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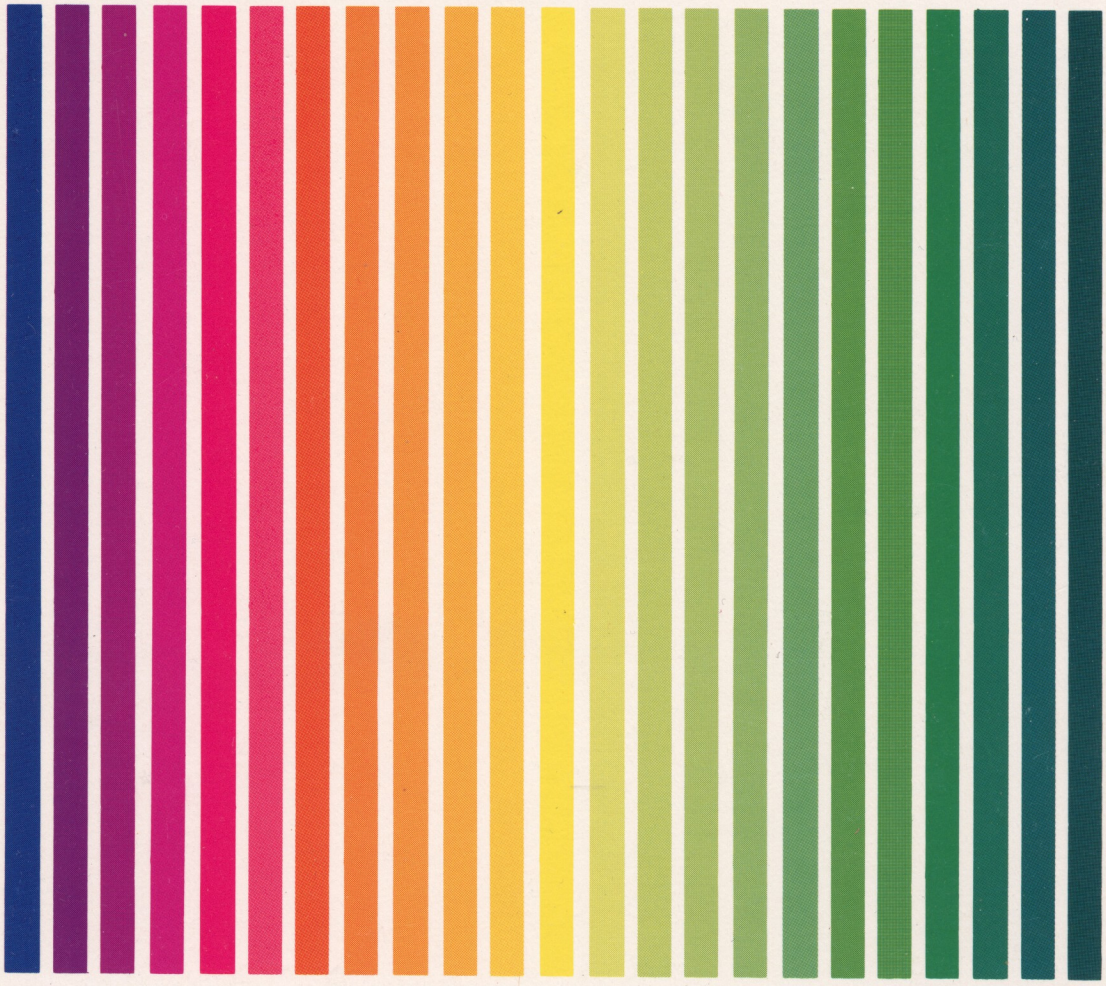

GRAPHICS/SOUND DEMONSTRATION

APX-20028

User-Written Software for ATARI Home Computers

GRAPHICS/SOUND DEMONSTRATION

APX-20028

GRAPHICS/SOUND DEMONSTRATION

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INTRODUCTION

OVERVIEW

The GRAPHICS/SOUND DEMONSTRATION diskette shows off some of the ATARI computer's outstanding graphics and sound effects capabilities. The programs illustrate but a few of the many two- and three-dimensional effects possible. One program demonstrates the ATARI computer's fine scrolling capability, and we've included the assembler source code to show you how it's done. By looking over the program listings of these programs and referring to the ATARI Personal Computer System Operating System User's Manual, (Part No. C016555), 1980, you'll see how you can adapt these techniques to your own needs. Using these techniques requires some knowledge of assembly language and a firm understanding of the ATARI computer.

