Kim-1/6502 USER NOTES

NOVEMBER 1976 VOLUME 1 ISSUE 2

As of now we have 470 members...and plenty of new ideas to develop. But first, we have some corrections for volume 1 issue 1.

ALREADY CORRECTED IN #1

Page 4 - the second instruction in the random number generator should be SEC not (SED)

Page 13 - bottom portion of listing should read:

```
027A C8
027B C0 06
027D 90 F3
027F 20 3D 1F
0282 60
```

Page 16 - top address should read 005B (not 005E), address 0091 should contain C9 15 (not 09 15)

Page 18 - address 0238 should be D0 (not DC)
address 0242 should be D8 (not DB)

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To alleviate possible typographical errors in future issues, please try to submit articles single spaced on white bond so that we may cut and paste instead of re-typing. Also, if you expect a personal response to correspondence, please include a self addressed stamped envelope, to help defray expenses.

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MOS KIMATH PACKAGE PRELIMINARY

Let's hold off from interfacing calculator chips to our 6502's - at least for a while. I just received preliminary documentation from MOS Technology for a floating-point package (up to 17 digits and exponents from +99 to -99) that may be what we need for adding higher math functions to our machines. It's a 2K X 8 ROM with routines for ADD, SUBTRACT, MULTIPLY, DIVIDE, SQUARE ROOT, LOG, ANTILOG, TANGENT, and ARCTANGENT, in 4 different formats. KIMATH also has several subroutines for evaluating polynomial expressions which can be used to approximate most other mathematical functions.

The price and availability are not known at this time and will be passed along when released from MOS.

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HAMS!!!

Have you seen the October issue of BYTE?

The theme of the issue was morse code interpretation and several different methods were presented. This application is a natural for the KIM! (with suitable I/O). The article on page 36 showed, perhaps, the most logical and easiest to implement form of morse code handling (I will be using this algorithm). There were also several audio

Con't.

to digital conversion circuits using the 567 tone decoder that looked promising.

I am quite excited over the possibility of combining two of my hobbies in this manner and will be spending alot of energy in this area. I know that some of you are also working on this application, so let's hear from you.

If we can get a workable program together - we may be able to interest MOS Technology into masking off a ROM (2K x 8). There might be room for a BAUDOT RTTY program also (ON ONE CHIP!).

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MORE USER GROUPS GETTING STARTED

STANTON, CALIFORNIA - Daniel Gardner, 11825 Beach Blvd., Stanton, Cal. 90680 Phone - 714-898-7264

TORONTO, CANADA - Peter R. Jennings, 1612-43 Thorncliff Pk. Dr., Toronto, Ontario, Canada M4H 1J4 Phone 416-423-8263 or 678-1363

HOUSTON, TEXAS - Jeff Campbell Phone 464-6571

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THE OTHER TIMER by Richard W. Luts

Need a second interval timer? Your KIM system has one in the 6530-002 that is used only when loading or dumping to audio cassette. In applications where possibly you have dedicated your "application" Timer (address 1704-170F) to a real time clock and you may still need to time intervals or incorporate delays,the other timer is available instead of using software timing loops. However, the timer has to be poled (BIT Test) rather than run on an interupt basis as PB-7 on 6530-002 is used for the audio cassette interface.

Addresses of The "Other Timer":

1744 = Divide by 1 Time
1745 = Divide by 8 Time
1746 = Divide by 64 Time
1747 = Divide by 1024 Time
1747 = Read Time Out Bit (Bit Test)
1746 = Read Time

Want your program in firmware? Richard is offering to program EPROMS with your program. He also has a circuit board available (with buffered address lines) that will accept the PROM and a 6530. For details, drop him a post card.

122 Carol Street
Carrboro, North Carolina 27510

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Here's a tip that may help other beginners with the KIM-1. In order for the single step SST switch to work, it is necessary to load the interrupt vector: 1C00 into location 17FA & 17FB 17FA (00) 17FB (1C)

I didn't know this--the manual isn't clear--and I sent my computer back to MOS Tech. for repairs.

EMBARRASSED

RELATIVE BRANCH TABLE
6502 and 6800

by Fred Crawford Jr.
2132 Carolina Dr. NE
Cedar Rapids, Iowa
52402

BACKWARD RELATIVE

8 -	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113
9 -	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97
A -	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81
B -	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
C -	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
D -	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
E -	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
F -	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 -	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 -	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2 -	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3 -	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
4 -	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
5 -	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6 -	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
7 -	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

FORWARD RELATIVE

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MODIFYING THE S.D. SALES 4K LOW-POWER RAM BOARD FOR USE WITH KIM

from Robert E. Haas
2288 Blackburn St.
Eugene, Or. 97405

My KIM-1 system currently has an additional 8K of RAM and a 16-line by 64-character video display of my own design plus an ASCII keyboard. One of the two 4K memory boards in my system is a modified S.D. Sales Altair-compatible board. My first contribution to the newsletter is the enclosed article detailing the modifications I made to the S.D. Sales board. The neophyte KIM owner should probably not attempt to perform such a modification, but a more knowledgeable user who is looking for a low-cost memory, but up to now has not had the confidence to purchase an Altair-compatible board, will be interested.

I am writing an assembler for the 6502 which will use a modified version of the KIM cassette I/O protocol for source input and object output. I have added start-stop control via peripheral pins and can read and write individual records on cassette tape. The process is slow but cheap and reliable. I would like to distribute the assembler through the User's Group when it is finished. I will make it easy for a user to integrate his own video or hard-copy output into it.

