

**THE
SYM/KIM APPENDIX
TO THE
FIRST BOOK OF KIM***

**by
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Introduction

Since the SYM-1 is a relative newcomer, there is not much software provided for it. However the KIM-1 has been around somewhat longer and has been the subject of many construction and programming articles.

As a learning exercise, game programs often provide the user with a good introduction to the capabilities of a system. Therefore this appendix was written to allow the set of games from the FIRST BOOK OF KIM to execute directly on the SYM-1.

All programs were designed to run originally on a 1K system. The basic SYM-1 is also only 1K so the prime goal of the translation was to keep the program size within the bounds of a basic SYM-1.

A secondary goal, which has been followed, was to keep most of the KIM program intact. This allows the user to follow the logic and instruction generated in the book and yet see where the changes were required and how they were accomplished.

This appendix contains only the program lines which require changes, thus it does not contain any complete programs. It is intended to supplement the FIRST BOOK OF KIM so it is assumed that the user already has access to this book.

If you have any questions, problems or suggestions for this or future manuals, you may contact me at the address below. If you wish an answer please include a self-addressed stamped envelope.

Even with best efforts, typographical errors will occur, but I hope that this pamphlet will serve to help you to understand some of the ways to adapt KIM programs to run on your SYM-1.

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RECREATIONAL PROGRAM CONVERSIONS

The following programs have been converted and are a part of this volume:

ADDITION	HI-LO
ASTEROID	HORSERACE
BAGELS	KEYTRAIN
BANDIT	KIM NIM
BITZ	KIM-TAC-TOE
BLACKJACK	LUNAR LANDER
BLACK MATCH	MULTI-MAZE
CARD DEALER	PING PONG
CHESS CLOCK	QUICK
CODE TEST	REVERSE
CRAPS	TEASER
DUEL	WUMPUS
FARMER BROWN	

MUSIC BOX requires an external speaker - only programs which can run on a stock, basic SYM-1 were translated here. CLOCK and TIMER can be done more accurately using the 6522 on-board timers. Since this volume was intended to contain no "complete" programs, these programs were left out.

Typographical Errors/Omissions

To aid in understanding the KIM programs, I felt it best to include a set of corrections or additions to the book. These are outlined below and apply to my copy (2nd printing, 1978). They may have been corrected since then but are provided here for the users convenience.

P.27 ASTEROID, LINE 0269; should be labeled NOBT.

P.42 BLACKJACK, LINE 0292; should be labeled HIT.

P.90 PING PONG, HEX DUMP; 0325 should be "08" not "C0".

P.108 WUMPUS, LINE 036C; DELETE DUPLICATE LABEL "ROOM".

Programming Notes - General

In the pages which follow, an astute programmer may find certain areas where changes may not have been added or where certain functions could possibly have been done more simply or elegantly. A super-efficient method was not the object of the exercise.

Rather the main object was to make maximum use (where appropriate) of the SYM-1 monitor and to provide useful game software during this learning experience.

Notes on Program Conversions

The basic SYM-1 has RAM space available from 0000 to 03FF. We can fit programs in without restrictions from 0200-03FF. The other areas however are slightly restricted.

The monitor program uses the area from approximately 01D1-01FF for the stack so if any of your program or data is written here it may be destroyed when you hit the reset key. Also note that the more levels of subroutine nesting which is used, the further the stack will extend downward from 01FF into the memory space. So some care must be used to avoid wiping out your data.

The monitor also uses locations 00FE and 00FF. If you try to use the monitor routines and also modify these locations, the program will get lost because it stores program counter data there.

The SUPERMON memory map specifies that the monitor uses all 00F0 to 00FF. On some occasions then, when simulating the KIM output routines, I have substituted A9, AA, and AB or E9, EA and EB for F9, FA and FB. But it appears in most cases (at least for these programs) the original use of F9, FA, FB locations does not affect the program operation.

All of the programs require the use of the keyboard and display. Since the registers which control both are in the write-protected area of memory, the first instructions in each program is always: 20 86 8B JSR ACCESS to allow the program to write into system RAM.

Certain of the routines which will be seen often in one form or another throughout this text are the following:

SCAND2 - A Substitute for KIM SCAND

GETKEY2 - A substitute for KIM GETKEY

These routines are presented here in their most general format for easy reference:

D8		SCAND2	CLD	;CLR Dec (Need if called when in Dec)
A9	2B		LDAIM #52B	;LOAD ACC with Hex 2B (setup no
8D	70 A6		STA A670	; scan for movement into DISBUF)
A5	FB		LDA 00FB	;LOAD ACC with contents of 00FB
20	FA 82		JSR OUTBYT	;MOVE two hex char into DISBUF
A5	FA		LDA 00FA	;LOAD ACC with contents of 00FA
20	FA 82		JSR OUTBYT	;PUSH two hex char into DISBUF
				; (Moves Prev)
A5	F9		LDA 00F9	;LOAD ACC with contents of 00F9
20	FA 82		Jsr OUTBYT	;PUSH two hex char into DISBUF
				(Moves Prev)
20	06 89		JSR SCAND	;JUMP to SYM SCAND routine
A9	06		LDAIM #509	;LOAD ACC hex 0
8D	70 A6		STA A670	;RRESTORE the SCANVEC to original
F8			SED	;SET DEC(only if in DEC when
				; SCAND2 called)
60			RTS	;RETURN
D8		GETKEY2	CLD	;CLEAR DEC (If in DEC when called)
20	88 81		JSR SAVER	;JUMP to register-SAVE routine
20	23 89		JSR KEYQ	;See if key down. Read input port
20	2C 89		JSR LRNKEY	;Bring ASCII of key into ACC,
				; no dis scan
20	75 82		JSR ASCNIB	;Convert ASCII to hex in low nibble
				; of ACC
F8			SED	;SETDECmode(IfenteredwithDECSET)
4C	B8 81		JMP RESXAF	;RESTORE regs except ACC and
				; Cond CODE/RTS

Some explanation is in order for these routines. The normal SYM GETKEY routine goes out and waits for a key to be pressed, scanning the display while it is waiting. The equivalent KIM routine, and GETKEY2 above, go out and look once at the keyboard without scanning the display and then come back right away to the calling routine.

