

# THE LOST "TRICKS" [PART 3]

BY MIKE WHITE

FIRST OFF, 2 CORRECTIONS ARE NEEDED FROM LAST TIME. 1: WHERE I SAID "ANY BYTE IN A STRING BETWEEN 01 AND 99 PRINTS OUT AS A CHARACTER" (CONCERNING "STRDIS"), I OMITTED THE "SKIP" FUNCTION! BYTES FROM 01 TO 31 LEAVE THAT MANY SPACES BEFORE PRINTING RESUMES! THIS FEATURE APPEARS IN RST 38 SUB 120 "QUIT" AND PERHAPS NOWHERE ELSE! NOTE: THIS IS THE ROUTINE THAT PRINTS "GAME OVER" IN 2x SIZE CHARACTERS. AND 2: !58 IS RED AND 08 IS BLUE, NOT VICE-VERSA! TO UNDERSTAND, READ ON.

LAST TIME I GAVE EVERYBODY A FLAG PROGRAM WHERE I TRIED TO MAKE IT AS SIMPLE AS POSSIBLE SO AS TO INTRODUCE THE READER TO THE IDEA OF USING THE SCREEN INTERRUPT. THE ORIGINAL FLAG (ARCADIAN VOL.6 PG.76) USED MULTIPLE INTERRUPTS TO GENERATE ALL THE STRIPES AND EVEN MOVED &(9) DYNAMICALLY TO CREATE THE BLUE FIELD! THIS WAS "SHOW OFF" PROGRAMMING, NOT AT A BEGINNERS LEVEL AT ALL! DOUBLE THAT FOR THE PROGRAM ON PAGE 94 AB HANDBOOK!! MOST GAME PROGRAMS DON'T USE "ARTISTIC" TRICKS TO FUNCTION, JUST A COLOR CHANGE (OR 2), PERHAPS A TIMER (IN REAL TIME), OR ANIMATION (WITHOUT BLINKING).

LET'S BEGIN BY EXAMINING THE MACHINE CODE PORTION OF OUR FLAG PROGRAM FROM LAST TIME, TITLED "BC DIVIDER". THIS 30 BYTE ROUTINE IS WHAT SEPARATES THE BLUE FIELD FROM THE RED STRIPES LEFT OF THE &(9) BOUNDRY. THE REST OF THE DISCRPTION OF THIS PROGRAM APPEARED LAST TIME AND IF THERE'S QUESTIONS, ASK!

3 RULES MUST BE KNOWN IN ORDER TO USE THE SCREEN INTERRUPT! RULE 1: PUSH EVERYTHING TO THE STACK THAT YOU INTEND TO USE! THE REASON IS THAT WE DON'T KNOW WHERE IN THE MAIN PROGRAM WE WERE WHEN THE INTERRUPT OCCURED, SO WE MUST SAVE AND RESTORE EVERYTHING, TO THE LAST DETAIL!! OTHERWISE A PROGRAM CRASH IS INEVITABLE WHEN WE RETURN TO THE FORGROUND PROCESSOR! NOTE: IF YOU USE THE "HOOK" AT !6DCF IN BRB, THE REGISTERS "AF", "BC", "DE", AND "HL" HAVE ALREADY BEEN PRESERVED. HOWEVER, IF YOU USE "IX", "IY", OR ANY OF THE ALTERNATE REGISTERS, THEY MUST BE PUSHED FIRST!

RULE 2: IF WE WISH TO PASS NUMBERS TO AND FROM THE FORGROUND PROCESSOR, OR EVEN ANOTHER INTERRUPT, WE MUST ASSIGN A SPOT IN THE SCRATCHPAD, BECAUSE OF THE SAME REASON AS IN RULE 1 (ABOVE)! **THINK ABOUT IT!** AND RULE 3: A "LEAD TIME" IS REQUIRED FOR MOST ROUTINES! THE REASON IS THAT THE 280 IS KEPT IN A "WAIT" STATE DURING MEMORY REFRESH CYCLES, AND DURING VIDEO GENERATION. BOTH HAVE A HIGHER PRIORITY! (SEE THE 25 PAGE TUTORIAL BY TONY MILLER TITLED "VIDEO HARDWARE DISCRPTION" FOR A DETAILED VIEW OF TIMING).