I am happy that a KIM/6502 User's Group has been started. I would like to see an end to the dominance of the hobby computer field by Altair and friends.

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The modifications described here do not require any damage or physical changes to the board (trace cut) so the board can be restored to, and retain resale value as, an Altair-compatible board. The modification proceeds as follows:

1. Solder all components on the board per the instructions. Do not insert any IC's into sockets yet. (Do solder the regulators on the board).

2. Install jumpers in the memory-address-selection area between a-a, b-b, c-c, and d-d.

3. Using a short piece of small-diameter bare wire (such as #30 wirewrap wire, stripped) tack a jumper between IC-34 pins 6, 9, and 10. Tack a similar jumper between IC-39 pins 2 and 3.

4. Using insulated wire tack a jumper between IC-34 pins 12 and 13 and IC-39 pin 4. Tack a jumper between IC-34 pin 8 and IC-39 pin 6.

5. Tack four insulated-wire jumpers between the following pins of IC's 37 and 33: IC-37 pins 13, 11, 9, and 5 to IC-33 pins 3, 8, 11, and 6, respectively.

6. Tack-solder four 560-ohm, ¼w resistors between +5 volts (found at IC-34 and IC-37 pin 14) and IC-34 pins 1, 2, 4, and 5.

7. Insert the 2LL02's and IC-34, a 74S20, and IC's 38, 40, 41, 42, and 43 (8T97's). IC's 33, 35, 36, 37, and 39 are not used, and must be omitted.

Modification is complete and connection between KIM and the memory board should be made via an Altair-style 100-pin connector. The connections are as follows:

KIM expansion connector	Memory board conn.
pin A (AB0)	pin 79
pin B (AB1)	pin 80
pin C (AB2)	pin 81
pin D (AB3)	pin 31
pin E (AB4)	pin 30
pin F (AB5)	pin 29
pin H (AB6)	pin 82
pin J (AB7)	pin 83
pin K (AB8)	pin 84
pin L (AB9)	pin 34
pin Z (RAM-R/$\overline{W}$)	pin 68
pin V (R/$\overline{W}$)	pin 47
pin 8 (DB7)	pins 43 and 90
pin 9 (DB6)	pins 40 and 93
pin 10 (DB5)	pins 39 and 92
pin 11 (DB4)	pins 38 and 91
pin 12 (DB3)	pins 42 and 89
pin 13 (DB2)	pins 41 and 88
pin 14 (DB1)	pins 35 and 94
pin 15 (DB0)	pins 36 and 95
KIM Application connector	
pin C (K1)	pin 33
pin D (K2)	pin 85
pin E (K3)	pin 86
pin F (K4)	pin 32

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System ground must be connected to memory board pins 50 and 100 and a source of +8 volts unregulated to memory board pins 1 and 51. The board draws about 1 ampere.

The 8T97 buffers used on the memory present a fraction of a TTL load to the KIM, therefore no other buffers are required. Of course, if additional devices are connected to the KIM, buffers will be required.

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TIMER

by Joel Swank #186
4655 S. W. 142nd
Beaverton, Ore. 97005

TIMER turns KIM into a digital stopwatch showing up to 99 minutes and 59.99 seconds. It is designed to be accurate to 50 microseconds per second. The interval time is used to count 9984 cycles and the instructions between the time out and the reset of the timer make up the other 16 cycles in .01 seconds. The keyboard is used to control the routine as follows:

KEY	FUNCTION
0	stop
1	go
2	reset
3	print time on terminal
4	return to KIM

TIMER

```
0320                TIMER    *=$0320
0320 A9 00          RESET    LDA #0
0322 85 F9                   STA INH          zero display
0324 85 FA                   STA POINTL
0326 85 FB                   STA POINTH
0328 20 1F 1F       HOLD     JSR SCANDS       light display
032B 20 6A 1F                JSR GETKEY       read keyboard
032E C9 04                   CMP #4           key 4
0330 D0 03                   BNE NOQUIT
0332 4C 64 1C                JMP CLEAR        return to kim
0335 C9 03          NOQUIT   CMP #3           key 3
0337 D0 1F                   BNE NOPRT
0339 A5 FB                   LDA POINTH
033B 20 3B 1E                JSR PRTBYT       print value
033E A9 3A                   LDA #':          on terminal
0340 20 A0 1E                JSR OUTCH
0343 A5 FA                   LDA POINTL
0345 20 3B 1E                JSR PRTBYT
0348 A9 2E                   LDA #'.
034A 20 A0 1E                JSR OUTCH
034D A5 F9                   LDA INH
034F 20 3B 1E                JSR PRTBYT
0352 20 2F 1E                JSR CRLF
0355 38                      SEC
0356 B0 D0                   BCS HOLD
0358 C9 02          NOPRT    CMP #2           key 2
035A F0 C4                   BEQ RESET        back to zero
035C C9 01                   CMP #1           key 1
```

MEMORY EXPANSION: Error in Diagnostic

The Kim-2/Kim-3 Users Manual (publication 6500-16) contains a diagnostic program to test memory on page 17 (program 2).

Due to a mistake in coding, it won't work. Label 'LOOP' is placed wrongly ... it should be on the previous line.

To correct, change location 0265 from value 0C given by the listing to value 09 which will give proper operation.