The normal SYM SCAND routine simply scans the display. To be compatible with the KIM system it must be capable of translation of bytes left in 00FB, 00FA, and 00F9 and then displaying them. I have modified the SCANVEC to return from routine 'OUTBYT' without scanning the display during the move of the data into the display buffer because this only causes a ghost of each digit to appear on all 6 digits of the display during each scan. This way I can take advantage of the monitor data move routines and the scan the display as often as desired later by calling the normal scan routine.

ADDITION

A) LOAD the KIM Program

B) Modify the following loations: (Note - this version is not relocatable)

0200	20	70	02	START	JSR	SCAND2	
0203	20	90	02		JSR	GETKEY2	
0206	20	75	82		JSR	ASCNIB	
0209	B0	F5			BCS	START	;Non-ASCII?
020B	C9	0A			CMP	#\$0A	; "A" key = add
020D	F0	09			BEQ	0218	
020F	C9	0B			CMP	#\$0B	; "B" key = clear
0211	F0	19			BEQ	DOGO	
0213	B0	EB			BNE	START	
0215	4C	39	02		JMP	NUM	
0260	20	86	8B	BEGIN	JSR	ACCESS	
0263	A9	2B			LDA	#\$2B	;Modify SCANVEC
0265	8D	70	A6		STA	A670	
0268	4C	00	02		JMP	START	
0270	A5	FB		SCAND2	LDA	00FB	
0272	20	FA	82		JSR	OUTBYT	
0275	A5	FA			LDA	00FA	
0277	20	FA	82		JSR	OUTBYT	
027A	A5	F9			LDA	00F9	
027C	20	FA	82		JSR	OUTBYT	
027F	20	06	89		JSR	SCAND	
0282	20	06	89		JSR	SCAND	
0285	20	06	89		JSR	SCAND	
0288	20	06	89		JSR	SCAND	
028B	20	06	89		JSR	SCAND	
028E	60				RTS		
0290	20	23	89	GETKEY2	JSR	KEYQ	
0293	20	2C	89		JSR	LRNKEY	
0295	C5	60			CMP	PREV	
0297	F0	03			BEQ	LDFP	
0299	85	60			STA	PREV	
029B	60				RTS		
029C	A9	FF		LDFP	LDA	#\$FF	
029E	60				RTS		

C) Run the program, starts at 0260

Notes: "A" key means add to total.

"B" key means clear display or clear incorrect entry.

The sequence B, 0, A will clear the total to zero.

ASTEROID

A) LOAD the KIM program.

B) Modify the following locations: (Note - Beeper will run continuously. Simulated space ship motor.)

0223	EA	EA	EA		NOP	NOP NOP	
0226	20	20	03		JSR	GETKEY2	
022D	C9	01			CMPIM	#\$01	;Go left?
0248	A9	09		DISP	LDAIM	#\$09	;Set up for output
024A	20	A5	89		JSR	CONFIG	
024D	A9	00			LDAIM	#00	;INIT digit
024F	8D	02	A4		STA	A402	
027A	8D	00	A4	DIGT	STA	A400	;Light digit
027F	8D	IE	A4		STA	A41E	;STORE in timer (1/64)
0282	2C	1F	A4	DELA	BIT	A41F	;Time up?
0285	10	FB			BPL	DELA	
0289	8D	00	A4		STA	A400	;PORT A data
028C	EE	02	A4		INC	A402	;SHIFT to next digit
028F	EA	EA	EA		NOP	NOP NOP	;
02C8	4C	30	03	FIN	JMP	SCAND2	
0310	20	86	8B	BEGIN	JSR	ACCESS	;Unprotect sys RAM
0313	4C	00	02		JMP	0200	
0320	20	88	81	GETKEY2	JSR	SAVER	;SAVE registers
0323	20	23	89		JSR	KEYQ	;READ port
0326	20	2C	89		JSR	LRNKEY	;What key is it
0329	20	75	82		JSR	ASCN1B	;CONVERT ASCII to hex
032C	4C	B8	81		JMP	RESXAF	;RESTORE registers
0330	A5	FB		SCAND2	LDA	00FB	;SEND two hex digits
0332	20	FA	82		JSR	OUTBYT	; into display buffer
0335	A5	FA			LDA	00FA	;Two more
0337	20	FA	82		JSR	OUTBYT	;
033A	A5	F9			LDA	00F9	;Last two
033C	20	FA	82		JSR	OUTBYT	;
033F	20	06	89	SCD	JSR	SCAND	;SCAN display
0342	4C	3F	03		JMP	SCD	;Continuously

C) Start program at 0310.

Use Key 3 to Go right, Key 1 (not Key 0) to Go left.

BAGELS

A) LOAD the KIM program.

B) Modify the following locations:

0202	20	23	89		JSR	KEYQ	
0261	20	00	03	RESUME	JSR	GETKEY2	
0271	B9	29	8C		LDA	TABLE,Y	
02A6	B9	29	8C		LDA	TABLE,Y	
02C0	B9	29	8C		LDA	TABLE,Y	
02CE	A9	09			LDAM	#09	;SET port to output
02D0	20	A5	89		JSR	CONFIG	
02D3	A0	05			LDY	#05	
02D5	A2	05			LDX	#05	
02D9	8D	00	A4		STA	SAD	
02DC	8C	02	A4		STY	SBD	
02E3	EA				NOP		
02E8	20	23	89		JSR	KEYQ	
02F0	20	86	8B	BEGIN	JSR	ACCESS	
02F3	4C	00	02		JMP	0200	
0300	20	88	81	GETKEY2	JRS	SAVER	
0303	20	23	89		JSR	KEYQ	
0306	20	2C	89		JSR	LRNKEY	
0309	38				SEC		
030A	E9	37			SBC	#\$37	;CONVERT ASCII to A-F
030C	4C	B8	81		JMP	RESXAF	

C) RUN the program, starts at 02F0.

BANDIT

A) LOAD the KIM program.