Even if you don't adapt these programs for yourself, you'll still enjoy watching and listening to them! Descriptions of each program appear below. The program name is the file name you use to load the program into RAM. We've also included short explanations of several technical terms used in the program descriptions. These terms are underlined in the descriptions.

REQUIRED ACCESSORIES

32K RAM
ATARI BASIC Language Cartridge
ATARI 810 Disk Drive
ATARI Joystick Controller
ATARI Paddle Controller

GETTING STARTED

1. Insert the ATARI BASIC Language Cartridge in the (Left Cartridge) slot of your computer.

2. Turn on your disk drive and insert the GRAPHICS/SOUND DEMONSTRATION diskette.

3. Power up your computer and turn on your video screen.

4. At the READY prompt, type RUN "D:filename" and press RETURN. Replace "filename" with one of the program names (in upper case). If you're using more than one disk drive, remember to follow the device initial (D) with the number of the drive containing the GRAPHICS/SOUND DEMONSTRATION disktte (e.g., RUN "D2:PRETTY" to run the PRETTY program on disk drive two).

5. You end some programs by pressing the BREAK key and some by pressing the SYSTEM RESET key. See the program descriptions for which method to use.

Note. The set-up procedure for the scrolling map (file names SCRL19.OBJ--the object code--and SCRL19.ASM--the source code) is slightly different. Please see the program description for this information.

PROGRAM DESCRIPTIONS

PRETTY

This program draws a variety of colorful two- and three-dimensional patterns on your video screen using, in part, color artifacting (color bleeding). Press the BREAK key to end the program.

JAZZ

This program plays a computer-generated melody against a preprogrammed bass sequence. When you see the prompt ENTER TEMP, set a speed between one and four, one being fastest and four being slowest. Pressing the RETURN key isn't necessary. Press the START key to select a different tempo. Press the SYSTEM RESET key to end the program.

TRIANGLE

This program illustrates another fascinating application of color artifacting. It's slow at times, so be patient. Press the BREAK key to end the program.

HOBBY1

(Uses one joystick controller)

This program demonstrates the player-missile graphics feature (a method of moving foreground objects without disturbing background objects) of ATARI computers. You can achieve good animation of objects even in BASIC by using player-missile graphics. Use your joystick controller to move the fighter around; plug your joystick controller into the first controller jack on your computer console. Press the SYSTEM RESET key to end the program.

HOBBY2

This program demonstrates the display list interrupt capabilities of ATARI computers. Half the screen is one color and half is another color. Press the SYSTEM RESET key to end the program.

HOBBY3

This program also demonstrates the display list interrupt feature using all 128 available colors simultaneously. Press the SYSTEM RESET key to end the program.

MDLI02.BAS

This is another program using all 128 available colors on the screen simultaneously. The program takes a few minutes to initialize, so be patient. Press the SYSTEM RESET key to end

the program.

HORSE.SRC
HORSE.OBJ
HORSE20.BAS

(Uses one paddle controller)

These programs combine the display list interrupt feature for color with a redefined character set. The result is some effective animation.

You can obtain the same program in either a BASIC version (HORSE20.BAS) or an assembly language version (HORSE.OBJ). In the BASIC version the horses run in place. The pure BASIC version contains three colors. To convert this program to nine colors, remove line 190 in the HORSE20.BAS program (by typing the line number and pressing the RETURN key). In the assembly language version, the horses gallop across the screen! The file HORSE.SRC contains the assembly listing for HORSE.OBJ. The section titled "HORSE OF A DIFFERENT COLOR" at the end of these user instructions discusses the technical aspects of these programs.

