable(s) into the text editor's buffer. ?ED "SQUARE
EDNS	<pkgname | pkgname list>	Loads all the variables in the work-space or the specified package(s) into the text editor's buffer. ?EDNS "PRACTICE.PACK

EDPS	<PKGNAME | pkgname list>	Loads all the procedures in the workspace or the specified package(s) into the text editor's buffer. ?EDPS "PLAY.PACK
ELLIPSE	[x y X-radius Y-radius]	Makes Logo draw an ellipse at the input x- and y- coordinates with the input X- and Y- radius.
EMPTYP	object	Outputs TRUE if the input object is an empty word or a empty list. Otherwise it outputs FALSE. ?EMPTYP " TRUE ?EMPTYP [] TRUE ?EMPTYP [x] FALSE
END		Indicates the end of a procedure definition. END must be the last line of a procedure. ?TO SAY. HI >PRINT "HI >END SAY.HI defined ?
EQUALP	object object	Outputs TRUE if input objects are equal numbers, identical words, or identical lists. Otherwise it outputs FALSE. ?EQUALP "POP "POP TRUE
ERALL	<pkgname | pkgname_list>	Erases all the unburied procedures and variables from the workspace or the specified unburied package(s). ?ERALL
ERASE ER	procname | procname_list	Erases the specified unburied procedure(s) from the workspace. ?ERASE "BOX
ERASEFILE	fname	Erases the specified disk file. ?ERASEFILE "B:\PIGLATIN ?LOAD "B:\PIGLATIN

DEFINE	procname defin_list	Defines a new word--similar to TO but must be one line. ?DEFINE "SAY.Hi ?SAY.Hi Hi!
DEFINEDP	object	Outputs TRUE if the input name identifies a defined procedure. Otherwise it outputs FALSE. ?DEFINEDP "SAY.HI TRUE
DEGREES	radians_n	Outputs the number of degrees in the input number of radians. ?DEGREES 25 1432.394742
DIR	<fname>	Outputs a list of Logo file (.LOG) names on the default or specified disk and accepts an ambiguous file name. ?DIR [STARS.LOG] ?DIR "B: [B:AVERAGE.LOG B:TOOLS.LOG]
EDALL	<pkgname | pkgname_list>	Loads all the procedures and variables in the workspace or the specified package(s) into the text editor's buffer. ?EDALL
EDF	fname	Loads the specified disk file into the text editor's buffer or creates a new file. ?EDF "STARTUP
EDIT ED	<name | name_list>	Loads the specified procedure(s) and/or variable(s) into the text editor's buffer. ?ED "SQUARE
EDNS	<pkgname | pkgname list>	Loads all the variables in the workspace or the specified package(s) into the text editor's buffer. ?EDNS "PRACTICE.PACK

EDPS	<PKGNAME | pkgname list>	Loads all the procedures in the workspace or the specified package(s) into the text editor's buffer. ?EDPS "PLAY.PACK
ELLIPSE	[x y X-radius Y-radius]	Makes Logo draw an ellipse at the input x- and y- coordinates with the input X- and Y- radius.
EMPTYP	object	Outputs TRUE if the input object is an empty word or a empty list. Otherwise it outputs FALSE. ?EMPTYP " TRUE ?EMPTYP [] TRUE ?EMPTYP [x] FALSE
END		Indicates the end of a procedure definition. END must be the last line of a procedure. ?TO SAY. HI >PRINT "HI >END SAY.HI defined ?
EQUALP	object object	Outputs TRUE if input objects are equal numbers, identical words, or identical lists. Otherwise it outputs FALSE. ?EQUALP "POP "POP TRUE
ERALL	<pkgname | pkgname_list>	Erases all the unburied procedures and variables from the workspace or the specified unburied package(s). ?ERALL
ERASE ER	procname | procname_list	Erases the specified unburied procedure(s) from the workspace. ?ERASE "BOX
ERASEFILE	fname	Erases the specified disk file. ?ERASEFILE "B:\PIGLATIN ?LOAD "B:\PIGLATIN

File not found

ERN	varname | varname list	Erases the specified unburied variable(s) from the workspace. ?ERN [SIDE ANGLE]
ERNS	<pkgname | pkgname_list>	Erases all unburied variables from the workspace or the specified unburied package(s). ?ERN "DRAW.PACK
ERPS	<pkgname | pkgname_list>	Erases all unburied procedures from the workspace or the specified unburied package(s). ?ERPS [DRAW.PACK MOVE.PACK]
ERROR		Outputs a list whose elements describe the most recent error. ?ERROR [29 [Not enough input to CIRCLE] CIRCLE [CIRCLE] [] []]
EXP	n	Outputs the natural exponent of the input number. ?EXP 1 2.71828
FENCE		Establishes a boundary that limits the turtle to plotting within the viewport ?FENCE ?FORWARD 300 Turtle out of bounds.
FILL		Paints an area with the current fill color, changing the dot under the turtle (and all horizontally and vertically contiguous dots of the same color) to the current fill attributes. ?FILL
FILLATTR		Outputs the style, index, and color attributes of the current fill pattern.
FIRST	object	Outputs the first element of the input object. ?FIRST "ZEBRA

```
Z
?FIRST [1 2 3]
1
```

FOLLOW procname procname

Reorganizes the workspace so the first input-named procedure is followed by the second.. FOLLOW does not change the order of procedures in a package definition.

```
?FOLLOW "FIRST "SECOND
```

FORWARD distance_n
FD

Moves turtle the input number of steps in the direction of its current heading.

```
?FORWARD 100
```

FPUT object object

Outputs a new object formed by making the first input object the first element in the second input object.

```
?FPUT "S "MILES
SMILES
?FPUT 1 [2 3]
[1 2 3]
```

GETTEXT

Outputs the effect number of the current special graphic text attributes.