B) Modify the following locations:

0296	A9	09		LDAIM	#09	;Port to output
0298	20	A5	89	JSR	CONFIG	
029B	A0	00		LDYIM	#00	;Set up INIT digit
02A1	8C	02	A4	STY	SBD	
02A4	8D	00	A4	STA	SAD	
02AE	C8			INY		
02AF	C0	03		CPYIM	#03	;is Y equal 3
02B1	F0	1E		BEQ	SPACER	;ADD one space to display
02B6	20	23	89	JSR	KEYQ	;READ keyboard, key down?
02BF	BD	29	8C	LDA	TABLE,X	
02CB	BD	29	8C	LDA	TABLE,X	
02D1	C8			SPACER	INY	;ADD space between
02D2	4C	B3	02			;Wheels and amount
02E0	20	86	8B	BEGIN	JSR	ACCESS
02E3	4C	00	02	JMP	0200	

C) RUN the program, start address is 02E0.

Notes: Links to SYM monitor are:

KEYQ	-	8923
CONFIG	-	89A5
SAD	-	A400
SBD	-	A402
ACCESS	-	8B86

The added space between the wheels and the amount makes the display more readable.

BITZ

A) LOAD the KIM program.

B) Modify the following locations:

0205	20	23	89	MAIN	JSR	KEYQ	;Key down?
0208	20	86	02		JSR	GETKEY2	;GET key input
021E	BD	29	8C		LDA	TABLE,X	
022A	BD	29	8C		LDA	TABLE,X	
023B	AD	1E	A4		LDA	TIMER	;GET random value
025F	A9	09		LIGHT	LDAIM	#09	;Port to output
0261	20	A5	89		JSR	CONFIG	
0264	A0	00			LDY	#00	
026A	8D	00	A4		STA	SAD	
026D	8C	02	A4		STY	SBD	
0274	C8	EA			INY	NOP	
0280	20	86	8B	BEGIN	JSR	ACCESS	
0283	4C	00	02		JMP	0200	
0286	20	88	81	GETKEY2	JSR	SAVER	
0289	20	23	89		JSR	KEYQ	
028C	20	2C	89		JSR	LRNKEY	
028F	C9	2E			CMP	#2E	;All legal keys 0-9, A-F
0291	90	06			BCC	NOTKEY	;RETURN ASCII 30-46
0293	20	75	82		JSR	ASCNIB	
0296	4C	B8	81		JMP	RESXAF	
0299	A9	15		NOTKEY	LDAIM	#\$15	;KIM says if 15 in ACC,
029B	4C	B8	81		JMP	RESXAF	; then no key down

C) RUN the program - start address is 0280.

BLACKJACK

A) LOAD the KIM program.

B) Modify the following locations:

0212	AD	IE	A4		LDA	TIMER	
0332	A0	05			LDY	#05	
0336	A9	09			LDA	#09	;Setup for output
0338	20	A5	89		JSR	CONFIG	
033D	8D	00	A4		STA	SAD	
0340	8C	02	A4		STY	SBD	
0347	88	EA			DEY	NOP	
034C	20	23	89		JSR	KEYQ	
034F	20	EC	03		JSR	GETKEY2	
03AC	B9	29	8C		LDA	TABLE,Y	
03B5	B9	29	8C		LDA	TABLE,Y	
03EC	20	2C	89		JSR	LRNKEY	
03EF	C9	2E			CMP	#\$2E	;Key 0-F?
03F1	B0	03			BCS	AKEY	
03F3	A9	15			LDA	#\$15	;KIM no-key
03F5	60				RTS		;RETURN
03F6	20	75	82	AKEY	JSR	ASCNIB	;Convert ASCII to hex
03F9	60				RTS		;RETURN
03FA	20	86	8B	BEGIN	JSR	ACCESS	
03FD	4C	00	02		JMP	0200	

C) RUN the program, start at location 03FA.

BLACK MATCH

A) LOAD the KIM program.

B) Modify the following locations:

020C	20	B5	02		JSR	SCAND3	
020F	20	86	02		JSR	GETKEY2	
0214	B0	F2			BCS	PLAY	
0230	8D	1F	A4		STA	CLOCK	
0233	20	92	02		JSR	SCAND2	
0236	2C	1F	A4		BIT	CLOCK	
024E	AE	04	A0		LDA	A004	;Random timer
0275	20	92	02				
0280	20	86	8B		(JSR ACCESS)		
0283	4C	00	02		JMP	START	
0286	D8			GETKEY2	CLD		
0287	20	23	89		JSR	KEYQ	
028A	20	2C	89		JSR	LRNKEY	
028D	20	75	82		JSR	ASCNIB	
0290	F8				SED		
0291	60				RTS		
0292	D8			SCAND2	CLD		
0293	A9	2B			LDA	#2B	;Change
0295	8D	70	A6		STA	A670	;SCANVEC
0298	A5	FB			LDA	00FB	
029A	20	FA	82		JSR	OUTBYT	
029D	A5	FA			LDA	00FA	
029F	20	FA	82		JSR	OUTBYT	
02A2	A5	F9			LDA	00F9	
02A4	20	FA	82		JSR	OUTBYT	
02A7	20	06	89		JSR	SCAND	
02AA	20	06	89		JSR	SCAND	
02AD	20	06	89		JSR	SCAND	
02B0	20	06	89		JSR	SCAND	
02B3	F8				SED		
02B4	60				RTS		
02B5	A5	F9		SCAND3	LDA	00F9	
02B7	C9	21			CMP	#\$21	
02B9	F0	03			BEQ	INIT	
02BA	4C	92	02		JMP	SCAND2	
02BD	A9	00			LDA	#\$00	
02BF	85	FA			STA	00FA	
02C1	4C	92	02		JMP	SCAND2	

C) RUN the program, start at 0280.

