

HI-RES TRICKS

SECOND FEATURE

hese powerful

and flexible routines can be used easily from BASIC or machine language, and will give you a large palette of special effects. Spice up your programs with Hi-Res Tricks!

i-Res Tricks is a package of 15 machine language routines that allow you to manipulate images on Apple's high-resolution graphics screen. You can create inverse screens, horizontal and vertical scrolling, mirror images (see Figure 1), upside down screens and more. Hi-Res Tricks can give your programs some extra visual punch, and you don't have to know machine language to use these routines.

THE ROUTINES

Let's look at the 15 routines, one at a time.

Negative Create. This routine inverts the entire Hi-Res screen. All pixels (dots) that were on are turned off, and all pixels that were off are turned on.

Left Shift. This routine scrolls the Hi-Res display seven pixels (one byte) to the left. The screen wraps around: whatever scrolls off the screen on the left reappears on the right.

Right Shift. This routine scrolls the Hi-Res display seven pixels (one byte) to the right. The screen wraps around: whatever scrolls off the screen on the right reappears on the left.

Up Shift. The Hi-Res display is scrolled up one pixel vertically. The screen wraps around: whatever scrolls off the screen on the top reappears on the bottom.

Down Shift. This routine scrolls the Hi-Res display down one pixel vertically. The screen wraps around: whatever scrolls off the screen on the bottom reappears on the top.

Left-Right Flip. By swapping the left and right sides of the screen, the image is reversed horizontally.

Top-Bottom Flip. By swapping the top and bottom sides of the screen, the image is reversed vertically.

Page 1 Plus Page 2. This routine takes the contents of Hi-Res page 2 and adds it to whatever is on page 1. The effect is like a transparent overlay.

Page 1 Minus Page 2. This routine subtracts the contents of Hi-Res page 2 from page 1. This, in effect, erases some parts of page 1, depending on what is on page 2.

Page 1 Transferred From Page 2. The contents of page 2 are copied to page 1, erasing whatever was on page 1 in the process.

TABLE 1: Routine Calling Addresses

	Starting Location					
Routine	Hex	Decima				
Negative Create	\$6000	24576				
Left Shift	\$601C	24604				
Right Shift	\$606A	24682				
Up Shift	\$60B8	24760				
Down Shift	\$6110	24848				
Left-Right Flip	\$6168	24936				
Top-Bottom Flip	\$61F6	25078				
Page 1 + Page 2	\$629E	25246				
Page 1 - Page 2	\$62C2	25282				
Page 1 → Page 2	\$62E8	25320				
Page 1 - Page 2	\$630A	25354				
Two Page Shift Left	\$632C	25388				
Two Page Shift Right	\$63A8	25512				
Two Page Shift Up	\$6424	25636				
Two Page Shift Down	\$64D8	25816				
Page 1 - Page 2 Special	\$658C	25996				

Note: These locations are valid only if you enter the programs as listed.

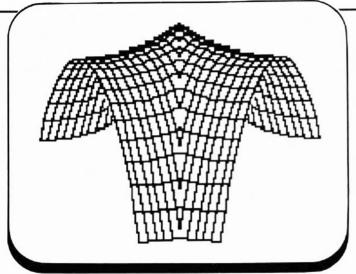


FIGURE 1: Left-Right Mirror

Page 1 Transferred to Page 2. This routine copies the contents of page 1 to page 2, crasing whatever was on page 2 in the process.

Page 1 Transferred From Page 2 (Special). This routine is special because only parts of page 2 are transferred onto page 1. This makes it possible to have as many variations to a display as you can fit onto one page of Hi-Res graphics. Page 1 can be set up for a general background, then parts of page 2 may be repeatedly transferred onto page 1 for different displays.

Two-Page Left Shift. Both Hi-Res pages are scrolled to the left as if they were one unit. This looks like a double-wide screen being scrolled.

Two-Page Right Shift. This routine scrolls both Hi-Res pages to the right.

Two-Page Up Shift. Both Hi-Res pages are scrolled up as if they were one unit. The effect is like a double-height screen being scrolled.

Two-Page Down Shift. This routine scrolls both Hi-Res pages down.

USING HI-RES TRICKS

Each of the routines in Hi-Res Tricks can be used separately, and each can be loaded anywhere in memory. This makes them very flexible.

To use a routine from BASIC, simply BLOAD it into an unused section of memory and CALL it, using the address at which you loaded it. HIRES.TRICKS (Listing 1) contains all 15 routines as one large file, but you can split it up to suit your needs. HIRES.DEMO (Listing 2) loads all the routines into memory and CALLs the appropriate one for each demonstration. Table 1 shows the addresses to CALL if you load all the routines as listed.

To use the routines from machine language, just JSR to the location where you have stored the routine. You must save the X and Y Registers if they contain important data; the routines will change the values stored there.

As presented in Listing 1, the first seven routines (Negative Create through Top-Bottom Flip) are set up to act on Hi-Res page 1. They can be modified to act on Hi-Res page 2; see the Modifications section of this article.

The routine called Page 1 Transferred From Page 2 (Special) requires some extra explanation. Since only parts of page 2 are transferred onto page 1, you must first set up three memory locations before CALLing the routine.

- \$658D (decimal 25997) sets the horizontal column of page 2 where the program starts the transfer.
- \$6605 (decimal 26117) sets the horizontal column of page 2 where the program stops the transfer.
- \$6599 (decimal 26009) sets the horizontal column of page 1 where the transfer begins.

These locations can be set from a machine language program by the statement:

LDA #\$XX, STA \$YYYY

or by POKEing them with values from BASIC. Forty columns are available, from 0 to 39. If the number you POKE is not in this range, the routine won't work properly and may overwrite parts of memory.

There is no horizontal stop for page 1. Whether you are going to transfer 2 or 5 or 35 columns from page 2, the exact same space must be available on page 1. The only information you have to supply for page 1 is where to start.

To run the demonstration program (Listing 2), you will need two Hi-Res pictures of your own on the disk. These can be any Hi-Res pictures you choose, as long as they

have been BSAVEd from page 1 (\$2000). To save a picture in the correct format, use the command:

BSAVE picture, A\$2000, L\$2000

When you run the demonstration by typing RUN HIRES.DEMO, you are prompted for the file names of the two pictures you want to use. Enter their names and the program will manipulate them using many of the Hi-Res Tricks routines.

ENTERING THE PROGRAMS

To enter the Hi-Res Tricks routines, either type the assembly source code in Listing 1 into your assembler and assemble the program, or enter the Monitor with CALL -151, type in the hexadecimal codes and save it with:

BSAVE HIRES.TRICKS, A\$6000, L\$609

Be sure you have saved Listing 1 before you enter and run Listing 2. To enter the demonstration program, type in the Applesoft program in Listing 2, and save it with:

SAVE HIRES.DEMO

For help with entering *Nibble* programs, see the directions in the Program Listings Section of this magazine.

HOW HI-RES TRICKS WORKS

All of the programs make use of the zero page for temporary storage. This is done for two reasons: First, this allows relocatability; second, the zero page is faster and much easier to use than other areas. In all programs, the Y-Register is used to indirectly index the base address stored in the zero page so that the effective address is indexed horizontally across the Hi-Res page. The X-Register, however, is used to index vertically down the page.

Negative Create

Lines 22-36 of Listing 1 are the Negative Create routine. After storing the first address in zero page and setting the index in the Y-Register to zero, the routine gets the value of a location in the Hi-Res area and then "complements" it. That is, if a bit was off, it is turned on; if it was on, it is turned off. This is done by the exclusive OR (EOR #SFF) in line 28.

The complemented value is then returned to its original location, the index is incremented and the next location is complemented. This process is repeated until the index goes through all the values from SOO-SFF.

Next, the high byte of the address is incremented, and the process is repeated until the end of the page is reached. At the end of the page, the high byte has a value of \$40 or more. This test is used in all the routines to determine when each routine should end. The routine then returns to the calling program.

Left Shift and Right Shift

The Left Shift routine appears in lines 44-86 of Listing 1, and the Right Shift routine appears in lines 94-137.

Left Shift begins by saving the first byte in a horizontal line of the screen. Then every byte is shifted one position to the left. Finally, the saved first byte is put in the last byte. This creates the effect of scrolling the screen to the left.

To index the screen horizontally, the Y-register is incremented, which indirectly indexes the base address in zero page locations SFA and SFB. After moving across a line, the program proceeds to the next line. To get to the next line, the value \$04 is added to the high byte of the base address. The high byte is then checked to see if the end of the Hi-Res area has been reached; if not, the routine shifts that line.

Next, the value \$1F80 is subtracted from the base address to get us back into the Hi-Res page. This value is used because the Hi-Res page is not stored sequentially in memory but in eight interlaced sections. The X-Register keeps track of which section of the Hi-Res page is being acted upon. For example, after completing the first section, the base address in \$FA and \$FB is \$4000. Subtracting \$1F80 gives a base address of \$2080, which is the address of the next section.