"BC DIVIDER" IS SO SIMPLE THAT ONLY "AF" (THE BARE MINIMUM) NEEDS SAVED, AS THAT'S ALL WE'RE USING! HOWEVER, WE DO NEED AN ADDRESS TO KEEP TRACK OF EXACTLY WHERE ON THE SCREEN WE ARE, AS WE CANNOT READ FROM AN OUTPUT PORT! THIS IS EASILY RESOLVED WITH THE BASIC VARIABLE "BC", WHICH IS A TWO BYTE VARIABLE USING ONLY THE LOWER BYTE TO HOLD THE "BACKGROUND COLOR"! THEREFORE, WE "BORROW" THE UPPER BYTE TO HOLD OUR CURRENT "TRIGGER" VALUE IN! THE VALUE OF !62 IS THE SCAN LINE AT THE LOWER EDGE OF THE BLUE FIELD. SINCE THE NEXT SEVEN LINES ARE "FC" (WHITE), THE TIMING DELAY (TILL LINE NO. !66) ISN'T EVEN NOTICED, SO WE'VE OBSERVED ALL 3 "RULES"!

ON THE FIRST "RUN THROUGH" OF "BC DIVIDER" THE UPPER BYTE OF "BC" STARTS OUT AT 00! AFTER SAVING "AF", "A" LOADS WITH THIS BYTE (00)! THIS IS THEN COMPARED TO !62 WHICH RESETS THE ZERO FLAG (IN THE "F" REGISTER). THEN "A" RELOADS WITH !08, AND REPLACES THAT WITH !62 BECAUSE THE "JUMP RELATIVE IF ZERO" INSTRUCTION DOES NOT JUMP IF THE ZERO FLAG IS RESET. THIS LAST VALUE IS SAVED TO THE UPPER BYTE OF "BC", AND ALSO SENT TO THE ADDRESS CHIP AT &(15). THIS SETS THE ADDRESS CHIP TO INTERRUPT THE SYSTEM AT LINE !62 (98 DEC. OR 49 IF YOU'RE COUNTING IN LOW-RES BASIC). "A" IS THEN LOADED WITH !58 RED (SORRY I GOT RED AND BLUE BACKWARDS LAST TIME. THE NUMBERS ARE CORRECT, ONLY MY NOTES GOT REVERSED.) AND THEN THE OTHER "JUMP RELATIVE IF ZERO" DOES NOTHING BECAUSE THE ZERO FLAG IS STILL RESET! NOTE: NONE OF THE INSTRUCTIONS IN THIS ROUTINE EFFECT THE FLAGS EXCEPT "COMPARE" AND "POP AF"! THEREFORE, "A" IS AGAIN RELOADED, THIS TIME WITH 08 (BLUE). THAT GETS SENT TO THE LOWER BYTE OF "BC". THEN WE "POP AF" WHICH RESTORES OUR REGISTERS AND LEAVES THE STACK EXACTLY WHERE IT WAS WHEN THIS ROUTINE BEGAN! REMEMBER, I SAID "TO THE LAST

**DETAIL!!**" FINALLY, WE JUMP INTO AB'S REGULAR INTERRUPT SERVICE ROUTINE WHERE THE VALUE OF "BC" (AND "FC") IS OUTPUT TO THE COLOR PORTS! (DISASSEMBLE "AB" FROM !21FD TO SEE WHERE THE OUTPUTS TO THE COLOR AND SOUND PORTS OCCUR).