CARD DEALER

A) LOAD the KIM program

B) Modify the following locations:

0018	4C 06 02		JMP	RESTART	
001B	AD 1E A4		LDA	A41E	
0020	AD 04 A0		LDA	A004	
0062	20 88 81	DISP	JSR	SAVER	
0065	A2 00		LDX	#\$00	
0067	B5 8C	MOVER	LDA	008C,X	;GET table value
0069	9D 40 A6		STA	A640,X	;STORE in disbuf
006C	E8		INX		
006D	E0 06		CPX	#\$06	;6 digits yet?
006F	90 F6		BCC	MOVER	;No, do again
0071	20 06 89		JSR	SCAND	;Scand Display
0074	20 23 89		JSR	KEYQ	;Key down?
0077	4C B8 81		JMP	RESXAF	;RESTORE registers
007A	EA		NOP		
0200	20 86 8E	BEGIN	JSR	ACCESS	
0203	4C 00 00		JMP	INIT	
0206	20 AF 88	RESTART	JSR	GETKEY	
0209	20 72 89		JSR	BEEP	
020C	20 72 89		JSR	BEEP	
020F	20 72 89		JSR	BEEP	
0212	20 72 89		JSR	BEEP	
0215	4C 00 00		JMP	START	

C) RUN the program, start at 0200.

Note: After 52 cards are dealt, beeper will ripple indicating reshuffle; first card after beep is first card of a new deck. Use Key 2 to select cards for best results.

CHESS CLOCK

A) LOAD the KIM program.

B) Modify the following locations:

0200	AA	A9	00		TAX ,	LDA #00	
0203	9D	7A	00		STA	007A,X	
0206	CA				DEX		
0209	20	AF	02	DISP	JSR	SCAND2	
020C	20	CD	02		JSR	GETKEY2	
0267	8D	1F	A4		STA	A41F	;Timer 1024
026A	20	AF	02		JSR	SCAND2	
026D	20	CD	02		JSR	GETKEY2	
0275	2C	05	A4		VIT	A405	;Time done?
0280	8D	1E	A4		STA	A41E	;Timer 64
0283	2C	05	A4		BIT	A405	
02A1	20	86	8B	BEGIN	JSR	ACCESS	
02A4	A9	2B			LDA	#02B	;Modify SCANVEC
02A6	8D	70	A6		STA	A670	
02A9	A9	F8			LDA	#0F8	;Arrange zeros in 00-F8 only
02AB	4C	00	02				
02AE	EA						
02AF	D8			SCAND2	CLD		
02B0	A5	FB	20	FA 82	LDA	00FB/JSR OUTBYT	
02B5	A5	FA	20	FA 82	LDA	00FA/JSR OUTBYT	
02BA	A5	F9	20	FA 82	LDA	00F9/JSR OUTBYT	
02BF	20	06	89	20 06	JSR	SCAND (X4)	
89	20	06		89 20			
06	89						
02CB	F8	60			SED/RTS		
02CD	D8			GETKEY2	CLD		
02CE	20	88	81		JSR	SAVER	
02D1	20	23	89		JSR	KEYQ	
02D4	20	2C	89		JSR	LRNKEY	
02D7	20	75	82		JSR	ASCNIB	
02DA	F8				SED		
02DB	4C	B8	81		JMP	RESXAF	

C) RUN the program, start at 02A1.

CODE TEST

A) LOAD the KIM program.

Note: This routine as modified does not need an external speaker. Instead the beeper is used.

B) Modify the following locations:

0256	20	23	89		JSR	KEYQ	
0286	8D	1F	A4		STA	A41F	;Timer 1024
0289	20	20	01		JSR	DISBEEP	;Light parts
028C	20	20	01		JSR	DISBEEP	;Of digit 6
028F	20	20	01		JSR	DISBEEP	;And beep
0292	20	20	01		JSR	DISBEEP	;Onboard SPKR
0295	EA				NOP		
0296	2C	05	A4		BIT	A405	;Time up?
02A4	8D	1F	A4		STA	A41F	;Start timer
02A7	2C	05	A4		BIT	A405	;Time up?
02B1	A9	09			LDA	#\$09	;Set for
02B3	20	A5	89		JSR	CONFIG	;Output
02B8	A2	00			LDX	#00	;INIT Digit
02BF	20	00	01		JSR	DISPL	
02C7	20	23	89		JSR	KEYQ	;Key down?
0100	8D	00	A4		STA	PAD	
0103	8E	02	A4		STX	PBD	
0106	E8				INX		
0107	E6	AA		DELAYA	INC	AA	
0109	D0	FC			BNE	DELAYA	
010B	60						
0110	20	86	8B	4C 00 02	BEGIN	JSR ACCESS/JMP 0200	
0120	A9	09		DISBEEP	LDA	#\$09	;Set up for
0122	20	A5	89		JSR	CONFIG	; output
0125	A9	05	8D	02 A4	LDA	#\$05/STA A402	;SELECT digit 6
012A	A9	80	E0	01 F0 02	LDA	#\$80/CPYIM #01/BEQ OUTS	
0130	A9	08			LDA	#\$08	
0132	8D	00	A4	OUTS	STA	A400	
0135	E6	AA	DO FC DELAYB		INC	AA/BNE DELAYB	
0139	20	72	89		JSR	BEEP	
013C	60				RTS		

C) RUN the program, start at 0110.

CRAPS

A) LOAD the KIM program.

B) Modify the following locations:

0201	20	86	8B		JSR	ACCESS	
0204	20	D3	02		JSR	GETKEY2	
021A	AD	1E	A4		LDA	TIMER	;Random value
0230	BD	29	8C		LDA	TABLE,X	;Segment
028C	A9	09		NOINC	LDA	#\$09	;Port to output
028E	20	A5	89		JSR	CONFIG	;
0291	A0	05			LDY	#\$05	;
0297	8D	00	A4		STA	SAD	
029A	8C	02	A4		STY	SBD	
02A1	88	EA			DEY	NOP	
02B9	BD	29	8C		LDA	TABLE,X	
02C2	BD	29	8C		LDA	TABLE,X	
02D3	20	88	81		JSR	SAVER	;SAVE registers
02D6	20	23	89		JSR	KEYQ	;READ input port
02D9	20	2C	89		JSR	LRNKEY	;Translate to ASCII
02DC	C9	2F			CMP	#\$2F	;ASCII 30-46?
02DE	B0	03			BCS	AKEY	;Yes
02E0	A9	15			LDA	#\$15	;KIM nokey indicator
02E2	4C	B8	81		JMP	RESXAF	;RESTORE registers
02E5	20	75	82		JSR	ASCNIB	;CONVERT ASCII to hex
02E8	4C	B8	81		JMP	RESXAF	;RESTORE registers

C) RUN the program, start at location 0215.