After completing the first section, the base address in \$FA and \$FB is now \$4380. Subtracting \$1F80 again gives \$2400, but now the value of the X-Register is zero so the program subtracts an additional \$03D8, giving \$2028. This is the address of the start of the second section. A similar process brings the routine to the third section. After the third section is complete and the subtractions have been made, the value of the low byte of the base address is \$78. Since this is the only time this value is reached, it is used to determine the end of the routine.

The procedures in the Right Shift routine are similar to those in the Left Shift routine but in reverse order. The additions and subtractions of \$04 are the same, still moving down the screen. The difference here is that instead of beginning at \$00 and going to \$27, the Y-Register now goes from \$27 to \$00. The value of the last byte is now put into the first location to create the scrolling effect.

Up Shift and Down Shift

Lines 145-191 of Listing 1 are the Up Shift routines, and lines 200-245 are the Down Shift routine.

Though these routines are similar to the side shift routines, they need an additional base address and the Y-register is set first (before the X-register). This allows the routine to index the addresses first vertically, then horizontally.

The top byte in a vertical column is temporarily saved. Then every byte is shifted up one line, and the saved word is put into the bottom of the column.

The line addresses are calculated as in the side shifts, but they are recalculated completely for each horizontal move, which slows the program down somewhat. Because each execution moves the screen only one pixel, shifting up or down is slower than shifting sideways. However, it is possible to speed up the program if you are more concerned with speed than with relocatability.

Left-Right Flip

This routine appears in lines 253-328 of Listing 1. The address calculations in the Left-Right Flip routine are the same as in the Left Shift routine because the program progresses down the screen. Again, the Y-Register is the horizontal index; however, the program takes a value from one address on a line and puts it in another some distance away, so two indexes are needed. They are stored in the zero page and loaded into the Y-Register as needed. One index goes from \$00 to \$14, and the other goes from \$27 to \$15. As the program proceeds, the first index is incremented and the second is decremented.

The bytes in the horizontal columns \$00 and \$27 are swapped first, then those in \$01 and \$26, and so on. This puts the first byte into the last location and the last into the first. Then the second goes into the next-to-last, the next-to-last into the second, and so on until \$14 and \$15 are swapped. After completing the first horizontal line, the routine moves down the screen to the next line.

Simply moving a byte from one screen location to another will not reverse the entire image. The bit order within the byte must be reversed also. The bits are reversed with little difficulty: loading the Accumulator with a byte, rotating the Accumulator right (ROR) and then rotating a memory location left (ROL).

By RORing the Accumulator, the rightmost bit goes into the Carry bit, and the rest of the bits are shifted one position to the right. When the memory location is ROLed, all the bits are shifted one position to the left and the Carry bit goes into the first location. As long as the memory location is zeroed first, the bit sequence in memory will be reversed from what was originally in the Accumulator.

One additional step is required. Since the display is created by the seven rightmost bits in a word (the picture bits), the RORing and ROLing is done only seven times. The eighth bit is the color bit and it must be preserved; otherwise, orange turns to green, and blue to violet.

The Accumulator is RORed one more time to get the last bit into the Carry bit; however, instead of ROLing the memory location this time, the Carry bit is only tested. If it is set, indicating that the eighth bit was on, then the value in memory is ORed with \$80, setting the eighth bit again. If the Carry is clear, then that part of the program is skipped, leaving the eighth bit off

Top-Bottom Flip

Like the Up Shift and Down Shift programs, this routine (lines 335-425 of Listing 1) progresses up and down the page simultaneously. Like the Left-Right Flip, it swaps the values in two corresponding locations, but it does not need to reverse the bit order of the words. This routine first swaps the words in the top and bottom thirds of the page, then it swaps the words in the middle section. Also, since it works across the page horizontally, separate index locations are not needed. But additional zero page locations are needed to store more base addresses.

Page 1 Plus Page 2

This routine appears in lines 442-460 of Listing 1. There are two methods to perform this operation depending on the background color of page 2. Since most graphs and charts have a black background, that's what you'll see when you run HIRES .DEMO (Listing 2). It can be modified quite easily for pictures and charts to a white or colored background.

In order to combine the two pages, the bits which make up the pages must be combined. If a bit is off in a byte in page 1, then we want to keep it off. If it is on, then we want to keep it on. If all of the bits in one of the bytes are zero, ANDing it with another byte will turn off all of the bits in that byte too. To get a black background, all of the bits in the background must be off. Therefore, in order to combine bits that are off in page 2 with bits that are on in page 1, the bytes must be ORed. This turns on a bit if it is on in either or both bytes.

For a white or colored background, the effect is reversed. If you assume a white background in page 2, then all of the bits would be on. ORing the byte from page 2 with a byte from page 1 would turn on all the bits including any bits that should be off. In this case, the bytes must be ANDed so that if a bit is off in page 1, the same bit will be off in the combined byte. In the AND operation, a bit is on only if the same bit is on in the first word and the second.

As shown, this routine works only if the background color of page 2 is black. To change it to a white or colored background, change the byte in location \$62B0 to \$31. This changes that step from an OR to an AND.

Page 1 Minus Page 2

This routine (lines 468-487 of Listing 1) reverses the process of the Page 1 Plus Page 2 routine. Line 477 (location \$62D4) holds an exclusive OR (EOR). By EORing the

byte from page 2, the bits are complemented or reversed; if a bit is on, it's turned off while if it's off, it's turned on. The complemented byte is then combined with the equivalent word in page 1.

By complementing the byte, we have effectively reversed the color. If it was originally black (all bits off), it will now be white (all bits on). So, following the same logic as above, the bytes must be ANDed.

To change this program to handle a white or colored background in page 2, the instruction in location \$62D6 must be changed to an OR (\$11) because the white background will be effectively changed to black by the EOR process.

MODIFICATIONS

The routines in Hi-Res Tricks can be modified to create even more Hi-Res effects. For example, you can shift the display left,

All of the programs make use of the zero page for temporary storage.

right, up and down without a scroll effect. You can also create mirror images of your displays. Other easy modifications will make the routines work on page 2. More involved modifications will allow the routines to operate on only specific sections of the pages.

The hex addresses and POKE instructions that follow are only valid if you have entered the programs exactly as listed. If you relocated them for any reason, you'll have to adjust the addresses.

Before you attempt any of these modifications, make sure you have a copy of the original version available as a backup.

No Scroll

Shifting the Hi-Res page left, right, up or down without scrolling erases the display once it has gone past the edge of the page. The portion of the display that scrolls off the screen is lost forever; there is no way to bring it back. So be sure that you have saved your Hi-Res graphic safely to disk if you ever want to use it again!

To modify the Left Shift routine so that it doesn't scroll, change locations \$6039 and \$603A to NOPs (SEA) from the Monitor or by issuing the statement POKE 24633,234: POKE 24634,234 from BASIC. However, whatever is in the last vertical column on the right will then be duplicated each time the program is executed.

Similar modifications can be made to perform right, up and down shifts without scrolling.

Making Mirrors

Changing the contents of locations \$61B6 and \$61B7 to SEA (POKE 25014,234: POKE 25015,234) will duplicate the left side of the page onto the right side, but it will not transfer the right to the left. The left side is unchanged, producing a mirror effect in which the left side is mirrored in the right.

Similarly, changing the contents of locations \$61B0 and \$61B1 to \$EA (POKE 25008,234 : POKE 25009,234) will cause the right side to be mirrored by the left.

Page Two Operations

To operate the programs on page 2, just change the base address locations and the test for the end of page as follows:

Negative Create. Change location \$6005 to \$40 and change \$6018 to \$60 (using the statement POKE 24581,64 : POKE 24600,96).

Left Shift. Change location \$6021 to \$40 and change \$6043 to \$60 (using the statement POKE 24609,64 : POKE 24643,96).

Right Shift. Change location \$606F to \$40 and change \$6091 TO \$60 (using the statement POKE 24687,64 : POKE 24721,96).

Up Shift. Change location \$60BF to \$44, change \$60C7 to \$40 and change \$60E2 to \$60 (using the statement POKE 24767,68 : POKE 24775,64 : POKE 24802,96).

Down Shift. Change location \$6117 to \$5B, change \$611F to \$5F and change \$613A to \$40 (using the statement POKE 24855,91: POKE 24863,95: POKE 24890,64).

Left-Right Flip. Change location \$616D to \$40 and change \$61CA to \$60 (using the statement POKE 24941.64 : POKE 25034.96).