By the way, it's not a very good diagnostic, in my opinion. Let's see some better ones in USER NOTES ....

Jim Butterfield

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```
035E DO C8          BNE HOLD
0360 A9 9C          LDA #$9C
0362 8D 06 17       STA TIMSET      set timer
0365 20 1F 1F  DISPL JSR SCANDS     display value
0368 AD 07 17  EXPCK LDA TIMGET     check timer
0368 F0 FB          BEQ EXPCK       wait loop
036D 8D 00 1C       STA HOM         delay 4 usec
0370 A9 9C          LDA #$9C        set timer
0372 8D 06 17       STA TIMSET
0375 18             CLC             set flags
0376 F8             SED
0377 A5 F9          LDA INH
0379 69 01          ADC #1          increment hundredths
037B 85 F9          LDA INH
037D A5 FA          LDA POINTL
037F 69 00          ADC #0          increment seconds
0381 85 FA          STA POINTL
0383 C9 60          CMP #$60        stop at 60
0385 D0 0B          BNE CKEY
0387 A9 00          LDA #0
0389 85 FA          STA POINTL      zero seconds
038B A5 FB          LDA POINTH
038D 18             CLC
038E 69 01          ADC #1          increment minutes
0390 85 FB          STA POINTH
0392 D8        CKEY CLD
0393 20 6A 1F       JSR GETKEY      read keyboard
0396 C9 00          CMP #0          key 0
0398 D0 CB          BNE DISPL
039A F0 8C          BEQ HOLD        stop
                    ..........
```

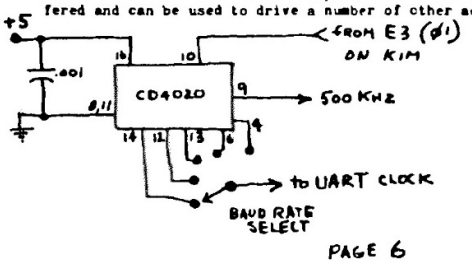
Programs for the 6502 can often be found in Dr. Dobb's Journal of Computer Calisthenics & Orthodontia (a year's subscription is $10 to Box 310, Menlo Park CA 94025). The August 1976 issue contains a full set of floating point routines (including logarithms but not trig functions); September 1976 has a 'disassembler'. You'll need to do a little modifying since programs are often written for other monitors (like APPLE or JOLT).

TINY BASIC NOW AVAILABLE ON KIM CASSETTE — from Bob Grater

Bob Grater has informed me that the Byte Shop #2 will be making Tom Pittman's Tiny Basic available on KIM compatible cassettes for $9.50 + $1.00 shipping. The user manual is included in the deal. (BASIC STARTS AT $0200) (NOT $2000)

Also from Bob...The SAB-1 (serial adapter board) will be available for $24.95 + $1.00 shipping from: Byte Shop #2, 3400 W. El Camino Real, Santa Clara, Cal. 95051.

We will have it set up at the Byte Shop #2, so that KIM users in the Bay Area can bring their KIM-1 in and play it thru our TVT to see how the system works. Also included a simple circuit that I use to clock the UART off of Ø1 on KIM instead of the on-board clock----this makes a super stable clock. All the CD4020 outputs are buffered and can be used to drive a number of other accessory circuits.



	FREQ. AVAILABLE
#9 =	500 KHZ
#7 =	62.5 KHZ
#5 =	31.25 KHZ
#4 =	15.625 KHZ
#6 =	7812.5 HZ
#13 =	3906.25 HZ
#12 =	1953.1 HZ
#14 =	976.6 HZ
#15 =	488.3 HZ
#1 =	244.1 HZ
#2 =	122 HZ
#3 =	61.03 HZ

$$\text{BAUD RATE} = \frac{\text{clock freq.}}{16}$$

NOTE: Some members have reported that they are having difficulties getting the following Kluge Harp to run correctly. —the editor—

KIM-1 KLUGE HARP

from Robert G. Lloyd
7554 Southgate Rd.
Fayetteville, N.C.
28304
(919) 867-5822

I am sending a program for A KLUGE HARP (OCT 75, BYTE, PAGE 14)

ADDRESS	MACHINE CODE			LABELS	MNEMONICS		COMMENTS
0300	A0	FF		MUSIC	LDY	#$FF	
02	A9	00		LOOP2	LDA	#$00	
04	8D	03	17		STA	PBDD	
07	EE	03	03		INC		
0A	A9	80			LDA	#$80	
0C	8D	01	17		STA	PADD	
0F	EE	0B	03		INC		
12	EE	0B	03		INC		
15	A2	02		NOTER	LDX	#$02	
17	CA			LOOP1	DEX		
18	D0	FD			BNE	LOOP1	
1A	88				DEY		
1B	D0	E5			BNE	LOOP2	
1D	A5	00		SCORE	LDA	#$00	IN 0 PAGE
1F	8D	16	03		STA	NOTER	
22	EE	1E	03		INC		
25	A2	FF			LDX	#$FF	SET LOOP COUNTER FOR
27	A0	FF		LOOP4	LDY	#$FF	SPEED OF MUSIC
29	88			LOOP3	DEY		
2A	D0	FD			BNE	LOOP3	
2C	CA				DEX		
2D	D0	F8			BNE	LOOP4	
2F	C5	30			CMP	#$30	SET FOR END OF SONG
31	D0	CF			BNE	LOOP2	
33	A9	00			LDA	#$00	RESET LOC
35	8D	1E	03		STA		031E TO 00
38	A9	02			LDA	#$02	RESET LOC
3A	8D	16	03		STA		0316 TO 02
3D	4C	DC	1C		JMP	PCCMD	EXIT DISPLAY PC

THE SCORE START IS SET AT ADDRESS 031E

THE SCORE END IS SET AT ADDRESS 0330

THE SCORE IS LOCATED IN "0" PAGE

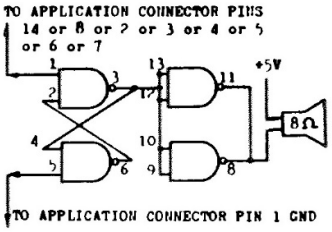
TWINKLE, TWINKLE, LITTLE STAR SET LOC 031E TO 00, SET LOC 0330 TO 30

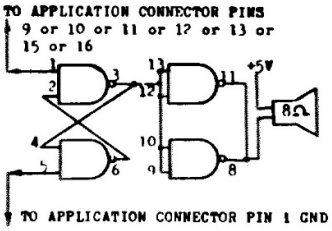
```
0000  02 02 02 55 55 39 39 33 33 39
      40 40 45 45 4C 4C 55 39 39 40
      40 45 45 55 39 39 40 40 45 45
      55 55 55 39 33 33 39 40 40 45
0028  45 4C 4C 55 02 02 02
```

DAISY SET LOC 031E to 00, SET LOC 0330 to 63