THE SECOND TIME THIS ROUTINE RUNS, THE UPPER BYTE OF "BC" IS !62 AND SO WAS THE LINE SCANNED WHEN THE INTERRUPT OCCURRED! THE ZERO FLAG WILL SET, VIA THE "COMPARE" INSTRUCTION, AND BOTH JUMP RELATIVE INSTRUCTIONS WILL JUMP OVER THE "RELOAD A" COMMANDS THAT FOLLOW THEM, RESULTING IN !C8 BEING SENT TO &(15), AND SAVED IN THE UPPER BYTE OF "BC" WITH !58 (RED) GOING TO THE LOWER BYTE. THE THIRD RUN THROUGH RESEMBLES THE FIRST, THE FOURTH RESEMBLES THE SECOND, ETC. THIS ROUTINE ALLOWS FULL OPERATION OF BASIC (EXCEPT THE "BC" VARIABLE) WHEN ACTIVE! HERE'S AN ADDITION TO TRY. TAKE OUT LINE 470 AND ADD:

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>470 NT=20
>480 FOR M=0TO 172
>490 MU=X(M)
>500 NEXT M
>510 IF KP%(T)=L
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THEN ENTER THIS LINE WITHOUT A LINE NUMBER:

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ENTER> FOR M=0TO 172;PRINT "%(",#1,M,")=",;X(M)=KP;TV=X(M);PRINT ;NEXT M [GO]
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THEN KEY IN THE MUSIC STRING FROM "THE STARS AND STRIPES FOREVER" (ON AB HANDBOOK PAGE 80). NOTE: DON'T KEY IN THE MULTIPLY SIGN IN THE "U000" LINE IF YOUR BOOK HAS ONE! THIS SHOULD MAKE IT COME OUT TO EXACTLY 173 ENTRIES!

NOTICE THAT THE "NT" VALUE IS SET TO 20! THIS IS BECAUSE THE INTERRUPT SERVICE ROUTINE IS BEING CALLED TWICE PER VERTICAL SCAN, MEANING THAT WE ARE NOW DECREMENTING THE TIMER 120 TIMES PER SECOND, NOT 60! THEREFORE, WE DOUBLE "NT" VALUE! NOTE: SINCE THE TIMING BETWEEN INTERRUPTS MAY NO LONGER BE EVEN, AN ODD VALUE (SAY 21) MAY SOUND FUNNY. SO FOR 2 INTERRUPTS PER SCAN, EXACTLY DOUBLE "NT", FOR 3 INTERRUPTS PER SCAN, EXACTLY TRIPLE "NT", ETC.