Top-Bottom Flip. Change location \$61FD to \$40, change \$6205 to \$5F, change \$620D to \$40, change \$6215 to \$5F, change \$6235 to \$60 and change \$627A to \$60. (POKE 25085,64 : POKE 25093,95 : POKE 25101,64 : POKE 25109,95 : POKE 25141,96 : POKE 25210,96)

To make these changes "on the fly" from BASIC, just POKE as indicated. If you plan to return to the original function within the same program, be sure to save the original values by PEEKing them first.

Many other effects can be created with careful program modifications. These include operation on part of a Hi-Res screen and use of a phantom Hi-Res page 3. Other modifications can improve the speed of the Hi-Res Tricks routines at the expense of memory and relocatability.

Hi-Res Tricks

Listing 1 for Hi-Res Tricks HIRES.TRICKS

			1 2 3	 . HIRES			
			4	. BY JO			
			5	- COPYR	IGHT (C	1987	
				. BY MI	CROSPAR	C. INC.	
			7	- CONCO			
			8				
			10	- PAGE			
			11				
			12				
			13				
			14 15 16		ORG	\$6000	
			17				
			18	. NEGA			
			19		*****		
			29				
6000	49	00			LDA	4500	
6892					STA	SFA	
6004:	A9	20	24		LDA	1520	
6896:					STA	SFB	
6008	AØ	90	26	NEG1	LDY	4500	
680A	81	FA	27	NEG2	LDA	(\$FA).	Y
680C:			28 29		STA	ASFF	
680E:	27	r.	30		INY	(SFA).	1
6011:			31		BNE	NEG2	
6013					INC	SFB	
6015:					LDA	SFB	
6017:	C9	40	34		CMP	4540	
6819:					BNE	NEG1	
601B:	60		36		RTS		
			37				
			38 39				
			40	. LE			
			41				
			42				
			43				
601C:			44		LDA	N\$00	
601E:					STA	SFA	
6828:			46		LDA	4520	
6022:				LEFT1	LDX	\$FB	
6024:	AC	98	49		LDY		
6028				LEFIZ	LDA	(SFA)	Y
682A					STA		
602C:			52	LEFT3	INY		
602D:			53		LDA	(SFA)	Y
682F:			54		DEY		
6030:					STA	(SFA).	Y
6033			56 57		CPY	4527	
6035:	De	FR	58			LEFT3	
6037			59		LDA	SFE	
6039:	91	FA	60		STA	(SFA)	Y
603B					LDA	SFB	

6030: 18 603E: 69 04		CLC ADC #504	60F5: A5 FA 60F7: 38	177		LDA	SFA		91 FA A4 FC	292		STA	(SFA).Y
6040: 85 FB	64	STA SFB	60F8: E9 D8	179		SBC	1108	6184	AS EE	294 295		LDA	SEE (SFA) .Y
6044 30 E0	66	BMI LEFT2	60FC: A5 FB	180		LDA	SFA		E6 FC	296		INC	SFC
6046: A5 FA 6048: 38		LDA SFA SEC	60FE: E9 03 6100: 85 FB	182		SBC	9103 1FB	61BA:		297 298		LOA	SFC
6049: E9 80 6048: 85 FA		SBC #\$80 STA \$FA	6102: A5 FA 6104: C9 78	184		CMP	SFA US78	61BE:	C9 14 D0 BA	380		BNE	US14 LR3
684D: A5 FB 604F: E9 1F	71	LDA SFB SBC #S1F	6106: DO C6 6108: A5 FE	186 187		BNE	UP2	61C2 61C4	A5 FB 18	381		CLC	SFB
6051: 85 FB 6053: CA	73	STA SFB DEX	618A 91 FC 618C 88	188		STA	(SFC).Y	61C5	69 64	303		ADC	#504 5FB
6054: D0 D0	75	BNE LEFT2	6100: 10 AB	198		BPL	UP1	6109	C9 48	395		CMP	#540
6056: A5 FA 6058: 38		LDA SFA	610F: 60	191		RTS		61CB	30 A7 A5 FA	396 397		LDA	SFA
6059: E9 D8 6058: 85 FA		SBC VSD8 STA SFA		193				61CF :	38 E9 80	308		SEC	1580
6050: A5 FB 605F: E9 03	80	LDA SFB SBC VS03		195 196	• DOWN			61D2 61D4	85 FA A5 FB	310		SYA	SFA
6061: 85 FB	82	STA SFB		197				6106	E9 1F	312		SBC	#51F 5F8
6065: C9 78	84	LDA SFA CMP #578	6110: A0 27	198		LDY	+527	61D8	85 FB C6 FE	313		DEC	SFE
6867: DØ 88 6869: 68	86	BNE LEFT1 RTS	6112: A9 D8 6114: 85 FA	200		STA	SFA	610€:	DØ 96 FØ 02	315		BEQ	LR2 LR9
	87 88		6116: A9 38 6118: 85 FB	202		STA	#138 1F8	61E0	DØ BE	317	LR8 LR9	LDA	SFA
	90 . RIGH	T SHIFT .	611A: A9 D0 611C: 85 FC	284		STA	9500 SEC	61E4	38 E9 D8	319		SEC	#\$D8
			611E: A9 3F 6120: 85 FD	296		LDA	#S3F SFD	61E7	85 FA A5 FB	321		STA	SFA SFB
686A: A9 00	93		6122: B1 FC	298		LDA	(SFC).Y	61EB	E9 03	323		SBC	#103
696C: 85 FA	95	STA SFA	6124: 85 FE 6126: A2 88		DOWN2	LDX	#508	61ED		324		LDA	SFB
696E: A9 20 6970: 85 FB		STA SFB	6128: 81 FA 612A: 91 FC	211		STA	(SFA).Y (SFC).Y	61F1		326		BNE	AS78 LR8
6072: A2 08 6074: A0 27		LDX #\$68 LDY #\$27	612C: A5 FA 612E: 85 FC	213		STA	SFA	61F5	60	328		RTS	
6976: B1 FA 6978: 85 FE	100	LDA (SFA), Y STA SFE	6130: A5 FB 6132: 85 FD	215		LDA	SFB SFD			330 331			
607A 88 607B 81 FA	102 RIGHT3	DEY	6134: 38	217		SEC	1504			332	. TOP-	BOTTOM	FLIP .
607D: C8	104	LDA (SFA), Y	6137: 85 FB	218		SBC	SFB			334			
607E: 91 FA 6080: 88	106	STA (SFA),Y DEY	6139: C9 20 6138: 10 E8	220		SPL	DOWN3		A9 27	335 336		LOY	#127
6081 EA 6082 EA		NOP NOP	613D: A5 FA 613F: 18	222		CLC	SFA		85 FA	337	T81	STA	SFA
6083: 00 F5 6085: A5 FE		BNE RIGHTS	6140: 69 80 6142: 85 FA	224		ADC STA	SFA	61FC		339		STA	#120 1FB
6087: 91 FA 6089: A5 FB	111	STA (SFA),Y	6144: A5 FB 6146: 69 IF	226 227		LDA ADC	1FB	6200 6202	A9 D0	341		LDA	#100 1FC
698B: 18	113	CLC	6148: 85 FB	228		STA	SFB	6204	A9 3F	343		L.DA	#\$3F
608E: 85 FB	115	ADC #584 STA \$FB	614A CA 614B DO DB	239		BNE	DOWN3	6206	85 FD A9 28	344 345		LDA	1528
6090: C9 40 6092: 30 E0		CMP #\$48 BMI RIGHT2	614D A5 FA 614F 18	231		CLC	SFA	620A	85 EC	346		STA	SEC AS20
6094: A5 FA 6096: 38		LDA SFA SEC	6150: 69 D8 6152: 85 FA	233		ADC	ASD8	620E	85 ED A9 A8	34B 349		STA	SED
6097: E9 80 6099: 85 FA	120	SBC #580 STA SFA	6154 A5 FB	235		LDA	5FB 4503	6212	85 EE A9 3F	350 351		STA	SEE ASSE
609B: A5 FB	122	LDA SFB	6158: 85 FB	236 237		STA	SFB	6216	85 EF	352		STA	SEF
6090: E9 1F 609F: 85 FB	124	SBC ASIF	615A A5 FA 615C C9 58	238		CMP	15A 1158	6218 621A		353 354	TB2	LDX	(SFA) Y
60A1: CA 60A2: DO DO		DEX BNE RIGHT2	615E: D0 C6 6160: A5 FE	240		LDA	SFE	621C:		355		LDA	(SFC) Y
60A4: A5 FA 60A6: 38		LDA SFA SEC	6162: 91 FC 6164: 88	242		STA	(SFC),Y	6220	91 FA AS FE	357 358		LDA	SFE .Y
68A7: E9 D8 68A9: 85 FA		SBC #108 STA SFA	6165: 10 AB 6167: 60	244		BPL RTS	DOWN1	6224	91 FC A5 FD	359		STA	(SFC).Y
60AB: A5 FB 60AD: E9 03	131	LDA SFB SBC #103		246 247				6228 6229	38 E9 04	361 362		SEC SBC	F184
60AF: 85 FB 60BL: A5 FA	133	STA SFB		248				6228	85 FD	363		STA	SFD
6983: C9 78	135	CMP VS78		249 250	- LEFT-RI			6220 622F	A5 FB 18	364 365		CLC	SFB
6985: DØ 88 6987: 60	137	BNE RIGHT1 RTS		251				6232		366 367		STA	SFB
	138		6168: A9 80 616A: 85 FA	253 254		STA	4500 SFA		C9 40 30 E2	368 369		BW1	#\$40 TB2
	140 141 . UP	SHIFT .	616C: A9 20 616E: 85 FB	255 256		LDA	#\$20 \$FB	6238 623A	10 02 10 BC	370	твз	BPL	TB1
	142		6170: A9 08 6172: 85 FE	257 258	LR1	LDA	FFE	623C		372	TB4	CLC	SFC
6088: AD 27	144	LDY #\$27	6174: A9 00 6176: 85 FC	259 260	LR2	LDA	#100 1FC	623F	69 80	374 375		ADC	#180 SFC
608A: A9 00 608C: 85 FA	146 UP1	LDA #\$00	6178: A9 27	261		LDA	#\$27	6243	A5 FD	376		LDA	SFD #51F
60BE: A9 24	148	STA SFA LDA #524	617A: 85 FD 617C: A4 FC	262 263	LR3	LDY	SFD SFC	6247	69 1F 85 FD	378		STA	SFD
60C0: 85 FB 60C2: A9 00	150	STA SFB LDA 4500	617E: A9 00 6180: 85 EF	264		STA	1500 1EF	624B		379		SEC	SFA
60C4: 85 FC 60C6: A9 20		STA SFC LDA 1520	6182: B1 FA 6184: A2 07	266 267		LDX	(SFA).Y		85 FA	381 382		SHC	SFA
60C8: 85 FD 60CA: B1 FC	153	STA SFD LDA (SFC),Y	6186: 6A 6187: 26 EF	268 269	LR4	ROR	SEF		A5 FB	383 384		LOA	5F8 V51F
60CC: 85 FE 60CE: A2 08	155	STA SFE	6189 CA 618A DO FA	270		DEX	LR4	6254		385 386		STA	SFB.
6000 B1 FA	157 UP3	LDA (SFA),Y	618C: 6A	272		ROR		6256 6257	D9 C1	387		BNE	TB2
6602: 91 FC 6604: A5 FA		STA (SFC),Y LDA SFA	618D: 98 86 618F: A9 88	273		BCC LDA	LR5	6259 6258	FØ Ø2	388	TB5	BEQ BPL	T86 T83
6806: 85 FC 6808: A5 FB		STA SFC LDA SFB	6191: 05 EF 6193: 85 EF	275		STA	SEF	6250 : 625F :	A2 04 B1 EE	390	TB6 TB7	LDX	4504 (SEE).Y
600A: 85 FD 600C: 18	162	STA SFD	6195: A4 FD 6197: A9 00	277 278	LR5	LDY	\$FD #\$80	6261 6263	85 FE B1 EC	392 393		STA	SFE (SEC).Y
6000: 69 84 600F: 85 FB	164	ADC #584 STA SFB	6199: 85 EE	279		STA	SEE	6265	91 EE A5 FE	394 395		STA	(SEE).Y
60E1: C9 40	166	CMP #\$40	619D A2 07	280		LDX	(SFA).Y	6267	91 EC	396		STA	(SEC) Y
60E3: 30 EB	168	BMI UP3 LDA SFA	619F 6A 61A0 26 EE	282 283		ROR	SEE	626B	A5 EF 38	397 398		SEC	SEF
60E8: E9 80		SEC SBC #\$80	61A2: CA 61A3: DO FA	284 285		BNE	LR6	6270	85 EF	400		SBC	1104 SEF
60EA: 85 FA 60EC: A5 FB		STA SFA LDA SFB	6145 6A 6146 90 06	286 287		ROR	LR7	6272	A5 ED 18	481		CLC	SED
60FE: E9 1F 60FO: 85 FB	173	SBC #11F STA \$FB	61A8: A9 80 61AA: 05 EE	288 289		LDA	#180 188	6275	69 84 85 ED	403		ADC STA	#194 1ED
60F2: CA 60F3: DO DO	175	DEX BNE UP3	61AC: 85 EE	290		STA	SEE	-					NAT Y
	.,.	013	61AE: AS EF	691	LR7	LDA	SEF						