```
0000  02 02 02 1C 1C 1C 22 22 22 2B
      2B 2B 39 39 39 33 2D 2B 33 33
      2B 39 39 39 39 39 39 26 26 26
      1C 1C 1C 22 22 22 2B 2B 2B 33
      2D 2B 26 26 22 26 26 26 26 26
      22 20 22 26 1C 1C 22 26 2B 2B
      2B 2B 26 22 22 2B 33 33 2B 33
      39 39 39 39 39 2B 2B 22 26 26
      39 2B 2B 22 26 22 20 1C 22 2B
005A  26 26 39 2B 2B 2B 2B 02 02 02
```

Here is the circuit for the music;





The program by STAN OCKERS (ALPHANUMERICS ON THE KIM DISPLAY) is very good. I tryed it and it works great. Is the'r some way to hook up a set of MAN 2 5 X 7 DOT MATRIX LEDS for the display?

I am trying to get a club started in the FAYETTEVILLE area. We only have 5 members right now.

HEX CODES FOR NOTES

LOW OCTAVE		MIDDLE OCTAVE		HIGH OCTAVE	
C	AA	C	55	C	2B
C#	A0	C#	50	C#	28
D	98	D	4C	D	26
D#	90	D#	48	D#	24
E	89	E	45	E	22
F	80	F	40	F	20
F#	7A	F#	3D	F#	1E
G	72	G	39	G	1C
G#	6C	G#	36	G#	1B
A	66	A	33	A	19
A#	60	A#	30	A#	18
B	5A	B	2D	B	16
				C	15

KEEP UP THE GOOD WORK

Yours truly,

ROBERT G. LLOYD

ANOTHER KIM-1 APPLICATION IDEA

AN AUTOMATED PROM PROGRAMMER can be set up to program fusible-link types (82S123, 82S129 etc.) or the erasable variety (1702A, 5204 etc.) Will save many hours of time doing a job that your computer does alot better. Who'll be the first to get this together?

A NOTE FROM WILLIAM R. DEAZLEY, 1320 Blood Road, Cowlesville, NY 14037

The KIM-1 USER'S MANUAL, page 36, last line, states that RAM locations 17C0 to 17EB are available for application programs; however 17E7, 17E8, 17E9, 17EA and 17EB are used for CHKL, CHKH, SAVX, SAVX and SAVX respectively (see page 3 of 6530-003 software list). Therefore application programs should not use those locations and the last line on page 36 of the KIM-1 USER'S MANUAL should be changed to: ".....RAM from 17C0 to 17E6".

HUNT THE WUMPUS

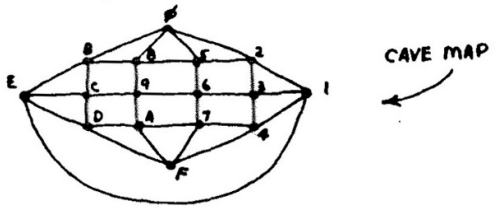
Stan Ockers
R.R. #4 Box 209
Lockport, Ill. 60441

GAME BY GREGORY YOB
ADAPTED FOR THE KIM-1 BY STAN OCKERS

I first ran across the WUMPUS in THE BEST OF CREATIVE COMPUTING where it is programmed in basic. The following is based on this program with modifications so I could fit the program and messages in the KIM-1 memory. The messages appear on the display in scanning form with "sort-of" alphanumeric letters.

The WUMPUS lives in a cave of 16 rooms (labeled Ø-F). Each room has four tunnels leading to other rooms (see the figure). When the program is started, you and the WUMPUS are placed at random. Also placed at random are two bottomless pits (they don't bother the WUMPUS, he has sucker-type feet) and two rooms with SUPERBATS, (also no trouble to the WUMPUS, he's too heavy). If you enter a room with a pit, you fall in and lose. If you enter a Bats' room you are picked up and flown at random to another room. You will be warned when Bats, Pits or the WUMPUS are nearby. If you enter the room with the WUMPUS, he wakes and either moves to an adjacent room or just eats you up (you lose). In order to capture the WUMPUS you have three cans of "MOOD CHANGE" Gas. When thrown into a room containing the WUMPUS the gas causus him to turn from a vicious snarling beast into a meek and loveable creature. He will even come out and give you a hug. Beware though, once you toss a can of gas in the room it is contaminated and you cannot enter or the gas will turn you into a beast (you lose).

The program starts at ØØØØ. If you lose and want everything to remain the same, (except the room you are in), restart at Ø316. Use the reset key to stop the program because about half of page one is used and if you just use the stop button the stack will eventually work its way down into the program. The byte at Ø229 controls the speed of the display. Once you get use to the characters you can speed things up by putting in a lower number. The message normally given tells you what room you are in and what the choices are for the next room. In order to fire the mood gas press PC (Pitch Can?) when the rooms to be selected are displayed. Then indicate the room into which you want to pitch the can. It takes a fresh can to get the WUMPUS (he may move into a room already gassed). GOOD HUNTING!



CAVE MAP