YOU COULD CORRECT THIS BY CHANGING PART OF THE MACHINE CODE LIKE SO:

```
20276 58 [SET FOR RED]
20277 28 JR,Z 04
20278 04 [TO SET "BC"]
20279 F1 POP AF
20280 C3 JP,21FD
20281 FD [CONTINUE INTERRUPT]
20282 21 [SERVICE ROUTINE]
20283 D3 OUT (04)
20284 04 [TO &(4)]
20285 D3 OUT (05)
20286 05 [TO &(5)]
20287 F1 POP AF
20288 FB EI
20289 C9 RET
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AND YOU MUST ADD "BC=8" INTO THE BASIC SOMEWHERE! THIS MEANS MORE BYTES! THEREFORE, IT'S EASIER AND MORE EFFICIENT TO DOUBLE, OR EVEN TRIPLE, "NT".

REAL TIME TIMERS IS ONE THING I'VE NEVER DONE! HOWEVER, ON BOARD SUB 200 DOES TIMING IF YOU CALL RST 38 SUB 14 EVERY INTERRUPT! BRB DOES THIS IF YOU SET THE 15TH BIT OF "NT" (NT=!40XX)! THE "PLAY" COMMAND USES THIS BIT BECAUSE RST 38 SUB 18 "B MUSIC" IS "PLAY", AND USES THE "ON BOARD" INTERRUPT TO RUN ITS TIMERS!! (SEE ARCADIAN VOL.5 PG.128 + 156 TO GET AN IDEA OF HOW TO BUILD A MUSIC STRING THAT PLAYS WHILE THE COMPUTER IS BUSY ELSEWHERE!)

HERE IS A BRB PROGRAM THAT DEMONSTRATES ANIMATION:

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>10 DATA %(<28092),128,256,-15610,3181,-2034,18552,3144,30862,18552,-8888
>20 DATA %(<28112),-8731,-17375,8557,27866,9054,9046,-26562,4110,16621,14632
>30 DATA %(<28132),25317,-17557,1320,22731,296,15916,-17830,1320,18635,296
>40 DATA %(<28152),-20700,10427,-13563,10320,11521,10426,-13563,10304,9473,2049
>50 DATA %(<28172),-250,21532,-7843,8062,5951,13055,11127,11122,-8845,-13855
>60 DEFAULT ;CLEAR ;DATA Y,9548,129;&(15)=175;NT=!2000
>70 IF &(23)GOTO 60
>80 GOTO 70

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THIS IS OUR OLD FRIEND "CHRDIS", BUT TRY IT NOW! THE PROGRAM WILL CLEAR THE SCREEN AND WAIT FOR EITHER JX(1) OR TR(1). LIMITS ARE BUILT IN AS WELL AS A TAIL WAG ON TR(1). THE "&(15)=175" COMMAND SETS THE INTERRUPT TRIGGER SO AS TO AVOID TIMING ERRORS AND RUN OUR ROUTINE DURING VERTICAL RETRACE. THE CHARACTER "BLANKS" ON PARTS OF THE SCREEN IF THIS COMMAND IS CHANGED! FOR A COMPLETE "WALK THROUGH" OF THIS PROGRAM, YOU'LL HAVE TO ASK ME.

ANOTHER WAY TO DO ANIMATION IS TO USE RST 38 SUB 46 "RESTORE" ("SHOW"). HOWEVER, IT OVERWRITES ON A 4 COLOR SCREEN, LEAVING OUT AB AND BB ENTIRELY!

THE BEST WAY IS THE "VECTOR ANIMATER"! TO GET IT TO RUN PROPERLY THE STACK POINTER ALWAYS GOT MOVED, (TO !4C70 IN "CRITTER"). ANYONE KNOW WHY? THIS IS THE WAY THAT THE CARTRIDGES ANIMATE, AND I HOPE THAT WITH LANCE SQUIRE'S WORK WE CAN GET IT GOING SOON!