Notes:

- 1) Program initializes to a \$10 pot at the start. Reset and restart at 0215 any time desired.
- 2) If GO key is used to roll the dice, impact on total display is minimized.

DUEL

A) LOAD the KIM program, deleting section from 0271 - 02A5

B) Modify the following locations:

0206	AD 08 A0	RAND	LDA	A008	;GET radom Number
0206	A9 20		LDA	#\$20	;ASCII blank
0216	2C 05 A4		BIT	A405	;Time up ?
0219	D0 0D		BNE	MORE	;
021D	8D 1F A4		STA	A41F	;START timer
0224	A9 2D		LDA	#\$2D	;Center segment only for DIG.3,4
0229	20 23 89		JSR	KEYQ	;
022C	20 A0 02		JSR	GETKEY2	;
0237	C9 04		CMP	#\$04	;change left player to 4 key
0264	20 23 89		JSR	KEYQ	;
0271	D8	LITE	CLD		;Clear DEC. mode
0272	A9 2B		LDA	#\$2B	; DELETE scan during
0274	8D 70 A6		STA	A670	; Data transfer
0277	A5 FB		LDA	00FB	;
0279	20 FA 82		JSR	OUTBYT	;
027C	A5 FA		LDA	00FA	;
027E	20 47 8A		JSR	OUTCHR	;
0281	20 47 8A		JSR	OUTCHR	;
0284	A5 F9		LDA	00F9	;
0286	20 FA 82		JSR	OUTBYT	;
0289	AD 97 02		LDA	0297	;
028C	8D AD 02		STA	02AD	;
028F	20 06 89	SC2	JSR	SCAND	;
0292	CE AD 02		DEC	02AD	;
0295	D0 F8 0A		BNE	SC2/.BYTE0A	;Display brightness
0298	F8		SED		;
0299	60		RTS		;
029A	20 86 8B	BEGIN	JSR	ACCESS	;
029D	4C 00 02		JMP	0200	;
02A0	20 88 81	GETKEY2	JSR	SAVER	;
02A3	20 2C 89		JSR	LRNKEY	;
02A6	20 75 82		JSR	ASCNIB	;
02A9	4C B8 81		JMP	RESXAF	;
02AD	00		.BYTE		;Workspace

C) RUN program, starts at 029A.

Note: Left player uses key 4, not zero.

Center two digits display hyphens after timeout.

If either player hits key before hyphens lit, he loses a point.

FARMER BROWN

A) LOAD the KIM program

B) Modify the following locations:

0220	4C	E6	02		JMP	DONE	:out of corn, show ERMSG
0223	AD	IE	A4	MORE	LDA	TIMER	;
0255	20	23	89		JSR	KEYQ	
0258	20	D0	02		JSR	GETKEY2	
0287	A9	09			LDA	#\$09	;Port to
0289	20	A5	89		JSR	CONFIG	; output
028C	A0	05			LDY	#\$05	
0292	8D	00	A4		STA	SAD	
0295	8C	02	A4		STY	SBD	
029C	88	EA	CA		DEY	NOP DEX	
02D0	20	88	81	GETKEY2	JSR	SAVER	
02D3	20	2C	89		JSR	LRNKEY	
02D6	20	75	82		JSR	ASCNIB	
02D9	4C	B8	81		JMP	RESXAF	
02E0	20	86	8B	BEGIN	JSR	ACCESS	
02E3	4C	00	02		JMP	START	
02E6	A9	00			LDA	#\$00	
02E8	38				SEC		
02E9	4C	71	81		JMP	ERMSG	

C) RUN the program, start at 02E0.

Note: When you run out of corn, display will show "Er 00." and will return to the monitor program.

HI-LO

A) Enter the KIM Program

B) Modify the following locations:

020F	20	23	89		JSR	KEYQ	
0223	20	70	02	GUESS	JSR	SCAND2	
0226	20	90	02		JSR	GETKEY2	
0229	C9	17			CMP	#\$17	;Go key?
0233	C9	11			CMP	#\$11	;"A" key?
026A	20	86	8B	BEGIN	JSR	ACCESS	
026D	4C	00	02		JMP	START	
0270	A9	2B		SCAND2	LDA	#\$2B	;Modify SCANVEC
0272	8D	70	A6		STA	A670	
0275	A5	FB			LDA	00FB	
0277	20	FA	82		JSR	OUTBYT	
027A	A5	FA			LDA	00FA	
027C	20	FA	82		JSR	OUTBYT	
027F	A5	F9			LDA	00F9	
0281	20	FA	82		JSR	OUTBYT	
0284	20	06	89		JSR	SCAND	
0287	20	06	89		JSR	SCAND	
028A	20	06	89		JSR	SCAND	
028D	60				RTS		
0290	20	88	81	GETKEY2	JSR	SAVER	
0293	20	23	89		JSR	KEYQ	
0296	20	2C	89		JSR	LRNKEY	
0299	38				SEC		
029A	E9	30			SBC	#\$30	
029C	4C	B8	81		JMP	RESXAF	

C) Run the program, starts at 026A.

HORSERACE

A) LOAD the KIM program.

B) Modify the following locations:

020B	A9	09		DISP	LDA	#\$09	;Port to
020D	20	A5	89		JSR	CONFIG	; output
0212	EA	EA			NOP	NOP	
0219	20	06	03		JSR	DISOUT	;Light display
0221	EA	EA	EA		NOP	NOP NOP	
029F	20	16	03		JSR	GETKEY2	
0300	20	86	8B	BEGIN	JSR	ACCESS	
0303	4C	00	02		JMP	0200	
0306	8D	00	A4	DISOUT	STA	A400	
0309	8C	02	A4		STY	A402	
030C	E6	40		WAITR	DEC	WAIT	
030E	D0	FC			BNE	WAITR	
0310	A9	00			LDA	#00	
0312	8D	00	A4		STA	A400	
0315	60				RTS		
0316	20	88	81	GETKEY 2	JSR	SAVER	
0319	20	23	89		JSR	KEYQ	
031C	20	2C	89		JSR	LRNKEY	
031F	20	75	82		JSR	ASCNIB	
0322	4C	B8	81		JMP	RESXAF	

C) RUN the program, start at 0300.