II-RES.TRI		li-Res Trick continued)	(S			516 . 1	AGE 1 <	PAGE 2.	638A 638C	81 FC 85 FE 88	630 631 632	RIGHT2C	STA DEY	SFE
279: C9 40	405	CMP	¥540			518 519			638F	B1 FC C8	633		LOA	(SFC)
278: 30 E2 270: A5 EE	406	SMI	TB7	630A A		520 521	LDA	SFA	63C2:	91 FC 88	635		STA	(SFC)
27F: 18 280: 69 80	408	CLC	: 580	630E 8	5 FC	522 523	STA	SFC AS20	63C5	EA	637		NOP	
282 85 EE	410	STA	SEE	6312 8 6314 A	5 FB	524 525	STA	SFB AS 40	63C7 63C9	DB F5 AB 27	639		BNE	RIGHT2
284: A5 EF 286: 69 1F	411	ADC	SEF SSIF	6316 8	5 FD	526	STA	SFD	63CB	B1 FA	641		LDA	(SFA)
288: 85 EF 28A: A5 EC	413		SEC		1 FC	527 T2 528 T2	8 LDA	(SFC) . Y	63CF	A0 00 91 FC	642		STA	(SFC).
28C: 38 28D: E9 80	415	SEC SBC	*\$80	631C 9		529 530	STA	(SFA) Y	63D1:	AØ 27 88	644	RIGHT20	DEY	*\$27
28F 85 EC 291 A5 ED	417	STA	SEC SED	631F De		531 532	INC	T218	63D4: 63D6:	B1 FA C8	646		LDA	(SFA)
293: E9 1F 295: 85 ED	419	SBC	ASIF	6323 E	6 FD	533 534	INC	SFD SFB	63D7 63D9	91 FA 88	648		STA	(SFA)
297: CA	421	DEX	SED	6327 C	9 40	535	CMP	4540	63DA:	EA	650		NOP	
298: DØ C5 29A: 88	422	DEY	T87	6329 36	0	536 537	RTS	TZIA	63D8: 63DC:	DO F5	652		BNE	RIGHT2
298: 10 BE 290: 60	424	RTS	TB5			538 539			63DE	AS FE 91 FA	653		STA	SFE (SFA)
	426						PAGE SHIP		63E2:	A5 FB 18	656		CLC	IFB
	428						•••••		63E5	69 84 85 FB	657		ADC	1504 1FB
	430	TWO PAGE GRAP	HIC .	632C: A		544	LDA	*108	63E9	18	659		CLC	A\$28
	431	. ROUTINES	:	632E 8	5 FA	546	STA	SFA	63EC	85 FD	661		STA	SFD
	433	:	:	6332: A	9 20	547 548	STA LDA	5FC #520	63EE:	C9 60 30 C6	663		GNI	RIGHT2
	435			6334: 8 6336: A		549 556	STA	15 40	63F 2	A5 FA 38	665		SEC	SFA
	437	. PAGE 1 . PAG		6338: 8 633A: A		551 552 LE	TZA LDX	SFD VSD8	63F5:	E9 80 85 FA	666		STA	4588 5FA
	439			633C: A 633E: B		553 LE 554	T2B LDY LDA	(SFA).Y	63F9:	85 FC A5 FB	669		STA	SFC SFB
29E A9 00	441	LDA	*500	6340: 8 6342: C	5 FE	555	TZC INY	SFE	63FD:	E9 1F	670		SBC	#SIF
2A0: 85 FA	443	STA	SFA	6343: B	1 FA	557	LDA	(SFA).Y	6401	18	672		CLC	#\$28
2A2: 85 FC 2A4: A9 20	444	LDA	5FC #528	6345: 8 6346: 9	1 FA	558 559	DEY STA	(SFA).Y	6404	85 FD	674		STA	SFD
2A6: 85 FB 2A8: A9 40	446		5FB #540		0 27	561	CPY	#527	6406:	DO AF	676		BNE	RIGHT
2AA: 85 FD 2AC: AB 00	448		1100	6348 D		562 563	LDY	LEFT2C	6409: 6408:	A5 FA 38	677		SEC	SFA
2AE B1 FC 2B0: 11 FA	450 451	P12 LDA	(SFC).Y	634F B		564	LDA	(SFC).Y	640C:	E9 D8	679		SBC	SFA
282: 91 FA	452	STA	(SFA) Y	6353 9 6355 A	1 FA	566 567	STA	(SFA) .Y		85 FC	681		STA	SFC SFB
284: C8 285: D8 F7	454		P12	6357 C	8	568 LE	T2D INY		6414:	E9 03	683		580	
287: E6 FB 289: E6 FD	455		SFB SFD	6358 B 635A 8		569 570	LDA	(SFC) Y	6416	85 F8 18	684		CLC	SFB
288: A5 FB 280: C9 40	457		SFB #540	6358: 9 6350: C		571 572	STA	(SFC) Y	6419: 641B:	69 28 85 FD	686 687		STA	1520 1FD
2BF: DØ ED 2C1: 60	459		P12	635E C	0 27	573 574	CPY BNE	AS27 LEFT2D	641D:	A5 FA C9 78	688		LDA	SFA VS78
201. 00	461	K13			5 FE	575 576	LDA STA	SFE (SFC).Y	6421:	DØ 93	698		BNE	RIGHT
	462	***************************************		6366 A	5 FB	577	LDA	SFB	6423	60	692		RTS	
	464	. PAGE 1 - PAG		6368: 1		578	CLC	#504			693	-0.2000000		
	465			6369: 6		579	ADC							
	466 467	***************************************		6368: 8 6360: 1	5 FB	580 581	STA	\$FB			695 696	- 2 PAGE	E SHIFT	UP .
2C2: A9 80 2C4: 85 FA	466	LOA	+\$00 \$FA	6368: 8 6360: 1 6368: 6	5 FB 8 9 20	580	STA				695	. 2 PAGE	E SHIFT	UP .
2C4: 85 FA 2C6: 85 FC	466 467 468 469 470	LOA STA STA	*500	6368: 8 6360: 1 636E: 6 6370: 8	5 FB 8 9 20 5 FD 9 60	580 581 582	STA CLC ADC	5FB #520	6424 6426	A0 27 A9 00	695 696 697	. 2 PAGE	E SHIFT	UP .
2C4: 85 FA 2C6: 85 FC 2C8: A9 20 2CA: 85 FB	466 467 468 469 470 471 472	LDA STA STA LDA STA	*\$00 \$FA \$FC *\$20 \$FB	6368: 8 6360: 1 636E: 6 6370: 8 6372: C 6374: 3 6376: A	5 FB 8 9 20 5 FD 9 60 0 C6 5 FA	580 581 582 583 584 585 586	STA CLC ADC STA CMP BMI LDA	5FB #520 3FD #560	6426 6428	A9 00 85 FA	695 696 697 698 699 700 701	· 2 PAGE	LDY LDA STA	#\$27 #\$00 \$FA
2C4: 85 FA 2C6: 85 FC 2C8: A9 20 2CA: 85 FB 2CC: A9 40 2CE: 85 FD	466 467 468 469 470 471 472 473 474	LDA STA STA LDA STA LDA STA	#\$00 \$FA \$FC \$FS \$FB \$\$40 \$FD	6368: 8 6360: 1 6366: 6 6370: 8 6374: 3 6376: A 6378: 3 6379: E	5 F8 8 9 20 5 FD 9 60 0 C6 5 FA 8 9 80	580 581 582 583 584 585 586 587 588	STA CLC ADC STA CMP BMI LDA SEC SBC	#\$20 #\$20 #\$60 #\$60 LEFT28 #\$A	6426 6428 642A 642C	A9 00 85 FA A9 24 85 FB	695 696 697 698 699 700 701 702 703	· 2 PAGE	LDY LDA STA LDA STA	#\$27 #\$00 \$FA #\$24 \$FB