GLIST prop <pkgname |pkgname_list>

Outputs a list of all objects in the workspace or specified package(s) that have the input property in their property lists.

```
?GLIST ".DEF "FLY
[FLY BUZZ ZOOM]
```

GO word

Executes the line within the current procedure following a LABEL expression with the same input word.

```
?GO "LOOP
```

GPROP name prop

Outputs the value of the named property of the named object.

```
?MAKE "HEIGHT "72
?GPROP "HEIGHT ".APV
72
?GPROP "HEIGHT ".DEV
[]
```

HEADING

Outputs the number that indicates the

		turtle's current heading. ?HEADING 126
HIDETURTLE HT		Makes the turtle invisible, which speeds and clarifies the drawing. ?HIDETURTLE
HOME		Returns the turtle to position [0 0] heading 0 (north). ?HOME
IF	pred_exp instr_list <instr_list>	Executes one of two literal instruction lists depending on the value of the input predicate expression. >IF (:A > :B) [PRINT [:A IS BIGGER]] > [PRINT [:B IS BIGGER]]
IFFALSE IFF	instr list	Executes the input instruction list if the most recent TEST expression was FALSE. (See TEST explanation for example.)
IFTRUE IFT	instr_list	Executes the input instruction list if the most recent TEST expression was TRUE. (See TEST explanation for example.)
INT	n	Outputs the integer portion of the input number. ?INT 3.333 3
ITEM	n object	Outputs the specified element of the input object. ?ITEM 4 "DWARF R
KEYP		Outputs TRUE if a character has been typed at the keyboard and is waiting to be read. ?KEYP FALSE
LABEL	word	Identifies the line to be executed after a GO expression with the input

word.

LABEL "LOOP

LAST	object	outputs the last element of the input object. ?LAST [0 2 4] 4
LEFT LT	degrees_n	Rotates the turtle the input number of degrees to the left. ?LEFT 90
LINEATTR		Outputs the style, width, and color attributes of the current line type.
LIST	object object (...)	Outputs a list made up of the input objects retains the list's outer brackets. ?LIST "BIG [FEET] [BIG [FEET]] ?(LIST) ?(LIST 1 2 3 4) [1 2 3 4]
LISTP	object	Outputs TRUE if the input object is a list; otherwise outputs FALSE. ?LISTP "WORD FALSE
LOAD	fname <pkgname>	Reads the input-named Logo file (.LOG) from the disk into the workspace; optionally packages file into the specified package. ?LOAD "PIGLATIN "PIG.PACK BEGIN.VOWELP defined PIG defined PIGLATIN defined
LOADPIC	fname	Paints the graphic design saved in the input-named picture file onto the graphic viewport. ?LOADPIC "B:\DESIGNS
LOCAL	varname (...)	Makes the input-named variable(s) accessible only to the current procedure and the procedures it calls.

```
?(LOCAL "A "B "C)
```

LOG n

Outputs the natural logarithm of the input number.

```
?LOG 2
0.693147
```

LOG10 n

Outputs the base 10 common logarithm of the input number.

```
?LOG10 100
2
```

LOWERCASE word
LC

Outputs the input word with all alphabetic characters in the lower case.

```
?LOWERCASE "SOUTH
south
```

LPUT object object

Outputs a new object formed by making the first input object the last element in the second input object.

```
?LPUT 4 [1 2 3]
[1 2 3 4]
LPUT "A [BCD]
[BCDA]
```

MAKE varname object

Outputs a new object formed by making the first input object the last element in the second input object.

```
?MAKE "SIDE 50
?:SIDE
50
```

MEMBERP object object

Outputs TRUE if the first input object is an element of the second input object. Otherwise it outputs FALSE.

```
?MEMBERP "Y "ONLY
TRUE
```

MOUSE

Outputs a list that contains the current mouse state in the form [x y b1 b2 b3].

x & y is the coordinate position, b1, and b2 are left and right mouse buttons that output TRUE if pressed. b3 outputs TRUE if the mouse pointer

		is over the graphic viewport. Otherwise it outputs FALSE. ?MOUSE [50 35 TRUE FALSE TRUE]
NAME	object varname	Makes the input object the value of the input-named variable. ?NAME 50 "SIDE ?:SIDE 50
NAMEP	word	Outputs TRUE if the input word identifies a defined variable. Otherwise it outputs FALSE. ?MAKE "FLAVOR "CHOCOLATE ?NAMEP "FLAVOR TRUE ?NAMEP "VANILLA FALSE (When previously indicated)
NODES		Outputs the number of free nodes in the workspace (1 node = 4 bytes). ?NODES 684
NOFORMAT		Removes procedure formatting, including comments, from the workspace. ?NOFORMAT
NOT	exp	Outputs TRUE if the input expression is FALSE. Outputs FALSE if the input is TRUE. ?NOT (3 = 4) TRUE
NOTRACE		Turns off trace monitoring of procedure execution. ?NOTRACE
NOWATCH	<procname | procname_list>	Turns off watch monitoring of all or specified procedure(s). ?NOWATCH "AVERAGE
NUMBERP	object	Outputs TRUE if the input object is a number. Otherwise it outputs FALSE.

```
                                ?NUMBERP "TWO
                                FALSE

                                ?NUMBERP "2
                                TRUE
```

OR — exp / exp (...)

Outputs FALSE if all input expressions are FALSE. Otherwise it outputs TRUE.

```
?OR (1=1) (1=3)
TRUE
```

OUTPUT / OP — object

Makes the input object the output of the procedure and exits the procedure at that point. The following example outputs from within a procedure.

```
>IF 24 = 4 * 6 [OUTPUT "TRUE]
TRUE
```

PACKAGE — pkgname name | name_list

Puts the name(s) into the input-named package.

```
?PACKAGE "SIZES [BIG SMALL]
```

PALETTE / PAL — color n

Outputs the RGB list for the specified color number. (See SETPAL to change colors.)

```
?PAL 1
[15 15 15]
```

PATH

Outputs the name of the current default drive and directory path.

```
?PATH
A:
```

PAUSE

Suspends the execution of the current procedure to allow interaction with the interpreter or editor.

```
?IF :A > :P [PAUSE]
```

PENDOWN / PD

Puts the turtle's pen down and the turtle resumes drawing.

```
?PENDOWN
```

PENERASE / PE

Makes the turtle draw in the background color and the turtle erases the drawn lines.

?PENERASE

PENREVERSE
PX

Makes the turtle change the color of any previously colored pixel in its trail to the reverse or logical color compliment.

?PENREVERSE

PENUP
PU

Picks the turtle's pen up and the turtle stops drawing.

?PENUP

PI

Outputs the value of PI:
3.1416

PIECE n n object

Outputs an object that contains the specified elements of the input object.

?PIECE 2 4 [a b c d e]
[b c d]

PKGALI pkgname

Puts all procedures and variables not already in packages into the specified package.

?PKGALL "OTHER

PLIST name

Outputs the property list of the input-named object.

?MAKE "BIRD "BLUE
?PLIST "BIRD
[.APV BLUE]

PO 'name | name_list

Displays the definition(s) of the specified procedure(s) or variable(s).