Notes: Whipping keys are set at locations 2F0, 2F1, 2F2, now set so that the 4 key controls the top segment, and 2 key controls the middle and the 1 key the bottom.

KEYTRAIN

A) LOAD the KIM program.

B) Modify the following locations:

0000	20 23 89	START	JSR	KEYQ	
0005	AD 1E A4		LDA	TIMER	
001A	20 0C 02	LIGHT	JSR	SCAND2	
001D	20 28 02		JSR	GETKEY2	
0200	D8	BEGIN	CLD		
0201	20 86 8E		JSR	ACCESS	
0204	A9 2B		LDA	#\$2B	;Setup for
0206	8D 70 A6		STA	A670	; no scan during move of data
0209	4C 00 00		JMP	0000	
020C	A5 F9	SCAND2	LDA	00F9	
020E	20 FA 82		JSR	OUTBYT	
0211	A5 FA		LDA	00FA	
0213	20 FA 82		JSR	OUTBYT	
0216	A5 FB		LDA	00FB	
0218	20 FA 82		JSR	OUTBYT	
021B	20 06 89		JSR	SCAND	
021E	20 06 89		JSR	SCAND	
0221	20 06 89		JSR	SCAND	
0224	20 06 89		JSR	SCAND	
0227	60		RTS		
0228	20 88 81	GETKEY2	JSR	SAVER	
022B	20 23 89		JSR	KEYQ	
022E	20 2C 89		JSR	LRNKEY	
0231	20 75 82		JSR	ASCNIB	
0234	4C B8 81		JMP	RESXAF	

C) RUN the program, START at 0200.

KIM NIM

A) LOAD the KIM program.

B) Modify the following locations:

0200	86	8B	START	JSR	ACCESS	
0203	20	50	03	JSR	GETKEY2	
020A	AD	1E	A4	LDA	TIMER	
0220	20	23	89	STALL	JSR	KEYQ
0225	AD	1E	A4	LDA	TIMER	
028D	A9	09		LDA	#\$09	
028F	20	A5	89	JSR	CONFIG	;Set for output
0292	A0	05	LIGHT	LDY	#05	
0298	8D	00	A4	STA	SAD	
029B	8C	02	A4	STY	SBD	
02A2	88	EA		DEY	NOP	
02D2	CC	1E	A4	CPY	TIMER	
0302	4C	03	02	JMP	START	
0332	B9	29	8C	LDA	TABLE,Y	
0350	D8		GETKEY2	CLD		
0351	20	88	81	JSR	SAVER	
0354	20	23	89	JSR	KEYQ	
0357	20	2C	89	JSR	LRNKEY	
035A	20	75	82	JSR	ASCNIB	
035D	D0	02		BNE	GOBACK	
035F	A9	13		LDA	#\$13	
0361	F8		GOBACK	SED		
0362	4C	B8	81	JMP	RESXAF	

C) RUN the program, START at 0200.

Note: Press "CR" at any time to start a new game (not GO key).

KIM-TAC-TOE (continued)

0181	A5	E9		LDA	00E9	
0183	20	FA	82	JSR	OUTBYT	
0186	A9	06		LDA	#006	;RESTORE
0188	8D	70	A6	STA	A670	;SCANVEC
018B	20	BC	01	JSR	SCAND3	;SCAN display once
018E	60			RTS		
018F	EA			NOP		
0190	85	AA	DISOUT	STA	00AA	
0192	A9	00		LDA	#00	
0194	8D	00	A4	STA	A400	;Turn off display
0197	A5	AA		LDA	00AA	;LOAD new data
0199	8E	02	A4	STX	A402	;Turn on display again
019C	8D	00	A4	STA	A400	
019F	E8	60		INX	RTS	;Increment X, Return
01A1	20	86	8B	BEGIN	JSR	ACCESS
01A4	4C	00	01		JMP	0100
01A7	85	AA			STA	00AA
01A9	20	75	82		JSR	ASCNIB
01AC	90	0B			BCC	RETN
01AE	A5	AA			LDA	00AA
01B0	38				SEC	
01B1	E9	30			SBC	#030
01B3	C9	22			CMP	#022
01B5	D0	02			BNE	RETN
01B7	A9	10			LDA	#010
01B9	4C	B8	81	RETN	JMP	RESXAF
01BC	20	06	89	SCAND3	JSR	SCAND
01BF	20	06	89		JSR	SCAND
01C2	20	06	89		JSR	SCAND
01C5	20	06	89		JSR	SCAND
01C8	20	06	89		JSR	SCAND
01CB	60				RTS	

C) RUN the program, START AT 01A1.

Notes: After starting, press either GO or +/- to begin game.

"MEM" key is used instead of "PC" key to see odds.

"REG" key is used instead of "DA" key to return to game.

"+/-" key is used to reset for users first selection.

"Go" key is used as text specifies to reset after end of game for machine to go first.

User markers are brighter than machine markers/SYM's markers flash.

During a win, user markers flash also but at a different flash rate than the SYM's.