ALSO, IF YOU WANT INDEPENDANT CONTROL OF MULTIPLE INTERRUPT ROUTINES, YOU CAN STILL RE-INITIALIZE THE "VECTOR" AND USE :RETURN TO STOP IT. THE "LIGHT PEN" INTERRUPT USED :INPUT (OR ":INPUT 300" IN BRB) TO ACTIVATE, AND :RETURN TO RESET IT, EXCEPT AB. YET THE PROGRAM ON PAGES 104-106 AB HANDBOOK PUTS IT TO USE. IN BRB YOU CAN TURN ONE ROUTINE ON OR OFF WITH "NT=X" AND ANOTHER WITH A CALL OR OP COMMAND (ON) AND :RETURN (OFF).

OUR OTHER TOPIC FOR THIS SERIES HAS BEEN THE "ON BOARD MENU". LAST TIME YOU GOT THE DEFAULTS FOR RESTORATION. THE COLORS ARE: BC=RED FA=WHITE FB=BLUE AND FC=SILVER. IF YOU MAKE YOUR OWN CHARACTERS, YOU ONLY HAVE THESE 4 TO WORK WITH! WHEN "MENU" RUNS, THE VALUE ASSIGNED TO "HL" MOVES TO "IX"! THEREFORE, TO RESTORE THE REGISTERS AT THE END OF TITLE #1: IX=!2001 D=!0C C=09 UNLESS YOU USED 2x SIZE LETTERS, THEN D=!14. AT THE END OF TITLE #2 IX=!3FBB IN OUR AB MULTICART LOADER OR !2FEB IN OUR BRB BASICART LOADER BECAUSE THAT'S WHERE THE SECOND "SEGMENT" OF THE "LINKED LIST" BEGINS. D=!14 FOR NORMAL SIZE PRINTING (!1C FOR 1 LINE OF 2x SIZE PRINTING AND !24 FOR 2). NOTE: THE "E" REGISTER GETS RESET FOR EACH TITLE AND THEREFORE DOESN'T NEED RESTORATION, WHILE THE "C" REGISTER ALWAYS NEEDS RESTORED TO 1x PLOP FB OVER FA (OR 09)!

AND HERE IS A "MENU" DEMO PROGRAM WITH A REAL SURPRISE!!

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!2000 55 [MENU FLAG] <USER>                !2015 19 [ADDRESS OF]
!2001 18 [ADDRESS OF] <1ST LINK>           !2016 20 [MESSAGE STRING]
!2002 02 [NEXT SEGMENT]                   !2017 02 [X INT C]
!2003 FA [ADDRESS OF]                    !2018 76 HALT
!2004 2E [TITLE STRING]                  !2019 49 I <MESSAGE STRING>
!2005 D0 [ADDRESS OF]                    !201A 54 T
!2006 2E [ANIMATE]                       !201B 20 [SPACE]
!2007 F3 DI <MESSAGE>                    !201C 57 W
!2008 FF RST 38                          !201D 30 0
!2009 00 [INTP C]                        !201E 52 R
!200A 14 [E MUSIC]                       !201F 4B K
!200B 1B [FILL+1]                        !2020 53 S
!200C 00 [STARTING]                     !2021 21 !
!200D 40 [ADDRESS]                       !2022 21 !
!200E 00 [# OF BYTES]                   !2023 00 (END)
!200F 0F [TO FILL]                       ↓
!2010 00 [WITH THIS]                    !2ED0 F3 DI <ANIMATE>
!2011 35 [STR DIS+1]                     !2ED1 FF RST 38
!2012 08 [HOR. POS.]                     !2ED2 1D [RECTAN+1]
!2013 25 [VER. POS.]                     !2ED3 88 [HOR. POS.]
!2014 5C [MAGIC BYTE]                    !2ED4 4A [VER. POS.]

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!2ED5 15 [WIDTH]