?PO "X
X is 5

POALL <pkgname | pkgname_list>

Displays the definitions of all procedures and variables in the workspace or the specified package(s).

?POALL "PLAY.PACK

POCALL procname

Displays the names of the procedures called by the input-named procedure.

?POCALL "AVERAGE
AVERAGE

ADDUP

POLY	(x1 y1 x2 y2 ... Xn Yn]	Makes Logo draw a polygon to the input x- and y- coordinates.
PONS	<pkgname | pkgname_list>	Displays the names and values of all variables in the workspace or the specified package(s).

```
?PONS
```

POPKG	<pkgname | pkgname_list>	Displays the name and contents of each package in the workspace or the specified package(s).

```
?POPKG
```

POPS	<pkgname | pkgname_list>	Displays the names and definitions of all procedures in the workspace or the specified package(s).

```
?POPS
```

POREF	procname | procname_list	Displays the names of the procedures that call the input-named procedure(s). In the following example triangle is a procedure within FLAG.

```
?POREF :"TRIANGE
TO FLAG
```

POS		Outputs a coordinate list of the turtle's current position.

```
?POS
[90 22]
```

POTL		Displays the names of the TOP-LEVEL procedures. These procedures are not called by any other procedure in the workspace.

```
?POTL
TO AVERAGE :NUMBERS
```

POTS	<pkgname | pkgname_list>	Displays the names and inputs of all procedures in the workspace or the specified package(s).

```
?POTS "SHAPES
TO POLY :SIDE :ANGLE
TO SPI :SIDE :ANGLE :INC.
```

PPROP	name propname	Puts the input property pair into the

	prop val	name's property list. ?PPROP "KATHY "EXTENSION 82
PPS	<pkgname | pkgname_list>	Displays the non-system property pairs of all objects in the workspace or the specified package(s). ?PPS KATHY's EXTENSION is 82
PRIMITIVEP	object	Outputs TRUE if the input object is a primitive name. Otherwise it outputs FALSE. ?PRIMITIVEP "TEST TRUE
PRINT PR	object (...)	Displays the input object(s) on the text window, file, or device. PRINT removes lists' outer brackets and follows last input with a carriage return. (Compare with SHOW and TYPE.) ?PRINT [A B C] A B C
PROCLIST		Outputs a list that contains the names of all defined procedures. ?PROCLIST [SQUARE AVERAGE ADDUP]
PRODUCT	n n (...)	Outputs the product of the input numbers. ?PRODUCT 2 2 4
QUOTIENT	n n	Outputs the integer quotient of the two input numbers and truncates the input numbers to integers before dividing. ?QUOTIENT 21 7 3
RADIANS	degrees_n	Outputs the number of radians in the input number of degrees. ?RADIANS 90 1.570796
RANDOM	n	Outputs a random integer. The input number must be between

32767 and -32768.

```
?RANDOM 20
19
```

READCHAR
RC

Outputs the first character typed at the keyboard or entered from a file or device.

```
?MAKE "KEY READCHAR
?:KEY
R
```

READLIST
RL

Outputs a list that contains a line typed at the keyboard (input must be followed by a carriage return) or read from a data file.

```
?READLIST
1 2 3
[1 2 3]
```

READQUOTE
RQ

Outputs a word that contains a line typed at the keyboard or read from a data file. READQUOTE input must be followed by a carriage return.

```
?READQUOTE
1 2 3
1 2 3
```

RECYCLE

Frees as many nodes as possible and reorganizes the workspace.

```
?RECYCLE
```

REMAINDER n n

Outputs the integer remainder obtained when the first input number is divided by the second.

```
?REMAINDER 7 3
1
```

REMPROP name prop

Removes the specified property from the name's property list.

```
?MAKE "PACK "Color
?PONS
?Pack IS COLOR
?REMRPOP
?PONS
 ?
```

REPEAT n instr_list

Executes the input instruction list the

input number of times.

?REPEAT 4 [FORWARD 50 RIGHT 90]

RERANDOM

Makes a subsequent RANDOM or SHUFFLE expression reproduce the same random sequence.

?RERANDOM
?RANDOM 20
19
?RERANDOM
?RANDOM 20
19

RIGHT degrees_n
RT

Rotates the turtle the input number of degrees to the right.

?RIGHT 45

ROUND n

Outputs the input number rounded off to the nearest integer.

?ROUND 3.333
3

RUN instr list

Executes the input instruction list.

?RUN [PRINT "HI]
HI

SAVE fname
<pkgname |
pkgname_list

Writes the contents of the workspace or specified package(s) to the input named disk file. If the name is less than nine characters, .LOG is added to the filename. If (.) is used after the first character only the next three letters are used as filename extensions.

?SAVE "MYFILE

SAVEPIC fname

Writes the contents of the graphic viewport to the input named picture file.

?SAVEPIC "DESIGN3

SCREENFACTS
SF

Outputs a list that describes the graphic viewport's attributes. The format is:

[BGCOLOR VIEWPORT-MODE SCRUNCH ZOOM XPAN YPAN]

BGCOLOR = Background color number of graphic viewport.
the VIEWPORT-MODE = WINDOW, WRAP, or FENCE mode.
SCRUNCH = Current aspect ratio of the graphic viewport.
ZOOM = Magnification factor for the visible objects on the graphic viewport.
XPAN YPA = Center point of the viewport in the graphic plane.

```
?SETBG 2
?WINDOW SETSCRUNCH 2 SETZOOM 2
?SETPAN [100 100]
?SCREENFACTS
[2 WINDOW 2 2 100 100]
```

SENTENCE / **SE** — object object (...)

Outputs a list made up of the input objects and removes the lists' outer brackets.

```
?SENTENCE "HARE [RABBIT BUNNY]
[HARE RABBIT BUNNY]
```

SETBG — color_n

Sets the graphic viewport background to the color represented by the input number. CLEARSCREEN must follow to display new background color.

```
?SETBG 1
```

SETFILL — [style_n index_n color_n]

Sets the fill pattern to the input numbered style, index, and color.

SETHEADNG / **SETH** — degrees_n

Turns the turtle to the absolute heading specified by the input number of degrees. The positive numbers turn the turtle clockwise; negative numbers counter-clockwise. To point the turtle east, enter the following:

```
?SETHEADING 90
```

SETLINE — [style_n width-n color_n]

Sets the line type to the input numbered style, width, and color.