```
0000   80 EE DC BE 80 F7 D0 F9 80 84 D4 80 xx 80 C0 80
0010   F8 BE D4 D4 F9 B8 ED 80 B8 F9 F7 DE 80 F8 DC 80
0020   xx xx xx xx 80 00 80 DC DC F3 ED 80 C0 80 FC BE
0030   B7 F3 F9 DE 80 F7 80 9C BE B7 F3 BE ED 80 80 00
0040   -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
0050   02 02 00 01 01 00 03 04 00 06 07 00 09 0A 01 04
0060   05 03 01 02 03 02 05 06 05 08 09 08 0B 0C 0B 07
0070   08 04 03 04 07 06 07 0A 09 0A 0F 0C 0D 0E 0C 0A
0080   0B 0E 05 06 0F 08 09 0F 0B 0C 0D 0E 0E 0F 0D 0D
0090   80 B7 84 ED ED F9 DE 80 C0 80 DC D4 B8 EE 80 xx
00A0   80 B9 F7 D4 ED 80 B8 F9 F1 F8 80 00 80 EE DC BE
00B0   80 B8 DC ED F9 80 00 80 D0 DC DC B7 D3 80 00 xx
```

 (con't.)

```
0100   80 9C BE B7 F3 BE ED 80 B9 B8 DC FD F9 00 80 F3
0110   84 F8 80 B9 B8 DC ED F9 00 80 FC F7 F8 ED 80 B9
0120   B8 DC ED F9 80 00 80 F6 F7 80 F6 F7 80 9C BE B7
0130   F3 BE ED 80 BD DC F8 80 EE DC BE 80 00 80 ED BE
0140   F3 F9 D0 FC F7 F8 80 ED D4 F7 F8 B9 F6 80 00 80
0150   EE EE 84 84 F9 F9 F9 80 F1 F9 88 88 80 84 D4 80
0160   F3 84 F8 80 00 80 BD F7 ED 80 84 D4 80 D0 DC DC
0170   B7 80 00 80 DC BE F8 80 DC F1 80 BD F7 ED 80 00

0200   84 DE 85 DD A9 07 85 DF A0 05 A2 05 B1 DD C9 00
0210   D0 01 60 95 E8 88 CA 10 F5 D8 18 98 65 DF 85 DC
0220   20 28 02 A4 DC 4C 0A 02 A2 0A 06 DB A9 52 85 07
0230   17 20 5E 02 2C 07 17 10 F8 C6 DB D0 EF 60 A9 7F
0240   8D 41 17 A0 00 A2 09 B9 E8 00 84 F1 20 4E 1F C8
0250   C0 06 90 F3 20 3D 1F 60 20 8C 1E 20 5E 02 D0 F8
0260   20 5E 02 F0 FB 20 5E 02 F0 F6 20 6A 1F C9 15 10
0270   E7 60 A5 C0 D0 04 E6 C0 D0 F8 29 8E F0 05 0A 90
0280   FD F0 05 06 C0 A5 C0 60 06 C0 E6 C0 A5 C0 60 A2
0290   04 D5 CB F0 03 CA 10 F9 60 20 72 02 29 0F C9 04
02A0   30 0D 20 B2 02 AD 06 17 29 03 AA B5 C6 85 CB A5
02B0   CB 60 A6 CA B5 90 95 C6 B5 60 95 C7 B5 70 85 C8
02C0   B5 80 85 C9 60 A2 03 D5 C6 F0 05 CA 10 F9 60 A0
02D0   01 20 00 02 A0 00 A9 AC 20 00 02 4C D4 02 BD D0
02E0   F9 F7 F8 C0 80 EE 3C BE 80 BD F9 F8 80 F7 80 F6
02F0   BE BD 80 F1 90 DC B7 80 9C BE B7 F3 BE ED 80 00