2C4: 85 FA 2C6: 85 FC 2C8: A9 20 2CA: 85 FB 2CC: A9 40 2CC: 85 FD 2CC: 85 FD 2CC: 85 FD 2CC: 85 FD	466 467 468 469 470 471 472 473 474 475	LOA STA STA LOA STA LOA STA LOA NIZA LOY NIZB LOA	#\$00 \$FA \$FC \$520 \$FB \$540 \$FD \$500 (\$FC).Y	6368: 8 6360: 1 636E: 6 6373: 8 6372: C 6374: 3 6376: A 6378: 3 6378: 8 6378: 8 6370: 8	5 FB 8 9 20 5 FD 9 60 0 C6 5 FA 8 9 80 5 FA	580 581 582 583 584 585 586 586 587 588 589 590	STA CLC ADC STA CMP BMI LDA SEC SBC STA	5FB #520 5FD #560 LEFT28 3FA #380 5FA 5FC	6426 6428 642A 642C 642E 643B	A9 00 85 FA A9 24 85 FB A9 00 85 FC	695 696 697 698 699 700 701 702 703 704 705	· 2 PAGE	LDY LDA STA LDA STA LDA STA	#\$27 #\$00 \$FA #\$24 \$FB #\$00 \$FC
204: 85 FA 206: 85 FC 208: A9 20 20A: 85 FB 20C: A9 40 20E: 85 FD 200: A0 00 20E: 81 FC 20A: 49 FF 20B: 31 FA	466 467 468 469 470 471 472 473 474 475 476 477	LOA STA STA LOA STA LOA STA LOA STA LOY N128 LOY N128 LOA EOR AND	#\$00 \$FA \$FC \$FB \$FB \$\$40 \$FD \$\$00 (\$FC),Y \$\$FF (\$FA),Y	6368 8 6360 1 6365 6 6370 8 6372 C 6374 3 6376 A 6378 3 6379 E 6378 8 6377 8 6370 8	5 FB 8 9 20 5 FD 9 60 0 C6 5 FA 8 9 80 5 FA 5 FB 9 1F	580 581 582 583 584 585 586 587 588 589 590 591	STA CLC ADC STA CMP 8M I LDA SEC SBC STA STA LDA SBC	5FB #520 3FD #560 LEFT28 3FA #380 3FA 5FC 3FB #51F	6426 6428 642A 642C 642E 6430 6432 6434	A9 00 85 FA A9 24 85 FB A9 00 85 FC A9 20 85 FD	695 696 697 698 699 700 701 702 703 704 705 706 707	· 2 PAGE	LDY LDA STA LDA STA LDA STA LDA STA	#\$27 #\$00 \$FA #\$24 \$FB #\$00 \$FC #\$20 \$FD
2C4: 85 FA 2C6: 85 FC 2C8: A9 20 2CA: 85 FB 2CC: A9 40 2CE: 85 FD 2C00: A0 00 2C00: A0 FC 2D4: 49 FF 2D6: 31 FA 2D8: 91 FA 2DA C8	466 467 468 469 470 471 472 473 474 475 476	LOA STA STA LOA STA LOA STA LOA STA LOY N128 LOY N128 LOA EOR AND	#\$00 \$FA \$FC #\$20 \$FB \$FB \$FD \$FD \$\$00 (\$FC),Y	6368 8 6360 1 6362 8 6372 C 6374 3 6376 A 6378 3 6379 E 6378 8 6377 A 6381 E 6383 8	5 FB 8 9 20 5 FD 9 60 0 5 FA 8 8 9 80 5 FC 5 FB 9 1F 5 FB 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	580 581 582 583 584 585 585 586 587 588 589 590 590 591 592 593	STA CLC ADC STA CMP 8MI LDA SEC STA STA LDA SBC STA CLC	5FB #520 3FD #560 LEFT28 3FA #580 5FA 5FC 5FB #51F 3FB	6426 6428 642A 642C 642E 6439 6432 6434 6436	A9 00 85 FA A9 24 85 FB A9 00 85 FC A9 20 85 FD B1 FC 85 EF	695 696 697 698 699 700 701 702 703 704 705 706 707 708 709	UPZA	LDY LDA STA LDA STA LDA STA LDA STA LDA STA	#\$27 #\$00 \$FA #\$24 \$FB #\$00 \$FC #\$20 \$FD (\$FC) \$EF
2C4: 85 FA 2C6: 85 FC 2C8: A9 20 2CA: 85 FB 2CC: A9 40 2CC: 85 FD 2CO: 85 FD 2CO: 81 FC 2D0: 40 FF 2D0: 41 FA 2D0: 91 FA	466 467 468 469 470 471 472 473 474 475 476 477 478	LDA STA STA LOA STA LDA STA LDY M128 LDA EOR AND STA INY BNE	#\$00 \$FA \$FC \$FB \$FB \$\$40 \$FD \$\$00 (\$FC),Y \$\$FF (\$FA),Y	6368 8 6360 1 6362 6 6370 8 6372 C 6378 3 6376 A 6378 8 6370 8 6370 8 6370 8 6370 8 6381 E 6383 8 6385 1 6386 6	5 FB 8 9 20 5 FD 9 6 6 6 5 FA 8 8 9 8 FA 5 5 FC 9 1 FB 9 1 FB 8 9 20	580 581 582 583 584 585 586 587 588 589 590 591 592 593	STA CLC ADC STA CMP BMI LDA SEC SBC STA LDA SBC STA SBC	5FB #520 3FD #560 LEFT28 3FA #380 3FA 5FC 3FB #51F	6426 6428 642A 642C 642E 643B 6432 6434	A9 00 85 FA A9 24 85 FB A9 00 85 FC A9 20 85 FD B1 FC	695 696 697 698 699 700 701 702 703 704 705 706 707 708	· 2 PAGE	LDY LDA STA LDA STA LDA STA LDA STA LDA	#\$27 #\$00 \$FA #\$24 \$FB \$FC #\$20 \$FC #\$20 \$FD (\$FC) \$EF #\$08
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2C4	466 467 471 472 473 474 475 476 477 478 480 481 481 481 481 481 481 481 481 481 481	LDA STA LDA STA LDA STA LDA STA LDA STA LDA STA LDY N128 LDA EOR AND STA INY BNE INC INC LDA CMP BNE RTS - PAGE 1> PA LDA STA STA STA STA STA STA STA STA STA ST	#500 \$FA \$FA \$FB \$540 \$550 \$550 \$550 \$550 \$550 \$550 \$550 \$560 \$65	6368 8 6300 1 636E 6 6370 8 6372 8 6372 8 6372 8 6378 8 6379 8 6377 A 6377 A 6377 A 6383 8 6383 8 6383 8 6384 8 6388 8 6388 8 6388 8 6388 8 6388 6 6388 8 6388 6 6388 8 6388 6 6388 7 6388 8 6388 7 6388 8 6388 7 6388 8 6388 6 6388 6 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6388 7 6389 8 6394 8 6394 8 6394 6 6397 8 6397 8 6397 8 6397 8 6398 8 6397 8 6398 8 6398 8 6398 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8 6399 8	5 F8 20 D 666 A 80 A C C B F 80 B 70 B	588 558 567 889 123 455 578 899 125 588 158 158 158 158 158 158 158 158 15	STA CLC ADC STA LDA SEC SEC STA LDA CLC SEC STA LDA CLC STA LDA LDA CLC STA LDA LDA CLC STA LDA LDA CLC STA LDA LDA LDA LDA LDA LDA LDA LDA LDA LD	5FB #520 5FD #560 LEFT28 5FA #580 5FA #580 5FB #51F #520 3FD LEFT28 5FA #508 5FA #508 5FA #508 5FA #508 5FA #508 1578 #578 LEFT2A	6426 6428 642C 643B 643C 643B 643B 643A 643A 644C 644B 644C 644B 644C 644B 644C 644B 644C 644C	A9 96 85 PB 0 85 FB 0 85 FC 0 85 FC 0 85 FC 0 85 FC 0 85 FC 0 85 FC 0 86 FC 0 87 FC 0 88 FC	695 696 697 698 699 700 701 702 703 704 705 706 710 711 715 716 717 715 719 720 721 722 723 724 725 726 727 728 739 731 732 734 735 736 733 734 735	UP2A	LDY LDA	#\$27 #\$300 #\$24 #\$24 #\$24 #\$500 (\$FC) #\$25 #\$500 (\$FC) \$FR \$FR \$FR \$FR \$FR \$FR \$FR \$FR \$FR \$FR