KIM-TAC-TOE (continued)

0181	A5	E9		LDA	00E9	
0183	20	FA	82	JSR	OUTBYT	
0186	A9	06		LDA	#06	;RESTORE
0188	8D	70	A6	STA	A670	;SCANVEC
018B	20	BC	01	JSR	SCAND3	;SCAN display once
018E	60			RTS		
018F	EA			NOP		
0190	85	AA		STA	00AA	
0192	A9	00		LDA	#00	
0194	8D	00	A4	STA	A400	;Turn off display
0197	A5	AA		LDA	00AA	;LOAD new data
0199	8E	02	A4	STX	A402	;Turn on display again
019C	8D	00	A4	STA	A400	
019F	E8	60		INX	RTS	;Increment X, Return
01A1	20	86	8B	BEGIN	JSR	ACCESS
01A4	4C	00	01		JMP	0100
01A7	85	AA			STA	00AA
01A9	20	75	82		JSR	ASCNIB
01AC	90	0B			BCC	RETN
01AE	A5	AA			LDA	00AA
01B0	38				SEC	
01B1	E9	30			SBC	#30
01B3	C9	22			CMP	#22
01B5	D0	02			BNE	RETN
01B7	A9	10			LDA	#10
01B9	4C	B8	81	RETN	JMP	RESXAF
01BC	20	06	89	SCAND3	JSR	SCAND
01BF	20	06	89		JSR	SCAND
01C2	20	06	89		JSR	SCAND
01C5	20	06	89		JSR	SCAND
01C8	20	06	89		JSR	SCAND
01CB	60				RTS	

C) RUN the program, START AT 01A1.

Notes: After starting, press either GO or +/- to begin game.

"MEM" key is used instead of "PC" key to see odds.

"REG" key is used instead of "DA" key to return to game.

"+/-" key is used to reset for users first selection.

"Go" key is used as text specifies to reset after end of game for machine to go first.

User markers are brighter than machine markers/SYM's markers flash.

During a win, user markers flash also but at a different flash rate than the SYM's.

KIM NIM

A) LOAD the KIM program.

B) Modify the following locations:

0200	86	8B	START	JSR	ACCESS	
0203	20	50	03	JSR	GETKEY2	
020A	AD	1E	A4	LDA	TIMER	
0220	20	23	89	STALL	JSR	KEYQ
0225	AD	1E	A4	LDA	TIMER	
028D	A9	09		LDA	#\$09	
028F	20	A5	89	JSR	CONFIG	;Set for output
0292	A0	05	LIGHT	LDY	#05	
0298	8D	00	A4	STA	SAD	
029B	8C	02	A4	STY	SBD	
02A2	88	EA		DEY	NOF	
02D2	CC	1E	A4	CPY	TIMER	
0302	4C	03	02	JMP	START	
0332	B9	29	8C	LDA	TABLE,Y	
0350	D8		GETKEY2	CLD		
0351	20	88	81	JSR	SAVER	
0354	20	23	89	JSR	KEYQ	
0357	20	2C	89	JSR	LRNKEY	
035A	20	75	82	JSR	ASCNIB	
035D	D0	02		BNE	GOBACK	
035F	A9	13		LDA	#\$13	
0361	F8		GOBACK	SED		
0362	4C	B8	81	JMP	RESXAF	

C) RUN the program, START at 0200.

Note: Press "CR" at any time to start a new game (not GO key).

MULTI-MAZE

A) LOAD the KIM program.

B) Modify the following locations:

0200	AD 1E A4	START	LDA	TIMER	
0203	85 D0		STA	00D0	
0205	EA EA		NOP	NOP	
0267	A9 09	MUG	LDA	#\$09	;PORT to output
0269	20 A5 89		JSR	CONFIG	
026C	A0 00		LDY	#\$00	
0272	8D 00 A4		STA	SAD	
0275	8C 02 A4		STY	SBD	
027D	EA		NOP		
0282	20 23 89		JSR	KEYQ	
0285	20 30 03		JSR		GETKEY2
02CE	47 39 31	TAB2	'G', '9', '1', '6', '4'		
02D1	36 34				
0330	20 88 81	GETKEY2	JSR	SAVER	
0333	20 23 89		JSR	KEYQ	
0336	20 2C 89		JSR	LRNKEY	
0339	4C B8 81		JMP	RESXAF	
0340	20 86 8B	BEGIN	JSR	ACCESS	
0343	4C 00 02		JMP	0200	

C) RUN the program, START at 0340.

PING PONG

A) LOAD the KIM program.

B) Modify the following locations:

0200	20	23	89	START	JSR	KEYQ	
0203	20	59	03		JSR	GETKEY2	
0206	C9	01			CMP	#\$01	; "1" key?
0214	EA	EA		NOGO	NOP	NOP	
0216	90	22			BCC	NOKEY	; Carry set for nonhex
023A	20	23	89	NOKEY	JSR	KEYQ	
0266	A9	09		FREEZE	LDA	#\$09	; Port to output
0268	20	A5	89		JSR	CONFIG	
026B	A0	05			LDY	#\$05	
027E	BD	29	8C	HOOP	LDA	TABLE,X	
02A4	8D	00	A4	SHOW	STA	SAD	
02A7	8C	02	A4		STY	SBD	
02AE	88	EA			INY	NOP	
02DE	AD	1E	A4		LDA	TIMER	
0359	20	88	81	GETKEY2	JSR	SAVER	
035C	20	2C	89		JSR	LRNKEY	
035F	20	75	82		JSR	ASCNIB	
0362	4C	B8	81		JMP	RESXAF	
0365	20	86	8B	BEGIN	JSR	ACCESS	
0368	4C	00	02		JMP	0200	

C) RUN the program, START at 0365.

Notes: "1" key is used to reset to a new game.
All other instructions are valid as written.

QUICK

A) LOAD the KIM program.

B) Modify the following locations:

0309	EA	EA	EA		NOP	NOP	NOP
030C	EA	EA			NOP	NOP	
0326	20	20	02		JSR	SCAND2	
032B	20	06	89	STAND	JSR	SCAND2	
032E	20	35	02		JSR	GETKEY2	
0220	D8			SCAND2	CLD		;CLEAR decimal
0221	A5	FB			LDA	00FB	
0223	20	FA	82		JSR	OUTBYT	
0226	A5	FA			LDA	00FA	
0228	20	FA	82		JSR	OUTBYT	
022B	A5	F9			LDA	00F9	
022D	20	FA	82		JSR	OUTBYT	
0230	20	06	89		JSR	SCAND	
0233	F8				SED		;Set decimal
0234	60				RTS		
0235	D8			GETKEY2	CLD		
0236	20	88	81		JSR	SAVER	
0239	20	23	89		JSR	KEYQ	
023C	20	2C	89		JSR	LRNKEY	
023F	C9	47			CMP	#\$47	
0241	F0	07			BEQ	GKEY	
0243	F8				SED		
0244	20	75	82		JSR	ASCNIB	
0247	4C	B8	81		JMP	RESXAF	
024A	A9	13		GKEY	LDA	#\$13	
024C	F8				SED		
024D	4C	B8	81		JMP	RESXAF	
0210	20	86	8B	BEGIN	JSR	SAVER	
0213	A9	2B			LDA	#\$2B	;Modify SCANVEC
0215	8D	70	A6		STA	A670	
0217	4C	00	03		JMP	START	

C) RUN the program, START at 0210.