Use the paddle controller to control the speed of the horse; plug the paddle controller into the first controller jack on your computer console. Press the BREAK key to end the program.

COLOSOUN

This program demonstrates some of the sound capabilities of ATARI computers, together with a simple graphic display. Press the SYSTEM RESET key to end the program.

BEET

This program shows off the ATARI computer's musical talent--in four-part harmony! Press the SYSTEM RESET key to end the program.

SCRL19.OBJ
and
SCRL19.ASM

(Uses one joystick controller)

This program has it all! It combines display list interrupts, vertical blank interrupts, horizontal fine scrolling, and vertical fine scrolling, plus character set redefinition. The program creates a scrolling map 32 x 64 pixels in size. Only 10 x 20 pixels display on the video screen at a time; use your joystick controller to move your "window" over the map.

The map uses BASIC's GRAPHICS 2 mode. To run the program:

1. Plug your joystick controller into the first controller jack on your computer console.

2. Type DOS to access the menu and select option L (BINARY LOAD).

3. In answer to the prompt LOAD FROM WHAT FILE? type SCRL19.OBJ

4. Return to BASIC mode by selecting DOS option B (RUN CARTRIDGE).

5. Call the program by typing

```
Q=USR(27648)
```

Press the SYSTEM RESET key to end the program.

The file SCRL19.ASM contains the source code showing you how it was done. The scrolling combines fine scrolling through the hardware fine scrolling registers with character scrolling by modifying the LMS (Load Memory Scan) bytes in the display list. The fine scrolling is straightforward; the character scrolling is more intricate. Each display byte in the display list has its LMS bit set. The following two bytes give the address of the display data. When the fine scrolling register overflows in the scrolling routine, the routine adjusts the bytes in the LMS addresses to point to the next character bytes. A variable referred to as the "offset" keeps track of this adjustment.

The other trick in the program is the redefinition of the character set into a graphics character set. The technique is powerful; this map uses very few of the available characters in the set, and yet the resulting map is quite believable. The map can appear even more realistic with additional characters. By changing the character set at appropriate times, the program could produce a variety of effects.

The amount of system resource used is low. The module as written occupies 4K of RAM, including the map, the display list, the initialization routines, and the interrupt service routine that reads the joystick. The program also uses 4 bytes of page zero (two of which are available after the initialization is complete) and 7 bytes of page six. The interrupt service is very fast, so it won't significantly slow whatever main program you add it to. Space has been left inside the 4K block for additions and modifications. The program is not fully locatable because four patches must be made to relocate it. However, these patches are well documented and easy to do.

GLOSSARY AND SUGGESTED READING

It's beyond the scope of these user instructions to explain in detail the audiovisual methods used in these program. Instead, we include brief descriptions of terms and a short list of publications in which you can find more material describing many of these techniques.

TERMS

COLOR ARTIFACTING

Color artifacting is a method for getting more colors out of the GRAPHICS command than the Operating System supports. It occurs because the resolution of a video screen is not as high as that of the computer. Try this simple experiment. (If you need help, see Chapter 9 of the BASIC REFERENCE MANUAL, "GRAPHICS Modes and Commands".) In GRAPHICS 8 mode, set the background color to black. Now draw two parallel or vertical lines, one on an even-numbered column and one on an odd-numbered column. If you look closely, you'll see that the two colors are different. Now draw a horizontal line anywhere. See the difference? Now enter another vertical line to one side or the other of your existing lines. A new color results! This is color artifacting. By experimenting with different directions and combinations, you'll soon get a feel for this technique and be able to put it to interesting uses. Remember, though, that colors usually don't look the same on different video screens. Both PRETTY and TRIANGLE use color artifacting.