0300   AD 06 17 85 C0 A9 FF A2 0E 95 C1 CA 10 FB A9 03
0310   85 E0 A0 05 10 02 A0 00 A2 05 20 72 02 29 0F D5
0320   CA F0 F5 CA 10 F9 99 CA 00 88 10 EC 20 B2 02 A0
0330   03 84 E1 B9 36 00 20 BF 02 9A 30 17 E0 03 30 04
0340   A9 19 10 0A E0 01 30 04 A9 0E 10 02 A9 00 A0 01
0350   20 00 02 C6 E1 A4 E1 10 DA A4 CA B9 E7 1F 85 0C
0360   A2 03 B4 C6 B9 E7 1F 95 20 CA 10 F6 A0 00 98 20
0370   00 02 20 58 02 C9 14 F0 48 20 C5 02 85 CA 8A 30
0380   EB A5 CA A2 04 D5 C1 F0 33 CA 10 F9 20 8F 02 8A
0390   30 9A E0 03 10 17 E0 01 10 1D A0 00 A9 26 20 00
03A0   02 20 99 02 C5 CA D0 84 A9 26 20 CF 02 A0 01 A9
03B0   3D 20 00 02 4C 16 03 A9 4F 20 CF 02 A9 65 20 CF
03C0   02 A0 00 A9 B7 20 00 02 20 58 02 20 C5 02 85 D1
03D0   8A 30 EE A5 D1 A6 E0 95 C0 C5 CB F0 15 C6 E0 F0
03E0   1A A4 E0 B9 E7 1F 85 9F A0 00 A9 90 20 00 02 4C
03F0   6C 03 A0 02 A9 DE 20 00 02 F0 F7 A9 73 20 CF 02
```

EDITORS NOTE: On the Bay Area TVT from The Byte Shop #2. Well, my friend TVT is up and running! Basically, it's a 32x16 display (a board to convert to a 64x16 display is available from other sources) that scrolls up after the screen is filled instead of going to another page. The memory, cursor control, and parallel interface are included on the main board instead of the usual plug-in arrangement. The pc board is definitely of industrial quality! Initial documentation was quite poor, but I understand from Bob Grater that it's been improved. The price of the TVT is 139.00 + 2.00 shipping from The Byte Shop #2, 3400 W. El Camino Real, Santa Clara, California 95051.

```
020E   C9 00
0210   D0 01
0212   60
0213   95 E8
```

There is a slight bug in the travelling message program I sent you. It seems that the last character is displayed momentarily and then goes blank. Rearrange as follows: The WUMPUS program enclosed has it fixed the right way.

I have the assembly level listing of WUMPUS (haven't typed it though), it is so long that I thought the hex listing would suffice. There are a few things of interest like a random number generator (ala Sept. '76 Byte) in 0272-028E but mostly it is all WUMPUS. For those interested I'd be willing to send the assembly listing for a self-addressed stamped envelope. I'd also be willing to copy the program on tape for those furnishing a tape and return postage. (It's not really that long though and can be punched in fairly quickly).

I hope the User-Notes are coming along well. I can hardly wait.

.....

Stan

Looking at Tape

Jim Butterfield, Toronto

Program VUTAPE lets you actually see the contents of a KIM format tape as it's going by. It shows the data going by very quickly, because of the tape speed .. but you can at least 'sense' the kind of material on the tape.

In case of tape troubles, this should give you a hint as to the area of your problem: nothing? noise? dropouts? And you can prepare a test tape (see below) to check out the tape quality and your recorder. The test tape will also help you establish the best settings for your volume and tone controls.

Perhaps VU-TAPE's most useful function, though, is to give you a 'feeling' for how data is stored on tape. You can actually watch the processor trying to synchronise into the bit stream. Once it's synched, you'll see the characters rolling off the tape ... until an END or illegal character drops you back into the sync mode again. It's educational to watch. And since the program is fairly short, you should be able to trace out just how the processor tracks the input tape.

VUTAPE starts at location 0000 and is fully relocatable (so you can load it anyplace it fits).

KIM UTILITY: VU-TAPE 02

```
0000 D8        START   CLD
0001 A9 7F             LDA #$7F
0003 8D 41 17          STA PADD  set display dir reg
0006 A9 13     SYN     LDA #$13  ..window 6 and tape in
0008 85 E0             STA POINT   and keep pointer
000A 8D 42 17          STA SBD
000D 20 41 1A          JSR RDBIT   get a bit and
0010 46 F9             LSR INH     ..slip it into
0012 05 F9             ORA INH     ..the right-hand
0014 85 F9             STA INH     ..side;
0016 8D 40 17          STA SAD   show bit flow on display
0019 C9 16     TST     CMP #$16   ..is it a SYNC?
001B D0 E9             BNE SYN   nope, keep 'em rolling
001D 20 24 1A          JSR RDCHT  yup, start grabbing...
0020 C9 2A             CMP #$2A   ..9 bits at a time and..
0022 D0 F5             BNE TST    ..if it's not an '*'..
0024 A9 00     STREAM  LDA #$00   ..then start showing
0026 8D E9 17          STA SAVX   ..characters 1 at a time
0029 20 24 1A          JSR RDCHT
002C 20 00 1A          JSR PACKT  ..converting to hexadec..
002F D0 D5             BNE SYN    ..if legal
0031 A6 E0             LDX POINT
0033 E8                INX
0034 E8                INX        Move along to next..
0035 E0 15             CPX #$15   ..display position
0037 D0 02             BNE OVER   (If last digit, ..
0039 A2 09             LDX #$09    ..reset to first)
003B 86 E0     OVER    STX POINT
003D 8E 42 17          STX SBD
0040 AA                TAX        change character read
0041 BD E7 1F          LDA TABLE,X  ..to segments and..
0044 8D 40 17          STA SAD      send to the display
0047 D0 DB             BNE STREAM   unconditional jump
                       -----
```

Checking Out Tapes/Recorders

Make a test tape containing an endless stream of SYNC characters with the following program:

```
0000 A0 7F     GO  LDY #$7F    directional..
0002 8C 42 17      STY PBDD    ..registers
0005 A9 16     LP  LDA #$16    SYNC
0007 20 7A 19      JSR OUTCH   ..out to tape
000A D0 F9         BNE LP
```

01

Now use program VUTAPE. The display should show a steady synchronisation pattern. Try playing with your controls and see over what range the pattern stays locked in. The wider the range, the better your cassette/recorder.

SUPERTAPE WORKS GREAT!! HIGHLY RECOMMENDED

~the editor~

KIM-1 / TTY FIXIT MOD - from Ronald Kushnier, 310 Addison Ct., Cornwell Hts., Pa. 19020

The keyboard return from the TTY normally goes through a 150 ohm resistor (R49) to +5 volts. Disconnect the keyboard return lead from pin "R" on the applications connector and connect it through a 470 ohm ½ watt resistor to pin "N" (+12 vdc). Pin "N" is now used for both audio cassette interface and TTY when hooked to +12 vdc. This turned hopeless chatter into perfect copy. Now if I can only figure a way to get the teletype home from work...

.....

SUPERTAPE!

Jim Butterfield
Toronto

How long does it take you to load a fu l 1K of KIM-1 memory? Over two minutes? And if you're going for memory expansion, how long will it take you to load your 8K? Twenty minutes?

Hold onto your hats. Program SUPERTAPE! will write fully compatible tapes in a fraction of the time. You can load a full 1K in 21 seconds.

Fully compatible means this: once you've written a tape using SUPERTAPE! you can read it back in using the normal KIM-1 program (starting at 1873 as usual). And the utilities and diagnostic programs work on this super-compressed data (e.g., DIRECTORY and VUTAPE).

You'll need some memory space for the program, of course. If you have memory expansion, there'll be no problem finding space, of course. But if you're on the basic KIM-1, as I am, you'll have to "squeeze in" SUPERTAPE! along with the program you're dumping to tape. I try to leave page 1 alone usually (the stack can overwrite your program due to bugs); so I stage SUPERTAPE! in that area. For the convenience of relocation, the listing underlines those addresses that will need changing. There are also four values needed in page zero which you may change to any convenient location.

For those interested in the theory of the thing, I should mention: SUPERTAPE! is not the limit. If you wished to abondon KIM-1 monitor compatibility, you could continue to speed up tape by a factor of 4 or 5 times more. (Can you imagine reading 1K in four seconds?). For the moment, however, SUPERTAPE! is plenty fast for me.

Thanks go to Julien Dube for his help in staging early versions of SUPERTAPE!

PRELIMINARY RESULTS OF SUPERTAPE TRIALS

So far, Supertape has been tried on a half-dozen or so cassette recorders, with mixed results. Three of them give solid input: never-fail loading. The other three work poorly or not at all.

The only common factor I can spot (don't have elaborate test facilities here) is cassette player output level - the good ones invariably blast out a fairly strong signal. In principle, level shouldn't matter; the first thing the signal hits on the KIM-1 board is a limiter which cuts all signals down to the same size.

For those who would like to improve their tape speed but can't get full speed Supertape to work on their cassettes, a change of two locations will give intermediate packing densities:

Name	Speed improvement	01BE	01C0
STANDARD	x 1	0C	12
FASTAPE	x 2	06	09
SPEEDTAPE	x 3	04	06
SUPERTAPE	x 6	02	03

Maybe we should start a catalogue of cassette recorder models and what speeds each will support.

contd.....

```
SUPERTAPE!                                  Jim Butterfield
October, 1976                               Toronto

0100 A9 AD     DUMPT  LDA #$AD      op code LDA
0102 8D EC 17         STA VEB
0105 20 32 19         JSR INTVEB    set up subrtn
0108 A9 27            LDA #$27
010A 85 E1            STA GANG      flag to go to SBD
010C A9 BF            LDA #$BF
010E 8D 43 17         STA IRDD      open the channels
0111 A2 64            LDX #$64       send 100...
0113 A9 16            LDA #$16         ..SYNC chars
0115 20 61 01         JSR HIC
0118 A9 2A            LDA #$2A       send asterisk
011A 20 88 01         JSR OUTCHT
011D AD F9 17         LDA ID         then the ID
0120 20 70 01         JSR OUTBT
0123 AD F5 17         LDA SAL        followed by
0126 20 6D 01         JSR OUTBTC      the start address
0129 AD F6 17         LDA SAH          (low and high)
012C 20 6D 01         JSR OUTBTC
012F 20 EC 17 DUMPT4  JSR VEB        get memory word
0132 20 6D 01         JSR OUTBTC      and send it
0135 20 EA 19         JSR INCVEB     on to next address
0138 AD ED 17         LDA VEB+1
013B CD F7 17         CMP EAL        is the address..
013E AD EE 17         LDA VEB+2       ..at the end?
0141 ED F8 17         SBC EAH
0144 90 E9            BCC DUMPT4     no, go back;
0146 A9 2F            LDA #$2F       yes, send end-data
0148 20 88 01         JSR OUTCHT
014B AD F7 17         LDA CHKL       ..and checksum
014E 20 70 01         JSR OUTBT
0151 AD F8 17         LDA CHKH       ..hi and low..
0154 20 70 01         JSR OUTBT
0157 A2 02            LDX #$02       send two..
0159 A9 04            LDA #$04       EOT characters
015B 20 61 01         JSR HIC
015E 4C 5C 18         JMP DISPZ      and we're finished
                    ; subroutines follow here
0161 86 E0     HIC    STX TIC        count
0163 48        HIC1   PHA
0164 20 88 01         JSR OUTCHT     send character
0167 68               PLA            ..and bring it back
0168 C6 E0            DEC TIC
016A D0 F7            BNE HIC1       do it agin
016C 60               RTS