SETPAL — color n RGB_list

Sets the input color number to the color combination of the input RBG_list values.

```
PAL 1
[0 0 0]
SETPAL 1 [1000 0 0]
PAL 1
[1000 0 0]
```

SETPAN coord list

Establishes the center point of the viewport in the turtle plane. Default is [0 0]. SETPAN doesn't clear the viewport nor alter any previous drawing.

```
REPEAT Y [FD 50 RT 50]
?SETPAN [50 50]
REPEAT Y [FD 50 RT 50]
SET PAN [0 0]
```

SETPATH d:

Makes the specified pathname the defalt pathname. Used to change disk drives. Access: A for startup Drive B; B for second drive.

```
?SETPATH "B:\PATHNAME
```

SETPC color_n

Sets the turtle's pen to the color specified by the input color number.

```
TO PENCOL
MAKE "N RANDOM 2
FD 25 RT 22.5 SETPC :N
PENCOL
END
```

SETPEN list

Sets the turtle's pen to the state and color specified in the input list.

```
?SETPEN [PD 2]
```

SETPOS coord list

Moves the turtle to the position specified in the input coordinate list.

```
SETPOS [50 50]
```

SETSCRUNCH n

Sets the graphic viewport's vertical aspect ratio to the input number. SETSCRUNCH doesn't clear the viewport nor alter anything previously drawn.

```
?SETSCRUNCH .5
```

SETTEXT effect_n

Sets a special attribute for the graphic text to the input numbered effect.

SETX	n	Moves the turtle horizontally to the x coordinate specified by the input number. ?SETX -50
SETY	n	Moves the turtle verticaly to the y co-ordinate specified by the input number. ?SETY 90
SETZOOM	n	Allows you to zoom in or out to magnify your graphic displays. SETZOOM doesn't clear the viewport nor alter any previous drawing. ?SETZOOM 2
SHOW	object	Outputs the input object on the text window, data file, or system device. SHOW retains the list's outer brackets and follows the input with a carriage return. (Compare with PRINT and TYPE.) ?SHOW [A B C] [A B C]
SHOWTURTLE ST		Makes the turtle visible if hidden. ?SHOWTURTLE
SHUFFLE	list	Outputs a list that contains the elements of the input list in random order. ?SHUFFLE [1 2 3 4] [3 2 4 1]
SIN	degrees_n	Outputs the sine of the input number of degrees. ?SIN 30 .5 ?Degrees SIN 30 28.647892
SORT	list	Outputs a list of input words sorted into ascending order. ?SORT[D C 8 A 4 3 2 1] [1234ABCD]
SQRT	n	Outputs the square root of the input

number.

```
?SQRT 25
5
```

STOP — Stops the execution of the current procedure and returns to TOPLEVEL (the ? prompt) or the calling procedure.

SUM n n (...) — Outputs the sum of the input numbers.

```
?SUM 2 2
4
```

TAN degrees_n — Outputs the tangent of the specified angle.

```
?TAN 45
1
```

TEST exp — Remembers whether the input expression is TRUE or FALSE for subsequent IFFALSE or IFTRUE expressions.

```
?TO FLIP.COIN
>TEST 1 = RANDOM 2
>IF 1 = RANDOM 100
>   [PRINT [LANDED ON EDGE] STOP]
>IFTRUE [TYPE "HEADS]
>IFFALSE [TYPE "TAILS]
>PRINT [\ SIDE UP.]
>END
FLIP.COIN defined
?
```

TEXT procname — Outputs the definition list of the specified procedure.

```
?TEXT "SQUARE
[[] [REPEAT 4 [FORWARD 50 RIGHT 90]]]
```

THING varname — Outputs the value of the input-named variable.

```
?MAKE "CHOCOLATE "SEMI#-SWEET
?THING "CHOCOLATE
SEMI-SWEET
```

THROW name — Executes the line identified by the input name in a previous CATCH expression.

```
>IF :A < :B [THROW "BIGGER]
```

TO procname <inputs>

Indicates the beginning of a procedure definition.

```
?TO SQUARE :SIDE
>REPEAT 4 [FD :SIDE RIGHT 90]
>END
SQUARE defined
?
```

TOWARDS coord_list

Outputs a heading that makes the turtle face the position specified in the input coordinate list.

```
?FORWARD 50 RIGHT 90
?TOWARDS [0 0]
180
```

TRACE

Turns on trace monitoring of procedure execution and variable assignment. TRACE displays the name of each procedure as it is called and the name and value of each variable as it is defined. TRACE allows observation of the procedure's execution without interruption.

```
?TRACE
```

TURTLEFACTS
TF

Outputs a list that describes the turtle's attributes. The format is:

```
[XCOR YCOR HEADING PENSTATE PENCOLOR_N
      SHOWNP]
XCOR = Turtle's x coordinate.
YCOR = Turtle's y coordinate.
HEADING = Compass direction the turtle
      is facing.
PENSTATE = PD for pendown, PE for
      penerase, PX for penreverse, or
      PU for penup.
PENCOLOR = Pen's color number.
SHOWNP = TRUE if the turtle is visible.

?SETPOS [15 30] RIGHT 60
?PENERASE SETPC 3 HIDETURTLE
?TURTLEFACTS
[15 30 60 PE 3 FALSE]
```

TURTLETEXT object (...)
TT

Displays the input object(s) at the turtle's current location on the graphic viewport in the current pen color and state.

```
?TURTLETEXT "HI
```

TYPE	object (...)	Outputs the input object(s) on the text window, data file, or system device. TYPE removes the lists' outer brackets, but does not follow the last input with a carriage return. (Compare with PRINT and SHOW.) ?TYPE [A B C] A B C
UNBURY	pkgname |	Restores the specified package(s) to workspace management commands. ?UNBURY "PLAY.PACK
UPPERCASE	word	Outputs the input word with all alphabetic characters in uppercase mode. ?UPPERCASE "Jones JONES
WATCH	<procname | procname_list>	Turns on the expression-by-expression procedure execution monitor. WATCH allows interaction with the interpreter or editor. ?WATCH "AVERAGE
WHERE		Outputs the item number of the most recent successful MEMBERP expression. ?MEMBERP "R [Q R S] TRUE ?WHERE 2
WINDOW		Allows the turtle to plot outside the viewport after a WRAP or FENCE expression. ?FENCE FD 300 [RETURN] ?WINDOW FD 300 ?CS
WORD	word word (...)	Outputs a word made up of the input words. ?WORD "SUN "SHINE SUNSHINE
WORDP	object	Outputs TRUE if the input object is a

word or a number. Otherwise it outputs FALSE.

```
?WORDP "HI
TRUE
?WORDP [HI]
FALSE
```

WRAP

Makes the turtle reappear on the opposite side of the graphics window when it exceeds the boundary.

```
?WRAP
```

XCOR

Outputs the x coordinate of the turtle's current position.

```
?XCOR
145
```

YCOR

Outputs the y coordinate of the turtle's current position.

```
?YCOR
36
```

+ a b (...)