PLAYER-MISSILE GRAPHICS

Player-missile graphics is a powerful tool exclusive to ATARI computers. It gives you a relatively simple method for moving objects around on the screen. These objects are independent of the playfield, meaning that they don't erase the field as they move over it. By studying the listing of HOBBY1, you can get a general idea of how this technique works. For a useful discussion of player-missile graphics, see the article by Chris Crawford cited at the end of this manual.

DISPLAY LIST INTERRUPT

Display list interrupt is another tool to let you change values while drawing the screen. It's usually used to change color registers. This technique lets you place all 128 colors on the screen at the same time. In HOBBY2, one display list interrupt is used and the screen is half one color, half another. In HOBBY3 and MDLI02.BAS, several display list interrupts are used. However, you can do more than simply change colors with this technique. For example, you can change character sets or GRAPHICS modes while other activities are occurring. Using display list interrupts is complex and requires that an interrupt service routine be in place before the interrupt is enabled. The SCRL19 programs are well-remarked; study their listings for further information about this technique.

HORIZONTAL AND VERTICAL FINE SCROLLING

These techniques are related to display list interrupts in that they're all activated by a command in the display list. You can achieve very smooth motion using horizontal and vertical fine scrolling. The map scroll program (SCRL19.OBJ) is a superb example. You can

also use these techniques in text modes to effect fine movement of letters.

VERTICAL BLANK INTERRUPTS

Vertical blank interrupts are similar to display list interrupts, except that you have more time with which to work. A display list interrupt needs to do everything within the horizontal blank (the time the beam takes to return from the right-hand end of a line to the left-hand start of the next line), whereas the vertical blank interrupt has a full vertical blank in which to accomplish its operation (the time the beam takes to return from the bottom right-hand corner of the screen to the upper left-hand corner). You also have a choice of two vertical blank interrupt modes, deferred or direct, by which you can send vertical blank interrupts to your own routines.

For a better understanding of all these techniques, study the program listings, especially SCRL19.ASM.

SUGGESTED READING

ATARI Personal Computer System Operating System User's Manual, 11/80, and ATARI Personal Computer System Hardware Manual, 10/80, (Part No. C016555.) Call ATARI Customer Service for ordering information. Chapter 6 of the Operating System manual describes interrupts. You'll find other useful information in Section II.6 (Display List) of the Hardware Manual.. Appendix A in the Hardware Manual also explains the use of player-missile graphics. (Note, Page 106 of the Operating System manual states that routine called SETVBV starts at E45F. The location cited is incorrect; set the routine to E45C.)

"Designing Your Own Atari Character Sets,", Craig Patchett, COMPUTE!, March 1981, pp. 72, 74-77.

The January 1981 issue of COMPUTE! contains an article by Chris Crawford describing ATARI player-missile graphics. The ATARI Program Exchange program CHARACTER SET EDITOR, (Order Number APX-20017) lets you design your own fonts using a joystick controller.

HORSE of a Different Color

by Gus Makreas 4/22/81
ATARI, Inc.

General Description

"Horse of a Different Color" is an assembler program designed to highlight several outstanding features of the ATARI Personal Computer System. Four-register sound effects, 128 colors, fine and coarse scrolling, user paddle-control, Display List Interrupts, a 60 Hz user interrupt, and animation with redefinable character set graphics all harmoniously combine into a synergistic symphony of technological wizardry certain to startle the senses. Used as a demonstration program on the showroom floor, "Horse" will attract attention to the ATARI PCS and invite hands-on interaction.

This demonstration displays three multicolored rows of horses that gallop from the screen's left-hand edge to the right-hand edge, accompanied by the thunder of hoofbeats. Horse speed is controlled by the paddle attached to the computer console's leftmost controller jack. Pressing the paddle trigger alters the screen's background color (up to 128 colors available). By twisting the paddle, it's possible to get many weird and wonderful sound and color combinations.

How to Make the Horses Run

System Requirements

* An ATARI 800 with at least 32K RAM and disk drive
* DOS 1 or DOS 2.0S
* One set of paddle controllers
* HORSE.DEM object file

Set Up and They're Off

* Insert the paddle controller into the leftmost jack in the front of the computer console. You will be using the leftmost paddle of the pair.