2C4	466 467 471 472 473 474 475 477 478 479 480 481 482 484 483 484 487 488 489 490 491 492 493 494 495 501 502 503 508 508 508	LDA STA LDA STA LDA STA LDA STA LDA STA LDA STA LDY M128 LDA EOR AND STA INC INC LDA CMP BNE RTS PAGE 1> PA LDA STA LDA STA STA LDA LDA STA LDA STA LDA LDA LDA LDA LDA LDA LDA LDA LDA LD	#\$00 \$FA \$FC \$FC \$\$FC \$\$FC \$\$FD \$\$SFD \$\$SFD \$\$FB \$FB \$FB \$FB \$FB \$FB \$FB \$F	6368 8 6360 1 6362 6 6379 8 63	5 FB 20 D 6 6 A 8 A C B F FB 20 D A F A B A C C B F FB 20 D A F A B A C C B F FB 20 D A F A B A C C B F B 20 D A F A B A C C B F B 20 D A F A B A C C B B 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5881 5881 5882 5882 5883	STA CLC ADC STATA CMP BMI LDA SEC STAL LDA STA LDA SIGN STA STA LDA SIGN STA STA LDA SIGN STA STA LDA SIGN STA	5FB #520 5FD #560 LEFT28 3FA #580 SFA #588 F51F #520 3FD LEFT28 SFA #508 SFA #	6426 6428 6438 6438 6438 6438 6438 6438 6438 6442 6446 6446 6446 6446 6446 6446 6466 6466	A9 96 85 FB 85 FC	695 696 697 698 699 700 701 702 703 704 705 706 711 712 713 715 716 717 715 719 720 721 723 724 725 726 727 728 730 731 732 733 733 733 733 7337	UP2A	LOY LOA STA LOA STA LOA LOA STA LOA LOA LOA LOA LOA LOA LOA LOA LOA LO	#\$27 #\$300 #\$24 #\$24 #\$24 #\$520 #\$24 #\$520 #\$520 (\$FC) \$5FD (\$FC) \$5FD (\$FC) \$FA \$450 #\$318 UP2C \$FA \$4518 \$518 UP2C \$FA \$5518 \$570 \$570 \$570 \$570 \$570 \$570 \$570 \$570
2C4 85 FA 2C6 85 FC 2C6 87 20 2C2 87 20 2C4 85 FB 2C5 85 FD 2C6 85 FD 2C6 85 FD 2C7 81 FC 2C7 81 FC 2C7 81 FA 2C8 91 FA	466 467 468 469 471 472 473 475 476 477 478 480 481 482 484 485 486 487 488 489 491 492 493 594 495 500 500 500 500 500 500 500 500 500 5	LDA STA INY BNE INC LDA CMP BNE RTS - PAGE 1> PA LDA STA STA LDA STA LDA STA LDA STA LDA LDA LDA LDA LDA LDA LDA LDA LDA LD	#\$00 \$FA \$FC \$\$7C \$\$7C \$\$7C \$\$7E \$\$5D	6368 8 6360 1 6362 6 6372 8 63	5 F8 20 D G G A A A C B F F8 20 D A F A B A C C B F F8 20 D A F A B A C C B F F8 20 D A F A B A C C B F B 20 D A F A B A C C B F B 20 D A F A B A C C B B 30 D A C C 20 B A C	5881 5881 5882 5883	STA CLC CLC ADD STA LDA STA LDA CRP BME LDA SEC STA LDA SEC STA LDA STA LDA STA LDA STA LDA STA LDA CLC CLC ADD STA LDA STA LDA STA LDA CRP BME LDA STA LDA ST	### ### ### ### ### ### ### ### ### ##	6426 6428 6438 6438 6438 6438 6438 6438 6448 644	A9 96 85 85 86 85 FB 0 85 FC 0	695 696 699 700 700 700 700 700 700 700 700 700 7	UP2A	LOY LOA STA LOA STA LOA LOA STA LOA LOA LOA LOA LOA LOA STA LOA LOA LOA LOA LOA LOA LOA LOA LOA LO	#\$27 #\$24 #\$24 #\$24 #\$56 #\$50 (\$FC) \$EF #\$00 (\$FFC) \$FA #\$20 (\$FFC) \$FA #\$56 #\$56 #\$56 #\$56 #\$56 #\$56 #\$56 #\$56
2C4 85 FA 2026 85 FC 2C8 89 FC 2C8 85 FD 2CC 85 FC 2C8 85 FD 2C2 85 FC 2C8 85 FD 2C8 81 FC 2C8 85 FC 2C8 8	466 467 468 469 477 472 473 474 475 476 477 478 480 481 482 483 484 489 491 492 493 494 495 496 501 502 503 504 506 509 510	LDA STA INY BNE INC LDA CMP BNE RTS - PAGE 1> PA LDA STA STA LDA STA LDA STA LDA STA LDA LDA LDA LDA LDA LDA LDA LDA LDA LD	#\$500 \$FA \$FC \$\$7C \$	6368 8 6360 1 6366 6 6370 6 6372 C 6374 3 6372 C 6378 3 6379 6 6379 8 6371 8 6383 8 6383 8 6383 8 6388 8 6388 8 6388 8 6388 8 6388 8 6388 6 6388 6 6388 6 6388 6 6388 7 6389 6 6380 6 63	5 F8 29 D 0 6 C 8 P 18 20 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0 6 D 0	58815555555555555555555555555555555555	STA CLC ADC STA STA STA STA LDA SEC SSCA STA LDA STA LDA STA CLC STA LDA STCA CLC STA STCA STCA STCA STCA STCA STCA STCA	### ### ### ### ### ### ### ### ### ##	6426 6428 6438 6432 6434 6436 6438 6438 6437 6440 6446 6446 6446 6446 6446 6446 6466 6466 6468 6466 6468	A9 96 A5 96	695 696 697 698 700 701 702 703 704 705 711 718 710 711 715 716 717 718 717 718 717 718 717 718 717 718 717 718 717 718 717 718 720 721 721 722 723 724 725 727 737 737 737 738 737 737 738 737 738 738	UP2A	LDY LDA STA LDA LDA LDA LDA LDA LDA LDA LDA LDA LD	#\$27 #\$300 #\$27 #\$300 #\$57 #\$520 #\$520 #\$520 #\$520 #\$520 #\$520 #\$580 #\$57 #\$580 #\$58