!2ED6 0D [HEIGHT]
!2ED7 00 [COLOR]
!2ED8 FF RST 38
!2ED9 1D [RECTAN+1]
!2EDA 92 [HOR. POS.]
!2EDB 4A [VER. POS.]
!2EDC 01 [WIDTH]
!2EDD 0D [HEIGHT]
!2EDE 55 [COLOR]
!2EDF 3E LD A,FF
!2EE0 FF [NOISE]
!2EE1 D3 OUT (15),A
!2EE2 15 [TO &(21)]
!2EE3 D3 OUT (17),A
!2EE4 17 [TO &(23)]
!2EE5 FB EI
!2EE6 06 LD B,4C
!2EE7 4C [WINDOW]
!2EE8 C5 PUSH BC <LAUNCH>
!2EE9 FF RST 38
!2EEA 31 [SCROLL+1]
!2EEB 28 [DESTINATION]
!2EEC 00 [OFFSET]
!2EED 06 [WIDTH]
!2EEE 4C [HEIGHT]
!2EEF DA [STARTING]
!2EF0 41 [ADDRESS]
!2EF1 FF RST 38
!2EF2 51 [PAWS+1]
!2EF3 05 [DELAY TIME]
!2EF4 C1 POP BC
!2EF5 10 DJNZ,F1
!2EF6 F1 [TO LAUNCH]
!2EF7 C3 JP,2007
!2EF8 07 [ADDRESS OF]
!2EF9 20 [MESSAGE]
!2EFA 53 S <TITLE STRING>
!2EFB 50 P
!2EFC 41 A
!2EFD 43 C
!2EFE 45 E
!2EFF 20 [SPACE]
!2F00 4D M
!2F01 49 I
!2F02 53 S
!2F03 53 S
!2F04 49 I
!2F05 30 0
!2F06 4E N
!2F07 70 (CHANGE IX)
!2F08 1E [FONT #1]
!2F09 2F [ADDRESS]
!2F0A 80 [ROCKET]
!2F0B 7E (CHANGE IX,D,C)
!2F0C 17 [FONT #2]
!2F0D 2F [ADDRESS]
!2F0E 17 (VER. POS.)
!2F0F 18 (MAGIC BYTE)
!2F10 80 [USA]

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!2F11 7E (CHANGE IX,D,C)
!2F12 01 [ADDRESS OF]
!2F13 20 [1ST LINK]
!2F14 0C (VER. POS.)
!2F15 09 (MAGIC BYTE)
!2F16 00 (END)
!2F17 80 <FONT #2>
!2F18 08 [HOR. ALLOTMENT]
!2F19 08 [VER. ALLOTMENT]
!2F1A 01 [WIDTH]
!2F1B 21 [HEIGHT]
!2F1C 25 [ADDRESS OF]
!2F1D 2F [USA BLOCK]
!2F1E 80 <FONT #1>
!2F1F 08 [HOR. ALLOTMENT]
!2F20 08 [VER. ALLOTMENT]
!2F21 03 [WIDTH]
!2F22 3E [HEIGHT]
!2F23 46 [ADDRESS OF]
!2F24 2F [ROCKET BLOCK]
!2F25 88 <USA BLOCK>
!2F26 88 ↓
!2F27 88 ↓
!2F28 88 ↓
!2F29 88 ↓
!2F2A 88 ↓
!2F2B 70 ↓
!2F2C 00 ↓
!2F2D 00 ↓
!2F2E 00 ↓
!2F2F 00 ↓
!2F30 00 ↓
!2F31 00 ↓
!2F32 70 ↓
!2F33 88 ↓
!2F34 80 ↓
!2F35 70 ↓
!2F36 08 ↓
!2F37 88 ↓
!2F38 70 ↓
!2F39 00 ↓
!2F3A 00 ↓
!2F3B 00 ↓
!2F3C 00 ↓
!2F3D 00 ↓
!2F3E 00 ↓
!2F3F 20 ↓
!2F40 50 ↓
!2F41 88 ↓
!2F42 F8 ↓
!2F43 88 ↓
!2F44 88 ↓
!2F45 88 (END)
!2F46 00 <ROCKET BLOCK>
!2F47 20 ↓↓
!2F48 00 ↓↓
!2F49 00 ↓↓
!2F4A 70 ↓↓
!2F4B 00 ↓↓
!2F4C 00 ↓↓

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(ROCKET BLOCK CONTINUED---IT'S BIG!!!)

!2F4D F8	!2F64 07	!2F7B 00	!2F92 77	!2FA8 00	!2FBE 07	!2FD4 FF	!2FEA F0
!2F4E 00	!2F65 FF	!2F7C 07	!2F93 00	!2FA9 07	!2FBF 07	!2FD5 00	!2FEB FF
!2F4F 01	!2F66 00	!2F7D FF	!2F94 07	!2FAA FF	!2FC0 00	!2FD6 07	!2FEC FF
!2F50 FC	!2F67 07	!2F7E 00	!2F95 7F	!2FAB 00	!2FC1 07	!2FD7 FF	!2FED F8
!2F51 00	!2F68 77	!2F7F 07	!2F96 00	!2FAC 07	!2FC2 77	!2FD8 00	!2FEE 07
!2F52 03	!2F69 00	!2F80 FF	!2F97 07	!2FAD FF	!2FC3 00	!2FD9 07	!2FEF FF