* Turn up the volume on the TV or monitor.

* From the DOS menu: Select Option L <RETURN>
  Key in: HORSE.OBJ <RETURN>
  Select Option M <RETURN>
  Key in: 529E <RETURN>

* From Assem. Edit. Cart: LOAD #D:HORSE.OBJ <RETURN>
  Key in: BUG <RETURN>
  Key in: G529E <RETURN>

* After the horses begin galloping, twist the paddle clockwise to increase speed, counterclockwise to slow them down.

* Press the trigger button once to change the background color ("color" is defined as a hue-luminosity pair. Sixteen hues combined with 8 luminosities yield 128 distinct colors). Keep the trigger depressed to cycle quickly through the various colors at the rate of four colors per second.

* Press SYSTEM RESET to stop the program.

* To rerun the program: from DOS, select Options L and M again with their previous arguments. From the Assembler Editor Cartridge, POWER UP again and re-execute from within DEBUG. These rerun instructions must be followed; otherwise, the horses will not reappear.

Some Items to Note

* Not all 128 colors will be seen at one time. At most, 13 unique ones will be visible on the screen at any given moment.

* Hitting the BREAK key while the program is executing under DEBUG (Assembler Editor Cartridge) will nullify the effects of the two DLIs (Display List Interrupts). Horse rows 2 and 3 will then take on the colors of row 1.

* Now and then, a gap or two or three will appear in the horse herd. The horse is there, but its color just happens to be identical to the background color.

* Unless you press the RETURN key (or any other key except SYSTEM RESET) within nine minutes, the computer goes into ATTRACT mode. At that point, altering the background color by pressing the trigger button becomes unpredictable. To regain previous color control, press any key except SYSTEM RESET.

* Depending on the condition (wear and tear) of your paddle set, the horse speed changes may appear to be jerky or they may stay ultrasmooth.

* Also, depending on the quality of your TV or monitor sound and upon the ATARI computer's sound register outputs, the horse hoofbeats will seem to "skip" intermittently. This is partly intentional to simulate the galloping sound effect.

Technical Information

Special Effects Department

HORSE GRAPHICS: Five redefined character sets (created with IRIDIS's FONTEDIT character set editor), each portraying a single horse in a different "frame" or position of its gallop, are used. Each horse is composed of 24 unique redefined characters.

ANIMATION: By changing the OS Shadow "CHBAS" (decimal address 756) during the 60 Hz user interrupt, a character set other than the standard set in ROM can be selected for printing when ANTIC resumes drawing the screen image. The five different horse character set locations can be substituted rapidly and sequentially for the CHBAS default value. This will make the horses appear to gallop. Of course, ANTIC requires a special display list and display memory to draw the nine horses on the screen.

SOUND: All four sound registers are used. Each time a horse "frame" is drawn on the screen (in other words, every time CHBAS value changes), a different one of the registers makes a "clop" sound. Four registers, four hoofbeats. During the fifth "frame", no sound is output. Slow the horses down and you can watch the

synchronization of sight and sound. Please refer to the note concerning the sound quality under "Some Items to Note."

COLOR: How to get 128 colors? The secret is two DLIs combined with ANTIC Mode 7 (BASIC Mode 2). The first DLI occurs just prior to the drawing of horse row 2 and the second DLI just prior to row 3. At these instances, the four playfield color registers (and therefore the four horse colors) are altered (and after nine minutes, ATTRACTed by the 60 Hz user interrupt), using values from a Page 6 color table. Color register 0 always gets a random color value via the 60 Hz user interrupt. Thus, the horses appearing off the left-hand edge will display a new, unique color.

GALLOP: Galloping is achieved by an alternating combination of fine and coarse scrolling. ANTIC's display memory only contains enough internal character set name bytes to build a row of four horses (numbered 1 through 4, left to right), which is cloned twice (by manipulating display list LMS address bytes), to create screen rows 2 and 3.