								-								
647C:		745 746		BNE	UP2E UP2E	6501	85 FB C9 40	821		STA	5FB #540			897		
6480	10 A4	747	UP20	BPL	UP2A	6503		823		BPL	DN2C				E 1 < 1	
6482	A9 00	748	UP2E	LDA	#100	6505		824		LDA	SFA				(SPECIAL)	
6484	85 FA A9 44	749 750		LDA	SFA #544	6507		825 826		ADC	#588			981		
6488	85 FB	751		STA	SFB	650A		827		STA	SFA			903		
648A	A9 00	752		LDA	#108	650C	A5 FB	828		LDA	SFB	658C	A9 89	904	LDY	1500
648C	85 FC	753		STA	SFC	650€	69 1F	829		ADC	HSIF	658E		995	STY	SEF
648E	A9 40	754		LDA	¥\$48	6510	85 FB	836		STA	SFB	6598	A9 69	906 SPEC1		4500
6492	85 FD B1 FC	755 756		LDA	(SFC) Y	6512	DØ DB	831 832		BNE	DN2C	6592	85 FA A9 40	997	LDA	5FA
6494	91 FE	757		STA	(SFE) Y	6515	A5 FA	833		LDA	SFA	6596		999	STA	SFB
6496	A2 08	758	UP2F	LDX	#508	6517	18	834		CLC	•	6598:	A9 RF	910	LDA	MAGE
6498	81 FA	759	UP2G	LDA	(SFA) Y	6518	69 D8	835		ADC	A\$D8	659A:	85 FE	911	STA	SFE
649A	91 FC A5 FA	769		SIA	(SFC).Y	651A	85 FA	836		STA	SFA	6390	A9 20	912	LDA	1520
649E	85 FC	761		STA	SFA	651C	A5 FB 69 03	837 838		LDA	SFB	659E:	85 FF	913	STA	SFF
6448	AS FB	763		LDA	SFB	6520	85 FB	819		STA	1503 1FR	65A0	A5 FE	914	SEC	TEE
64A2	85 FO	764		STA	SFD	6522	AS FA	840		LDA	SFA	65A3	ES EF	916	SBC	SEF
6444	18	765		CLC		6524	C9 58	841		CMP	F\$58	65A5	85 FC	917	STA	SFC
64A5	69 04 85 FR	766		ADC	#504	6526	DØ C6	842		BNE	DN2B	65A7	A5 FB	918	LDA	1F8
6449	C9 68	767 768		STA	1560	6528 652A	A5 FC 85 FE	843		STA	SFC SFE	65A9	ES FF	919	SEC	SED
64AB	30 EB	769		BMI	UP2G	652C	A5 FD	845		LDA	SFD	65AD	EA	920	NOP	
64AD	AS FA	770		LDA	SFA	652E	85 FF	846		STA	SFF	65AE	A2 08	922 SPECI	AL2 LDX	*508
64AF	38	771		SEC		6530		847		BNE	DN2E	6580	B1 FA		AL3 LDA	(SEA),Y
6489	E9 80 85 FA	772		SEC	# \$80 \$FA	6532	FO 02	848	24/20	9EQ	DN2E	65B2		924	STA	(SFC).Y
6484	A5 FB	774		LDA	SFB	6534	10 A4 A9 D0	849 850	DN2D DN2E	LDA	DN2A #SDB	6584: 6586:	AS FD	925 926	CLC	SFD
6486	E9 1F	775		SBC	ASIF	6538	85 FA	851	DITZE	STA	SFA	65B7	69 94	926	ADC	*504
6488	85 FB	776		STA	SFB	653A	A9 3B	852		LDA	#\$3B	6589		928	STA	SFD
648A	CA	777		DEX		653C		853		STA	SFB	65BB	A5 FB	929	LDA	\$18
648B	DO DB	778		BNE	UP2G	653E		854		LDA	# \$ DØ	65BD:	18	936	CLC	
648F	38	780		SEC	SFA	6540		855 856		STA	SFC 453F	65BE :		931 932	STA	#104 1FB
64C0	E9 D8	781		SBC	4508	6544		857		STA	SED	65C2:		933	CMP	1160
64C2	85 FA	782		STA	SFA	6546	B1 FC	858		LDA	(SFC) Y	65C4:	38 EA	934	BNI	SPECIAL3
6404:	A5 FB	783		LDA	SFB	6548		859		STA	(SFE) Y		AS FA	935	LDA	SFA
6406	E9 03 85 FB	784 785		SBC	1503 1FB	654A	A2 08	868	DN2F	LDX	# 5 C 8	65C8:		936	SEC	
64CA	AS FA	786		LDA	SFA	654C	81 FA 91 FC	861 862	DN2G	STA	(SFA).Y	65C9:	85 FA	937	SBC	15A
64CC	C9 78	787		CMP	4578	6550	AS FA	863		LDA	(SFC).Y	65CD:		939	LOA	158
64CE	DØ C6	788		BNE	UP2F	6552	85 FC	864		STA	SFC	65CF :		940	SBC	VSIF
6400	AS EF	789		LDA	SEF	6554		865		LDA	SFB		85 FB	941	STA	1F8
6404	91 FC 88	790		STA	(SFC),Y	6556	85 FD	866		STA	SFD		A5 FC	942	LOA	SFC
6405	10 A9	792		BPL	UP20	6558	38 E9 04	867		SEC	1504	65D5:	38 F9 88	943	SEC	U180
6407		793		RTS	0.20	6558	85 F8	869		STA	SFB	65D8	85 FC	945	STA	1FC
		794		25,000		6550	C9 20	870		CMP	+520	65DA	A5 FD	946	LDA	SFD
		795				655F	10 EB	871		BPL.	DN2G		E9 1F	947	SBC	#SIF
		796 797	- 2 PA	GE SHIF	T DOWN	6561		872		LDA	SFA		85 FD	948	STA	SFD
		798		******		6563	69 80	873 874		ADC	*580	65E0:	DØ CD	949	DEX	SPECIAL3
		799				6566	85 FA	875		STA	SFA	65E3:	A5 FA	951	LDA	SFA
	2000	800				6568	AS FB	876		LDA	SFB	65E5	38	952	SEC	
64D8	A8 27	801		LDY	#\$27	656A	69 1F	877		ADC	FSIF	65E6:	E9 D8	953	SBC	ASD8
64DA	85 FA	802	DNZA	STA	# SDO	656C	B5 FB	878 879		STA	SFB	65E8	85 FA A5 FB	954	STA	SFA SFB
64DE	A9 58	804		LDA	# \$ 5 B	656F	DØ DB	879		BNE	DN2G		A5 FB E9 83	955	SBC	4503
64E0:	85 FB	805		STA	1FB	6571		881		LDA	SFA		85 FB	957	STA	1FB
64E2:	A9 D0	806		LDA	* \$00	6573	18	882		CLC		65FQ	AS FC	958	LDA	SFC
64E4:	85 FC	807		SIA	SFC	6574	PA DR	883		AUC	F108	65F2	38	959	SEC	
64E6:	A9 5F 85 FD	808		STA	# S S F	6576	85 FA	884		STA	SFA	65F3:	E9 D8	960	SBC	*108
64EA:	BI FC	810		LDA	(SFC).Y	6578 657A	69 03	885 886		ADC	1F8 4103	65F5:	85 FC A5 FD	961 962	STA	SFC
64EC:	85 EF	811		STA	SEF	657C	85 FB	887		STA	\$FB	65F9:	E9 03	963	SBC	1503
64EE	A2 08	812	DN28	LOX	A 5 0 8	657E	A5 FA	888		LDA	SFA	65F8:	85 FD	964	STA	SFD
64F0:	B1 FA	813	DN2C	LDA	(SFA) Y	6580	C9 58	889		CMP	+558	65FD	A5 FA	965	LDA	SFA
64F4:	91 FC A5 FA	814		STA	(SFC).Y	6582	DØ C6	890		BNE	DN2F	65FF:	C9 78	966	CMP	#578
64F6	A5 FA 85 FC	815		STA	SFA	6584	AS EF 91 FC	891		LDA	SEF	6601:	DØ AB	967 968	INY	SPEC IAL 2
64F8:	A5 FB	817		LDA	SFB	6588		892 893		STA	(SFC),Y	6684	CØ 27	969	CPY	#527
64FA	85 FD	818		STA	SFD	6589	10 A9	894		BPL	DN2D	6686	DØ 88	970	BNE	SPECIALI
64FC	38	819		SEC		6588		895		RTS	1797	6608		971	RTS	
64F0	E9 84	820		SBC	#504			896				. Ford	assembly	1545 bytes	Frence	. 0
												END (OF LISTING	1		
												- 1				