!2F53 FE	!2F6A 07	!2F81 00	!2F98 8F	!2FAE 00	!2FC4 07	!2FDA FF	!2FF0 00
!2F54 00	!2F6B 77	!2F82 07	!2F99 00	!2FAF 07	!2FC5 77	!2FDB 00	!2FF1 0C
!2F55 07	!2F6C 00	!2F83 FF	!2FAA 07	!2FB0 FF	!2FC6 00	!2FDC 07	!2FF2 01
!2F56 FF	!2F6D 07	!2F84 00	!2F9B F7	!2FB1 00	!2FC7 07	!2FDD FF	!2FF3 80
!2F57 00	!2F6E 77	!2F85 07	!2F9C 00	!2FB2 07	!2FC8 77	!2FDE 00	!2FF4 1E
!2F58 07	!2F6F 00	!2F86 FF	!2F9D 07	!2FB3 FF	!2FC9 00	!2FDF 0F	!2FF5 03
!2F59 FF	!2F70 07	!2F87 00	!2F9E 77	!2FB4 00	!2FCA 07	!2FE0 FF	!2FF6 C0
!2F5A 00	!2F71 77	!2F88 07	!2F9F 00	!2FB5 07	!2FCB FF	!2FE1 80	!2FF7 3F
!2F5B 07	!2F72 00	!2F89 FF	!2FA0 07	!2FB6 DF	!2FCC 00	!2FE2 1F	!2FF8 07
!2F5C FF	!2F73 07	!2F8A 00	!2FA1 8F	!2FB7 00	!2FCD 07	!2FE3 FF	!2FF9 E0
!2F5D 00	!2F74 77	!2F8B 07	!2FA2 00	!2FB8 07	!2FCE FF	!2FE4 C0	!2FFA 7F
!2F5E 07	!2F75 00	!2F8C FF	!2FA3 07	!2FB9 AF	!2FCF 00	!2FE5 3F	!2FFB 8F
!2F5F FF	!2F76 07	!2F8D 00	!2FA4 FF	!2FBA 00	!2FD0 07	!2FE6 FF	!2FFC F0
!2F60 00	!2F77 77	!2F8E 07	!2FA5 00	!2FBB 07	!2FD1 FF	!2FE7 E0	!2FFD FF
!2F61 07	!2F78 00	!2F8F 8F	!2FA6 07	!2FBC 77	!2FD2 00	!2FE8 7F	!2FFE DF
!2F62 FF	!2F79 07	!2F90 00	!2FA7 FF	!2FBD 00	!2FD3 07	!2FE9 FF	!2FFF F8
!2F63 00	!2F7A 8F	!2F91 07					

THE MACHINE CODE LISTINGS FOR THIS SERIES ARE FORMATTED AT TWO COLUMNS PER PAGE WITH THREE ITEMS EACH. THE COLUMNS ARE IN ORDER OF THEIR ADDRESSES (THE FIRST ITEM) WITH GAPS IN THE SEQUENCE INDICATED BY A DOWN ARROW "↓". THE ACTUAL SOURCE CODE (IN HEX) FOLLOWS SO THAT WITH THE BLUE RAM UTILITY OR THE MLM YOU CAN KEY IN ANY OF THIS DIRECTLY. THE LAST ITEM IS THE ASSEMBLY CODE WITH NOTES ADDED [IN BRACKETS]. <THESE> INDICATE A "LABEL"! THIS DENOTES AN ADDRESS THAT STARTS A BLOCK, OR A SPOT WHERE A "JUMP" (OF SOME TYPE) BRANCHES TO. ONLY THIS LAST PAGE HAS 8 COLUMNS AND NO THIRD ITEM.

**THIS SERIES ENDS HERE UNLESS SOMEONE WANTS TO ASK SOMETHING!** WHETHER OR NOT IT'S IN REFERENCE TO ANYTHING DISCUSSED! MY ADDRESS IS THE SAME AS IT WAS IN THE "FILE SEARCH II" TUTORIAL. ALWAYS REMEMBER: "IF ANY OF MY PROGRAMS PUZZLE YOU, DON'T HESITATE TO WRITE. A S.A.S.E. SPEEDS UP REPLYS!"

FINALLY, IF YOU'VE NOT ALREADY GUESSED, THE "SURPRISE" IN THE "MENU DEMO" LISTED ABOVE IS THAT THE "ON BOARD MENU" **ANIMATES** WHEN THE SELECTION IS MADE! **BELIEVE IT OR NOT!** NOTE: IF THE LISTING LOOKS ,TOO, LONG TO BOTHER WITH, JUST SEND ME TEN DOLLARS FOR A CARTRIDGE OF JUST IT! OR THE SAME FOR ONE THAT DIDN'T GET INTO THE "MULTICART" THAT'S TITLED "FUN WITH VECTORS" (AUTHOR UNKNOWN) THAT DEMONSTRATES THE "VECTOR ANIMATER". OR I COULD EVEN PUT BOTH IN ONE CARTRIDGE FOR THE SAME PRICE! KEEP BUGGIN'!