Infix or prefix primitive and delimiter. Outputs the sum of the input numbers.

```
?2 + 2
4
```

- a b

Infix or prefix primitive and delimiter. Outputs the difference of the two input numbers.

```
?10 - 5
5
```

***** a b (...)

Infix or prefix primitive and delimiter. Outputs the product of the input numbers.

```
?4 * 6
24
```

/ a b

Infix or prefix primitive and delimiter. Outputs the decimal quotient of the two input numbers.

```
?25/5
5
```

^ a b

Infix or prefix primitive and delimiter. Outputs the exponent of the two input numbers.

```
?10 ^ 2    (read 10 to the 2nd)
99.999961
```

< a b

Infix or prefix primitive and delimiter. Outputs TRUE if the first input word is less than the second. Otherwise it outputs FALSE.

```
?13 < 27
TRUE
```

> a b

Infix or prefix primitive and delimiter. Outputs TRUE if the first input word is greater than the second. Otherwise it puts FALSE.

```
?20 > 19
TRUE
```

= a b

Infix or prefix primitive and delimiter. Outputs TRUE if the two input objects are equal. Otherwise it outputs FALSE.

```
?1 = 2
FALSE
?"logo = "logo
TRUE
```

<> a b

Infix or prefix primitives and delimiters. Outputs TRUE if the two objects are not equal. Otherwise it outputs FALSE.

```
?<>1 2
TRUE
?<>2 2
FALSE
```

>< a b

Infix or prefix primitives and delimiters. Outputs TRUE if the two objects are not equal to each other. Otherwise it outputs FALSE.

```
?><3 1
TRUE
?><3 3
FALSE
```

>= a b

Infix or prefix primitives and

delimiters. Outputs TRUE if the first word is greater than or equal to the second. Otherwise it outputs FALSE.

```
?>=3 4
FALSE
?>=3 3
TRUE
?>=5 3
TRUE
```

`=>` `a b`

Infix or prefix primitives and delimiters. Outputs TRUE if the first word is greater than or equal to the second. Otherwise it outputs FALSE.

```
?=>13 15
FALSE
?=>54 54
TRUE
?=>75 3
TRUE
```

`<=` `a b`

Infix or prefix primitives and delimiters. Outputs TRUE if the first word is less than or equal to the second. Otherwise it outputs FALSE.

```
?<=4 7
TRUE
?<=4 4
TRUE
?<=7 4
FALSE
```

`=<` `a b`

Infix or prefix primitives and delimiters. Outputs TRUE if the first word is less than or equal to the second. Otherwise it outputs FALSE.

```
?=<14 18
TRUE
?=<40 40
TRUE
?=<87 4
FALSE
```

ATARI Logo Special Characters

;	Delimiter. Indicates comments to be ignored by the interpreter.
(	Delimiter. Begins an enclosed expression that contains multiple inputs or groups of numeric expressions and specifies the order of operations.
)	Delimiter. Ends an enclosed expression that contains multiple inputs or groups of numeric expressions and specifies the order of operations.
"	Forces Logo to interpret a word as an object instead of a procedure name.
[]	Delimiters. Enclose elements of a list.
#	Forces Logo to interpret a special character as a literal character.

APPENDIX G
FUNCTIONAL COMMAND LIST

The primitives are grouped by function and the input form is indicated where applicable.

Arithmetic Operations

```
ABS n
ARCTAN n
COS degrees_n
DEGREES radians_n
EXP n
INT n
LOG n
LOG10 n
PI
PRODUCT n n (...)
QUOTIENT n n
RADIANS degrees_n
RANDOM n
REMAINDER n n
RERANDOM
ROUND n
SIN degrees_n
SQRT n
SUM n n (...)
TAN degrees_n
+ a b (...)
- a b
* a b (...)
/ a b
^ a b
```

Conditionals and Flow of Control

```
BYE
CO <object>
GO word
IF pred_exp instr_list <instr_list>
IFFALSE, IFF instr_list
IFTRUE, IFT instr_list
LABEL word
OUTPUT, OP object
REPEAT n instr_list
RUN instr_list
STOP
```

```
TEST pred_exp
```

Defining Procedures

```
COPYDEF new_procname old_procname
DEFINE procname defin_list
DEFINEDP object
PRIMITIVEP object
TEXT procname
```

Defining Variables

```
LOCAL varname (...)
MAKE varname object
NAME object varname
NAMEP word
THING varname
```

Disks

```
PATH
SETPATH d:
```

Editing Procedures and Variables

```
EDALL pkgname |pkgname_list>
EDIT, ED <name | name list>
EDNS pkgname | pkgname_list>
EDPS <pkgname | pkgname_list>
```

Error Handling and Debugging

```
CATCH name instr_list
ERROR
NOTRACE
NOWATCH <procname | procname_list>
PAUSE
THROW name
TRACE
WATCH <procname | procname_list>
```

Files

```
CHANGEF new_fname old_fname
DIR <fname>
EDF fname
ERASEFILE fname
LOAD fname <pkgname>
```

```
SAVE fname <pkgname | pkgname_list>
```

Graphic Movement

```
ARC [x y radius begin_angle end_angle]
BACK, BK distance_n
BOX [x y width height]
CIRCLE [x y radius]
ELLIPSE [x y X-radius Y-radius]
FORWARD, FD distance_n
HEADING
HIDETURTLE HT
HOME
LEFT, LT degrees_n
POLY [x1 y1 x2 y2...xn yn]
POS
RIGHT, RT degrees_n
SETHEADING, SETH degrees_n
SETPOS coord_list
SETX n
SETY n
SHOWTURTLE, ST
TOWARDS coord_list
XCOR
YCOR
```