Through those same LMS manipulations, under 60 Hz user interrupt control, a graphics "window" is placed over horses 2 through 4. These are the three horses initially seen on the screen when the program begins. By decrementing the LMS address bytes, the "window" slides leftwards over the four horses. The speed of this window movement is controlled by the paddle. As the left edge of display memory, or rather the tail end of horse 1, is reached, the window is reset to approximate its original position over horses 2 through 4. This cycling continues indefinitely. And the horses gallop from left to right. The 60 Hz user interrupt will fine scroll one horse image by four color clocks, and coarse scroll the next frame, or image, with a one-byte LMS address decrement. This cycle also continues indefinitely, thus simulating smoother motion than could be achieved through coarse scrolling alone.

Object Code Information

REDEFINED HORSE CHARACTER SETS $4800 - $51FF. Each set is $0200 bytes in length. Non-horse characters (the majority) are zeroed out by the code. Each horse is composed of a six-byte by four-byte matrix in display

memory. And, since each character requires eight bytes to defne it in the internal character set, each horse image thus occupies 24 x 8 = 192 bytes of each internal character set.

DISPLAY LIST: $5200 - $5229. ANTIC Mode 7, Basic Mode 2. Includes two Display List Interrupts. Horizontal scrolling is enabled. Screen mode lines 5 - 8 are initialized to point to the solitary row of four horses in display memory, via the ANTIC LMS address bytes. The same holds true for screen mode lines 9 - 12.

DISPLAY MEMORY: $522A - $529D. This consists of one row of four different-colored horses, each separated by a space character. Bits 6 and 7 of each character name byte in the display memory select one of the four color registers to be used for coloring that name byte's character. ANTIC Mode 7 will display a 20-byte x 12-byte screen-image matrix. Each screen mode line in display memory is preceded by two blank bytes to conform to the horizontal scrolling wide-playfield requirement.

EXECUTABLE CODE: $529E - $557D.

```
       Mainline: $529E - $533E.
           DLIs: $533F - $5382.
  60 Hz Interr: $5383 - $557D.
```

The Mainline zeroes out the non-horse characters of each of the five horse character sets, sets up the DLIs, Display List, and the 60 Hz user interrupt. Finally, it locks itself into an infinite loop while each of the two DLIs executes once per screen image and the 60 Hz user interrupt executes at VBLANKI, just prior to the regular 60 Hz interrupt.

The DLIs alter the four playfield color registers at a specific point of the screen display (see "COLOR" under "Technical Information"). These two DLIs are actually compacted into a single DLI using a switch to alternate between them.

The 60 Hz user interrupt reads the paddle to set the horse speed and change the background color, ATTRACTs the DLI colors, oversees the timing of printing a horse image by changing CHBAS, outputs the hoofbeat sounds, and alternately fine and coarse scrolls the display memory by modifying the Display List LMS addresses.

PAGE 0 and PAGE 6: Page 0 contains indirect addresses, while Page 6 contains color register tables, timing tables, sound register tables, and miscellaneous variables.

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ATARI PROGRAM EXCHANGE

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1. Name and APX number of program _____

2. If you have problems using the program, please describe them here.

_____

_____

_____

3. What do you especially like about this program?

_____

_____

_____

4. What do you think the program's weaknesses are?

_____

_____

_____

5. How can the catalog description be more accurate and/or comprehensive?

_____

_____

6. On a scale of 1 to 10, 1 being "poor" and 10 being "excellent", please rate the following aspects of this program?

_____ Easy to use
_____ User-oriented (e.g., menus, prompts, clear language)
_____ Enjoyable
_____ Self-instructive
_____ Useful (non-game software)
_____ Imaginative graphics and sound

7. Describe any technical errors you found in the user instructions (please give page numbers).

8. What did you especially like about the user instructions?

9. What revisions or additions would improve these instructions?

10. On a scale of 1 to 10, 1 representing "poor" and 10 representing "excellent", how would you rate the user instructions and why?

11. Other comments about the software or user instructions:

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