KEY PERFECT 5.0 RUN ON HIRES.TRICKS

**********		BREEFER	
CODE - 5.0	ADDR# -	ADDR#	CODE - 4.0

8EA793EE	6000 -	604F	2A37
57D8E41C	6050 -	609F	273A
AGGCOFAE	60A0 -	60EF	2502
FE525392	60F0 -	613F	2ADD
71907C81	6140 -	618F	284C
9D835E37	6190 -	61DF	26F2
92040108	61EØ -	622F	2947
D77F2E7E	6230 -	627F	28C7
335FD30B	6280 -	62CF	299E
397CBA55	62DØ -	631F	2825
1F4956C0	6320 -	636F	298B
A2126BDB	6370 -	63BF	283C
FØDC36CB	63C0 -	640F	2429
B08119C6	6410 -	645F	2BAA
1878830C	6460 -	64AF	2961
92796AC2	6480 -	64FF	264B
A6D67D62	6500 -	654F	29BD
57DF2505	6550 -	659F	24A4
55D7D367	65A0 -	65EF	2953
99F87B7B	65F0 -	6608	ØDCD
93CFD590 =	PROGRAM	TOTAL I	0609

Listing 2 for Hi-Res Tricks HIRES.DEMO

```
10
        REM
20 REM . HIRES DEMO
        REM . BY JOHN MAJKA
30
        REM • COPYRIGHT (C) 1987
REM • BY MICROSPARC, INC.
40
50
                   . CONCORD, MA 01742
60
        REM
70
         REM
         TEXT : HOME : PRINT "HI-RES DEMO": PRINT
80
           "BY JOHN MAJKA": PRINT "COPYRIGHT 1987 B
"BY JOHN MAJKA": PRINT "COPYRIGHT 1987 B
Y MICROSPARC, INC."

90 EF = 1: ONERR GOTO 580

100 VTAB 10: HTAB 1: CALL - 958: PRINT "NAM
E OF FIRST PICTURE (? FOR CAT): ": INPUT
"";PC$: ON PC$ = "" GOTO 100: ON LEFT$
(PC$,1) = "?" GOTO 620: PRINT CHR$ (4)"
           VERIFY"PCS
VERIFY"PCS

110 EF = 2: ONERR GOTO 580

120 VTAB 14: HTAB 1: CALL - 958: PRINT "NAM E OF SECOND PICTURE (? FOR CAT): ": INPUT "":PD$: ON PD$ = "" GOTO 120: ON LEFT$ (PD$,1) = "?" GOTO 620: PRINT CHR$ (4)" VERIFY"PD$
```

```
430 FOR I = 1 TO 2000: NEXT
130 EF = 3: ONERR GOTO 580
                                                   440 HOME : POKE 49236.1: POKE 49235.1: PRINT
140 HGR :D$ = CHR$ (4): POKE 34.20: HOME :E
                                                        "2 OVERLAYED ONTO 1":E$
     S = CHRS(7)
                                                   450 CALL 25246
150 PRINT DS: "BLOAD HIRES. TRICKS": PRINT DS;
                                                   460 FOR I = 1 TO 3000: NEXT
     "BLOAD" : PC$
                                                        HOME : PRINT "1 MINUS 2": CALL 25282
                                                   470
160 PRINT "HIRES TRICKS-SINGLE PAGE": POKE 3
                                                   480 FOR I = 1 TO 3000: NEXT
     4.21
                                                   490 HOME : PRINT "PAGES 1-2 SCROLL LEFT" : ES
170 PRINT "NEGATIVE CREATE": ES
                                                   500 FOR I = 1 TO 20: CALL 25388: NEXT
180 FOR I = 1 TO 10: CALL 24576: FOR J = 1 TO
                                                   510 HOME : PRINT "PAGES 1-2 SCROLL RIGHT": E$
     500: NEXT J: NEXT I
                                                   520 FOR I = 1 TO 20: CALL 25512: NEXT
190 HOME : PRINT "LEFT SHIFT" : E$
                                                   530 HOME : PRINT "PAGES 1-2 SCROLL DOWN": ES
200 FOR I = 1 TO 40: CALL 24604: NEXT
                                                   540 FOR I = 1 TO 96: CALL 25816: NEXT
210 HOME : PRINT "RIGHT SHIFT" : ES
                                                   550 HOME : PRINT "PAGES 1-2 SCROLL UP" : E$
220 FOR I = 1 TO 40: CALL 24682: NEXT
                                                   560 FOR I = 1 TO 96: CALL 25636: NEXT
230 HOME : PRINT "UP SHIFT" : ES
                                                   570 TEXT : HOME : END
240 FOR I = 1 TO 96: CALL 24760: NEXT
                                                   580 IF EF = 3 THEN TEXT : HOME
250 HOME : PRINT "DOWN SHIFT" : ES
                                                   590 POKE 216.0: PRINT : PRINT "TROUBLE LOCAT
260 FOR I = 1 TO 96: CALL 24848: NEXT
                                                        ING FILE "PAS
270 HOME : PRINT "LEFT-RIGHT FLIP" : ES
                                                   600 VTAB 22: HTAB 1: PRINT "PRESS RETURN TO
280 FOR I = 1 TO 10: CALL 24936: FOR J = 1 TO
                                                        RE-ENTER NAMES":: GET ZS: PRINT
     1000: NEXT J: NEXT I
                                                   610 ON EF GOTO 90.110.90
290
    HOME : PRINT "TOP-BOTTOM FLIP" : ES
                                                   620 HOME : PRINT CHRS (4) LEFTS ("CATALOG".
300 FOR I = 1 TO 10: CALL 25078: FOR J = 1 TO
                                                        7 - 4 + ( PEEK (48896) = 76)): PRINT "PR
     1300: NEXT J: NEXT I
                                                        ESS RETURN TO CONTINUE" ; : GET Z$ : PRINT
310 HOME : PRINT "RIGHT SIDE MIRROR OF LEFT"
                                                        : HOME : GOTO 100
     : E$
                                                   END OF LISTING 2
320 POKE 25014.234: POKE 25015.234: CALL 249
     36
330 FOR I = 1 TO 1500: NEXT
    HOME : PRINT "BOTTOM MIRROR OF TOP"
340
                                                                     KEY PERFECT 5.0
    PRINT DS: "BLOAD"PCS: POKE 25120.234: POKE
                                                                         RUN ON
    25121.234: POKE 25193.234: POKE 25194.23
                                                                      HIRES . DEMO
     4: CALL 25078
                                                        -----
360 HOME : PRINT "BOTTOM MIRROR OF TOP" : E$
                                                           CODE - 5.0
                                                                     LINE# - LINE#
                                                                                      CODE-4.0
370 FOR I = 1 TO 2000: NEXT
380 PRINT D$; "BLOAD"PC$", A$2000"
                                                           33E34911
                                                                         10 -
                                                                                100
                                                                                         A4A5
    POKE 34.20: HOME : PRINT "HIRES TRICKS-T
390
                                                           1944E163
                                                                       110 -
                                                                                200
                                                                                         9F68
    WO PAGES": POKE 34,21
                                                           4BA40F41
                                                                        210 -
                                                                                300
                                                                                         772C
400
    PRINT "CURRENT PAGE 1":ES
                                                           010839B4
                                                                        310 -
                                                                                400
                                                                                         8BF4
410 FOR I = 1 TO 1500: NEXT
                                                                        410 -
                                                           F39A5E73
                                                                                500
                                                                                         7308
    HOME : PRINT "CURRENT PAGE 2": PRINT D$;
                                                           ØAF25C95
                                                                        510 -
                                                                                600
                                                                                         7A3D
     "BLOAD"PD$". A$4000": POKE 49234.1: POKE
                                                           18ØBC777
                                                                        610 -
                                                                                620
                                                                                         2DE8
    49237,1
                                                           95791B85 = PROGRAM TOTAL =
                                                                                        0737
```