Graphic Viewport

```
CLEAN
CLEARSREEN, CS
FENCE
FILL
FILLATTR
GETTEXT
LINEATTR
LOADPIC fname
PAL color_n
PENDOWN, PD
PENERASE, PE
PENREVERSE, PX
PENUP, PU
SAVEPIC fname
SETBG color_n
SETFILL [style_n index n color_n]
SETLINE [style_n width_n color_n]
SETPC color_n
SETPEN list
SETPAL color_n RGB list
SETPAN coord_list
SETSCRUNCH n
SETTEXT effect_n
SETZOOM n
```

```
SCREENFACTS, SF
TURTLEFACTS, TF
TURTLETEXT, TT object
WINDOW
WRAP
```

Keyboard

```
KEYP
READCHAR, RC
READLIST, RL
READQUOTE, RQ
```

Logical Operations

```
AND pred_exp pred_exp (...)
NOT Pred_exp
OR pred_exp pred_exp (...)
= a b
< a b
> a b
<> or >< a b
>= or =< a b
<= or => a b
```

Peripheral Devices

```
COPYOFF
COPYON
MOUSE [x y b1 b2 b3]
```

Property Lists

```
GLIST prop <pkgname | pkgname_list>
GPROP name prop
PLIST name
PPROP name prop object
PPS <pkgname | pkgname_list>
REMPROP name prop
```

Text Window

```
CLEARTEXT, CT
PRINT, PR object (...)
SHOW object
TYPE object (...)
```

Word and List Processing

```
ASCII word
BUTFIRST, BF object
BUTLAST, BL object
CHAR n
COUNT object
EMPTYP object
EQUALP object object
FIRST object
FPUT object object
ITEM n object
LAST object
LIST object object (...)
LISTP object
LOWERCASE, LC word
LPUT object object
MEMBERP object object
NUMBERP object
PIECE n n object
PROCLIST
SENTENCE, SE object object (...)
SHUFFLE list
SORT list
UPPERCASE, UC word
WHERE
WORD word word (...)
WORDP object
```

Workspace Management

```
BURY pkgname | pkgname_list
ERALL pkgname | pkgname_list>
ERASE, ER procname | procname_list
ERN varname | varname_list
ERNS <pkgname | pkgname_list>
ERPS <pkgname | pkgname_list>
FOLLOW procname procname
NODES
NOFORMAT
PACKAGE pkgname name | name_list
PKGALL pkgname
PO name | name_list
POALL <pkgname | pkgname_list>
POCALL procname
PONS <pkgname |pkgname_list>
POPKG <pkgname |pkgname_list>
POPS <pkgname | pkgname_list>
POREF procname | procname_list
POTL
POTS <pkgname | pkgname_list>
RECYCLE
```

UNBURY pkgname | pkgname_list

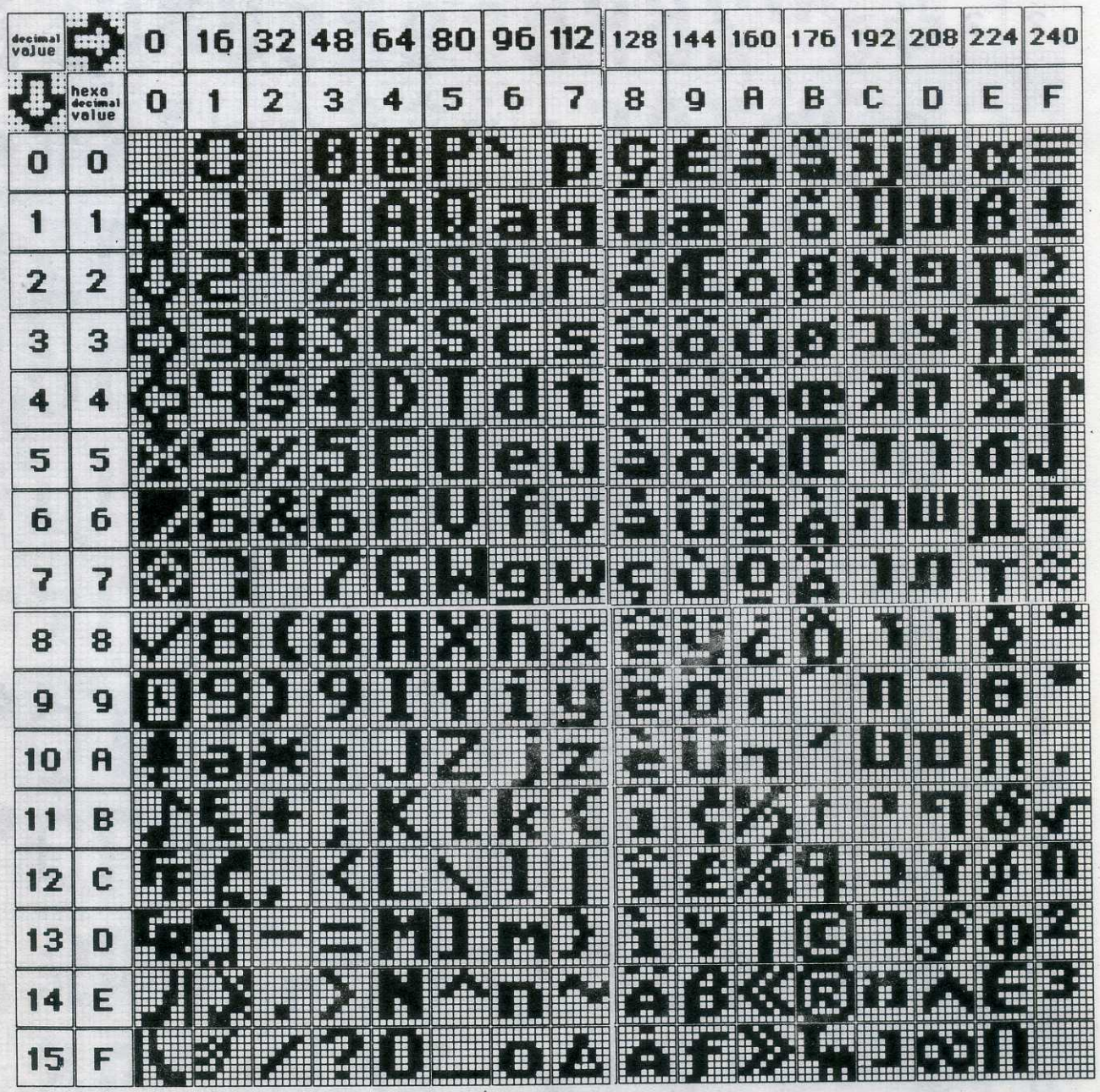
APPENDIX H
ST ASCII CHARACTER SET

The following tables show the complete character sets available on the ST Computer. To print any of these characters from ATARI Logo, type:

?PRINT CHAR n

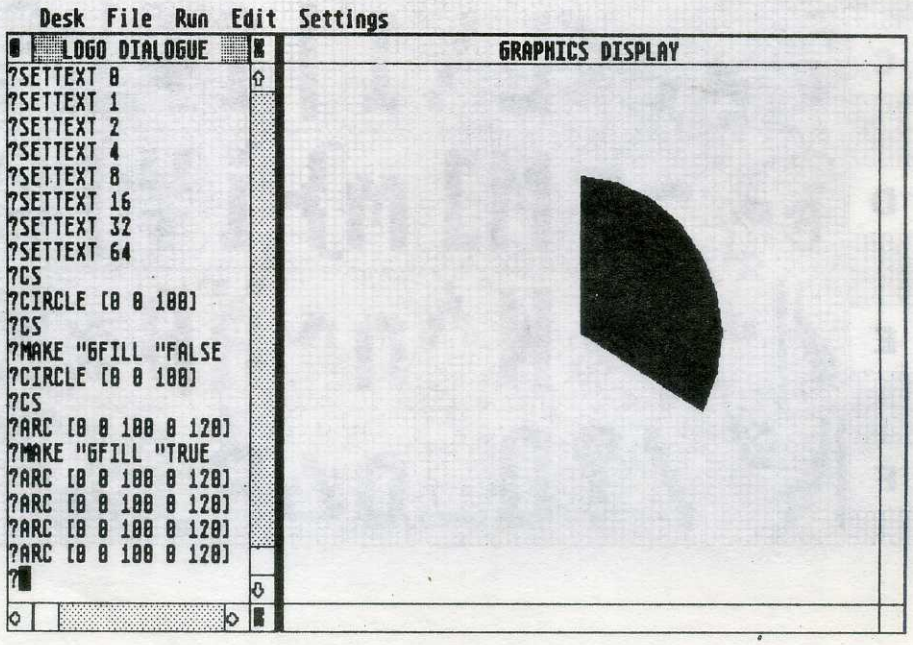
Replace the letter n with the ASCII value from the table.

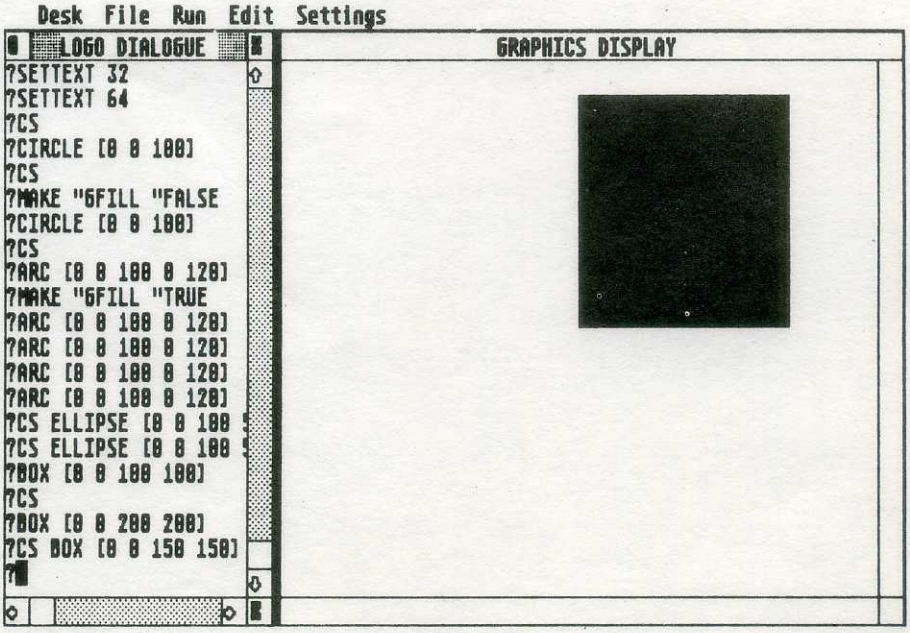
There are two character tables. The first is set up with 8x16 characters; the second for 16x16 characters. The different character set sizes are used with different screen resolutions.