016D 20 4C 19 OUTBTC  JSR CHKT    compute checksum
0170 48       OUTBT   PHA         save the character
0171 4A               LSR A
0172 4A               LSR A       ..and take its
0173 4A               LSR A        four left bits..
0174 4A               LSR A
0175 20 7D 01         JSR HEXOUT  write 'em ...
0178 68               PLA         now the 4 right bits..
0179 20 7D 01         JSR HEXOUT
017C 60               RTS
```

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more.....

KIM-1 SOFTWARE:

Robert Tripp, editor of THE JOM-UTERIST has put together a package of games, demo-programs and a real-time monitor to control the whole works on a cassette. It's available as a package (cassette, source listings & instructions) for $10.00. It's called PLEASE, runs on the basic KIM with no additional memory or I/O and sounds very interesting. It is available from Micro-Cosmos, 210 Daniel Webster Hwy. So., So. Nashua, N.H. 03060

MORE SOFTWARE:

6502 Programs Exchange, 2920 Moana Ln., Reno Nevada, 89509 ($.25 for program list.) Most programs were written for TIM & JOLT monitors, but easily converted to KIM by changing I/O subroutine calls. You need a TTY or TVT. For .25 extra, order TIM (DEMON) subroutine list and you will receive a list of 16 TIM routines and their effects to make conversion to KIM a lot easier. (and it's cheaper than buying a TIM manual).

```
                        ;
017D 29 0F      HEXOUT  AND #$0F   remove unwanted bits
017F C9 0A              CMP #$0A    change to ASCII by..
0181 18                 CLC            adding:
0182 30 02              BMI HEX1
0184 69 07              ADC #$07    $37 if A to F
0186 69 30      HEX1    ADC #$30    $30 if numeric
0188 A0 08      OUTCHT  LDY #$08    for the eight bits..
018A 84 E2              STY COUNT
018C A0 02      TRY     LDY #$02    send 3 units
018E 94 E3              STY TRIB    starting at 3600 hertz
0190 BE BE 01   ZON     LDX NPUL,Y   number of half cycles
0193 48                 PHA          keep the character
0194 2C 47 17   ZON1    BIT CLKRDI   Wait for the previous..
0197 10 FB              BPL ZON1      . cycle to complete
0199 B9 BF 01           LDA TIMG,Y   Get the time to the..
019C 9D 44 17           STA CLK1T     ..next pulse ($7E or C3)
019F A5 E1              LDA GANG
01A1 49 80              EOR #$80     Flip between 1 and 0
01A3 8D 42 17           STA SBD
01A6 85 E1              STA GANG
01A8 CA                 DEX          have we sent all the cycles?
01A9 D0 E9              BNE ZON1     nope, send another one
01AB 68                 PLA          get back the character
01AC C6 E3              DEC TRIB     one less unit to send
01AE F0 05              BEQ SETZ     and the last one's here
01B0 30 07              BMI ROUT     none left?  quit
01B2 4A                 LSR A        Take next bit
01B3 90 DB              BCC ZON      ..and if it's a one..
01B5 A0 00      SETZ    LDY #$00     switch to 2400 cycles/sec
01B7 F0 D7              BEQ ZON     unconditional return
01B9 C6 E2      ROUT    DEC COUNT    one less bit
01BB D0 CF              BNE TRY      any more? go back
01BD 60                 RTS
                ; frequency/density controls
01BE 02         NPUL    .BYTE $02   two pulses; one cycle!
01BF C3 03 7E   TIMG    .BYTE $C3,$03,$7E
                        end
```

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A Microcomputer Data Processing course, utilizing the KIM-1, will be held at Thames Valley State Technical College in Norwich, Connecticut. The course will consist of 22 evening sessions and will run from Dec. 6, 1976 thru Feb. 28, 1977. Contact Frank Rybicki (203) 886-0177 for more information.

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SUBSCRIPTION INFORMATION

KIM-1 USER NOTES is published every 5 to 8 weeks. The subscription rate for U.S. and Canadian subscribers is $5.00 for volumn 1 issues 1 thru 6 including 1st class postage. Foreign subscriptions which includes Europe and S. America is $8.00 including 1st class air mail postage.

Payment should be made in U.S. funds with a check or money order (no cash or purchase orders) please.

KIM-1 User Notes
c/o Eric C. Rehnke
7656 Broadview Rd. #207
Parma, Ohio 44134

KIM-1/6502 POWER!

If you think that KIM-1 with 1K RAM is a limited power machine -- hold on to your hat! Peter Jennings has written a chess-playing program that runs in 1K using just the keyboard and display. I've played against his current version, which plays at the 'competent beginner' level. Even this is quite impressive, but Peter tells me that he'll be beefing up the strategy over the next few months and expects it to play a fairly competent game. All this in 1K! Never underestimate your KIM.

Peter plans to market his chess program commercially after he polishes it up in the next few months ... I'm looking forward to seeing the final version.

--Jim Butterfield