REVERSE

A) LOAD the KIM program.

B) Modify the following locations:

0202	20	23	89		JSR	KEYQ	
0239	B9	33	8C		LDA	TABLE+10,Y	
0262	A9	09			LDA	#\$09	
0264	20	A5	89		JSR	CONFIG	
0267	A0	00			LDY	#00	
026D	8D	00	A4		STA	SAD	
0270	8C	02	A4		STY	SED	
0277	EA				NOP		
027C	20	23	89		JSR	KEYQ	
027F	20	B0	02		JSR	GETKEY2	
0282	EA	EA			NOP		
0284	B0	C5			BCS	SLINK	;Carry set if not hex char.
02A6	77	7C	39	WINNER	.BYTE	\$77,\$7C,\$39,\$5E,\$79,\$71	
02A9	5E	79	71				
02B0	20	88	81	GETKEY2	JSR	SAVER	
02B3	20	2C	89		JSR	LRNKEY	
02B6	20	75	82		JSR	ASCNIB	
02B9	4C	B8	81		JMP	RESXAF	
02C0	20	86	8B	BEGIN	JSR	ACCESS	
02C3	4C	00	02		JMP	START	

C) RUN the program, START at 02C0.

Note: "CR" key serves as reset for start of new game.

TEASER

A) LOAD the KIM program but do not enter 02DD-02FA.

B) Modify the following locations:

021B	20	23	89		JSR	KEYQ	
0220	20	23	89		JSR	KEYQ	
0225	20	01	03		JSR	GETKEY2	
0228	C9	17			CMP	#\$17	;Go key?
0235	20	FA	02		JSR	SEG	;Convert to segments
025A	20	FA	02		JSR	SEG	
0261	20	F6	02		JSR	LEFT	
026D	20	10	03		JSR	SCN	
02BE	20	23	89		JSR	KEYQ	
02C1	20	01	03		JSR	GETKEY2	
02C4	C9	17			CMP	#\$17	
02DD	20	88	81	DISP	JSR	SAVER	;Display routine
02E0	A0	00			LDY	#\$00	
02E2	A2	00			LDX	#\$00	
02E4	B5	D0		DLOAD	LDA	00D0,X	;Move contents of
02E6	99	40	A6		STA	A640,Y	; D0,D2,D4,D6,D8,DA
02E9	E8	E8	C8		INX	INX INY	; into disbuff
02EC	C0	06			CPY	#\$06	;6 digits moved?
02EE	90	F4			BCC	DLOAD	
02F0	20	06	89		JSR	SCAND	
02F3	4C	C4	81		JMP	RESALL	
02F6	4A	4A	4A	4A LEFT	(LSR A)	*4	;Left shift routine
02FA	29	0F			AND	#\$0F	
02FC	A8				TAY		
02FD	B9	29	8C		LDA	TABLE,Y	
0300	60				RTS		
0301	20	88	81	GETKEY2	JSR	SAVER	
0304	20	2C	89		JSR	LRNKEY	
0307	38	E9	30		SEC,	SBC #\$30	
030A	4C	B8	81		JMP	RESXAF	
0310	20	88	81	SCN	JSR	SAVER	
0313	20	06	89		JSR	SCAND	
0316	4C	C4	81		JMP	RESALL	
0320	20	86	8B	BEGIN	JSR	ACCESS	
0323	4C	00	02		JMP	BEGN	

C) RUN the program, START at 0320.

WUMPUS

A) LOAD the KIM program

B) Modify the following locations:

035B	B9	29	8C		LDA	TABLE,Y	
0364	B9	29	8C		LDA	TABLE,Y	
0375	EA	EA			NOP	NOP	
0377	B0	48			BCS	ROOM	;Note - ROOM is 03C1, TYPO ; ERROR duplicated room at 036C
022E	8D	IF	A4		STA	TIMESSET	;1024 cycle timer
0234	2C	IF	A4		BIT	A41F	;Time up?
023E	A9	09			LDA	#\$09	
0240	20	A5	89		JSR	CONFIG	
0245	A2	00			LDX	#\$00	
024A	EA	EA			NOP	NOP	
024C	20	B6	01		JSR	DISOUT	
0254	20	23	89	60	JSR	KEYQ/RTS	
0258	EA	EA	EA	DEBO	NOP	NOP NOP	
026A	20	C1	01		JSR	GETKEY2	
026D	EA	EA			NOP	NOP	
026F	EA	EA			NOP	NOP	
02A5	AD	IE	A4		LDA	TIMER	
02E0	B9	29	BC		LDA	TABLE,Y	
01B0	20	86	8B	BEGIN	JSR	ACCESS	
01B3	4C	05	03		JMP	0305	
01B6	8D	00	A4	DISOUT	STA	A400	
01B9	8C	02	A4		STY	A402	
01BC	E6	46		WAITR	INC	WAIT	
01BE	D0	FC			BNE	WAITR	
01C0	60				RTS		
0C1	20	88	81	GETKEY2	JSR	SAVER	
01C4	20	23	89		JSR	KEYO	
01C7	20	2C	89		JSR	LRNKEY	
01CA	20	75	82		JSR	ASCNIE	
01CD	4C	B8	81		JMP	RESXAF	

C) RUN the program, START at 01B0

Note: "GO" key is used to pitch can of gas.

Rate at location 0229 should be "03" for a decent display speed.