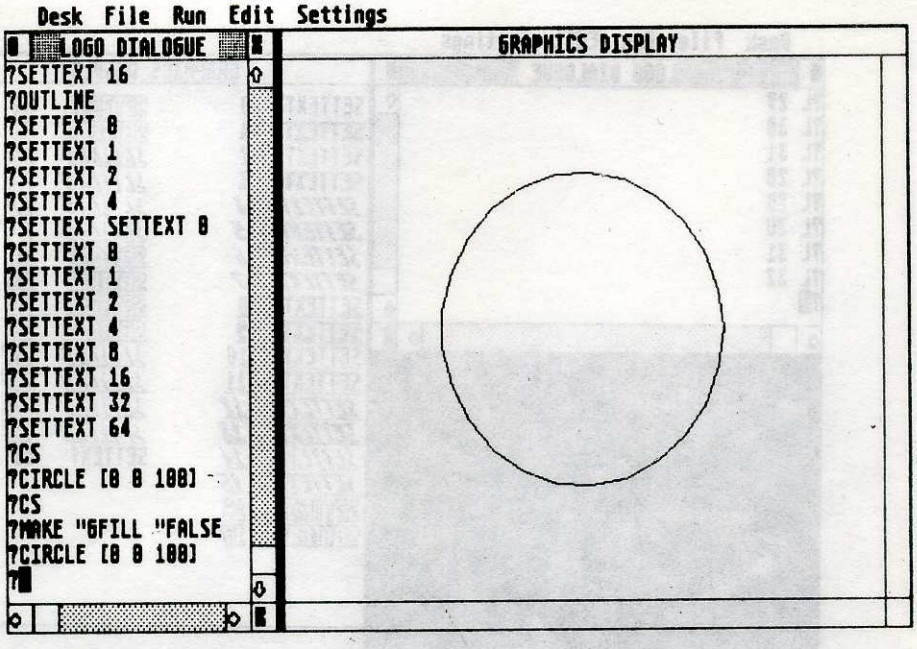


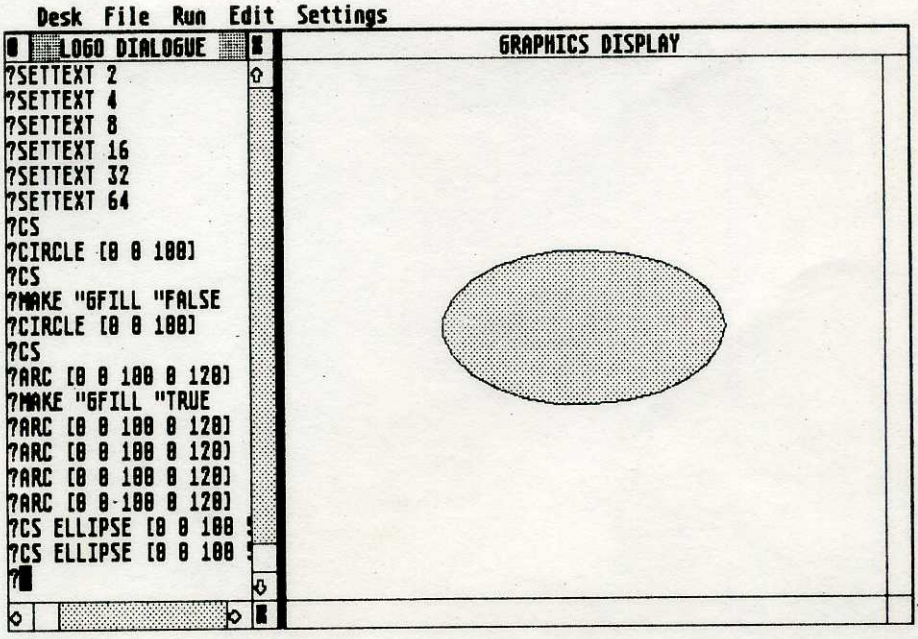

decimal value
hexa decimal value
0 16 32 48 64 80 96 112 128 144 160 176 192 208 224 240
0 1 2 3 4 5 6 7 8 9 A B C D E F
0 0
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 A
11 B

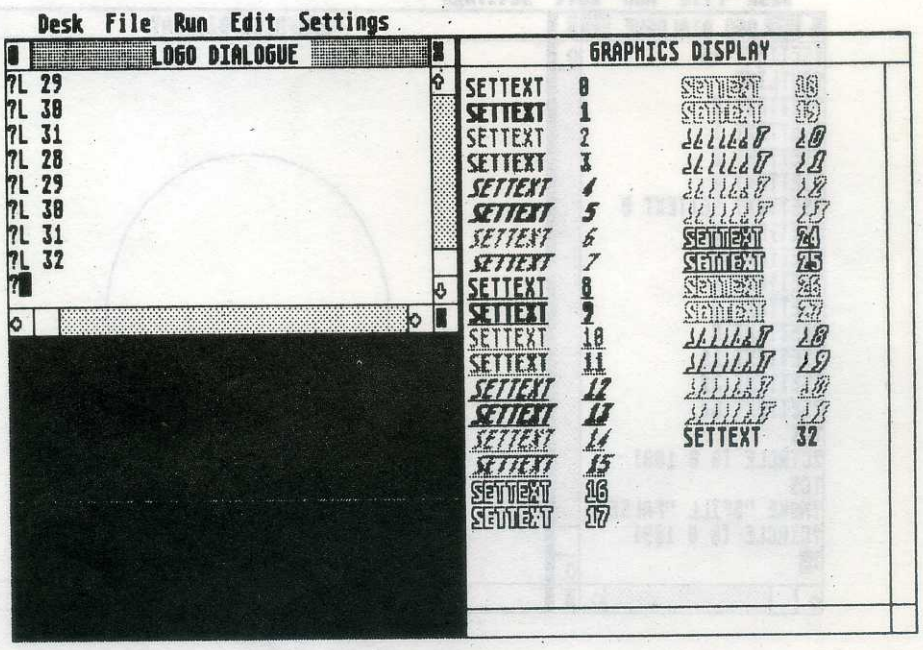
APPENDIX I
SAMPLE LOGO PROCEDURES






Desk File Run Edit Settings
LOGO DIALOGUE
?SETTEXT 16
?OUTLINE
?SETTEXT 0
?SETTEXT 1
?SETTEXT 2
?SETTEXT 4
?SETTEXT SETTEXT 0
?SETTEXT 0
?SETTEXT 1
?SETTEXT 2
?SETTEXT 4
?SETTEXT 8
?SETTEXT 16
?SETTEXT 32
?SETTEXT 64
?CS
?CIRCLE [0 0 100]
?CS
?MAKE "GFILL "FALSE
?CIRCLE [0 0 100]
?
GRAPHICS DISPLAY


Desk File Run Edit Settings
LOGO DIALOGUE
?SETTEXT 2
?SETTEXT 4
?SETTEXT 8
?SETTEXT 16
?SETTEXT 32
?SETTEXT 64
?CS
?CIRCLE [0 0 100]
?CS
?MAKE "GFILL "FALSE
?CIRCLE [0 0 100]
?CS
?ARC [0 0 100 0 120]
?MAKE "GFILL "TRUE
?ARC [0 0 100 0 120]
?ARC [0 0 100 0 120]
?ARC [0 0 100 0 120]
?ARC [0 0-100 0 120]
?CS ELLIPSE [0 0 100
?CS ELLIPSE [0 0 100
?
GRAPHICS DISPLAY


Desk File Run Edit Settings
LOGO DIALOGUE
?L 29
?L 38
?L 31
?L 28
?L 29
?L 38
?L 31
?L 32
?
GRAPHICS DISPLAY
SETTEXT 0
SETTEXT 1
SETTEXT 2
SETTEXT 3
SETTEXT 4
SETTEXT 5
SETTEXT 6
SETTEXT 7
SETTEXT 8
SETTEXT 9
SETTEXT 10
SETTEXT 11
SETTEXT 12
SETTEXT 13
SETTEXT 14
SETTEXT 15
SETTEXT 16
SETTEXT 17
SETTEXT 24
SETTEXT 25
SETTEXT 32

CUSTOMER SUPPORT

Atari Corp. welcomes any questions you might have about your ATARI Computer product.

Write to:

Atari Customer Relations
P.O. Box 61657
Sunnyvale, CA 94088

Please write the subject of your letter on the outside of the envelope.

We suggest that you contact your local Atari user groups. They are outstanding sources of information on how to get the most out of your Atari Computer. To receive a list of user groups in your area, send a self-addressed stamped envelope to:

Atari User Group List
P.O. Box 61657
Sunnyvale, CA 94088

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