

Kim-1/6502 USER NOTES

NOVEMBER 1976

VOLUME 1 ISSUE 2

PAGE 1

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 09 15 (not 09 15) ✓

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

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.

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.

RAMS!!!

Have you seen the October issue of BYTES?

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

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 making off a ROM (2K x 8). There might be room for a BAUDOT RTTY program also (ON THE CHIP!).

MODE 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 416-423-3263 or 678-1363

HOUSTON, TEXAS - Jeff Campbell Phone 464-6571

THE OTHER TIMER

by Richard V. Lutz

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 interrupt 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

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 vectors: 1000 into location 177A & 177B, 177A (00) 177B (10)
I didn't know this--the manual isn't clear--and I sent my computer back to MOS Tech. for repairs.

EMBARRASSED
PAGE 2

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

MODIFYING THE S.D. SALES 4K LOW-POWER RAM BOARD from Robert E. Haas
FOR USE WITH KIM 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 tapes. 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.

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 5.
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, 1/2w 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 21102's and IC-34, a 74S20, and IC's 38, 40, 41, 42, and 43 (8797's). IC's 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 (A30)	pin 79
pin B (A31)	pin 80
pin C (A32)	pin 81
pin D (A33)	pin 31
pin E (A34)	pin 30
pin F (A35)	pin 29
pin H (A36)	pin 82
pin J (A37)	pin 83
pin K (A38)	pin 84
pin L (A39)	pin 34
pin Z (RAM-R/W)	pin 68
pin V (R/A)	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

Con't.

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.

TIMER ON TAPE #1 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 9994 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	FUNCTION	INSTRUCTION	COMMENT
0320	TIMER	*40320	
0320 A9 00	RESET	LDA #0	zero display
0322 85 F9		STA INH	
0324 85 FA		STA POINTL	
0326 85 FB		JTA POINTH	
0328 20 1F 1F	HOLD	JSR SCANDS	light display
0328 20 6A 1F		JSR GETKEY	read keyboard
032E C9 04		CMR #4	key 4
0330 D0 03		BNE NO-QUIT	
0332 4C 64 1C		JMP CLEAR	return to kim
0335 C9 03	NO-QUIT	CMR #3	key 3
0337 D0 1F		BNE NOPRT	
0339 A5 FB		LDA POINTH	
033B 20 3B 1E		JSR PRINT	print value
033E A9 3A		LDA #1	on terminal
0340 20 40 1E		JSR OUTCH	
0343 A5 FA		LDA POINTL	
0345 20 3B 1E		JSR PRINT	
0348 A9 2E		LDA #1	
034A 20 40 1E		JSR OUTCH	
034D A5 F9		LDA INH	
034F 20 3B 1E		JSR PRINT	
0352 20 2F 1E		JSR CLRF	
0355 38		SEC	
0356 80 D0		BCS HOLD	key 2
0358 C9 02	NOPRT	CMR #2	back to zero
035A F0 04		BHQ RESET	key 1
035C C9 01		CMR #1	

REMARKS: Error in Diagnostics
The Kim-2/Kim-3 Users Manual (Publication 6900-16) 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 0365 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

Con't.

```

035E D0 C8          BNE #ELD
0360 A9 9C          LDA #9C
0362 8D 06 17      STA TIMSET          set timer
0365 20 1F 1F      JSR SCANDS         display value
0368 AD 07 17      LDA TIMSET         check timer
036B FD FB          BE, EXPCX         wait loop
036D 8D 00 1C      STA MM            delay 4 usec
0370 A9 9C          LDA #9C            set timer
0372 ED 06 17      STA TIMSET
0375 18            CLC
0376 FB            JED
0377 A5 F9          LDA INH            increment hundredths
0379 69 01          ADC #1
037B 85 F9          LDA INH
037D A5 FA          LDA POINTL        increment seconds
037F 69 00          ADC #0
0381 85 FA          LDA POINTL
0383 09 60          CMP #60           stop at 60
0385 D0 0B          BNE CKEY
0387 A9 00          LDA #0
0389 85 FA          LDA POINTL        zero seconds
038B A5 FB          LDA POINTH
038D 18            CLC
038E 69 01          ADC #1            increment minutes
0390 85 FB          LDA POINTH
0392 D8            CLD
0393 20 6A 1F      JSR GETKEY        read keyboard
0396 09 00          CMP #0            key 0
0398 D0 C8          BNE DISPL
039A FD 8C          BE, #ELD         stop

```

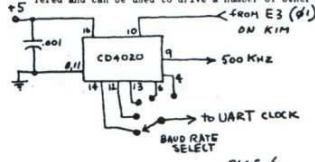
Program for the 6800 can often be found in Dr. Dobbs Journal of Computer Graphics and Graphics. The August 1976 issue contains a full description of the program. The program is written in assembly language but not in machine language. The program is written in assembly language but not in machine language. The program is written in assembly language but not in machine language. (The program is written in assembly language but not in machine language.)

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 #1 on KIM instead of the on-board clock---this makes a super stable clock. All the CD-4020 outputs are buffered and can be used to drive a number of other accessory circuits.



FREQ. AVAILABLE

#9	= 800 KHZ
#7	= 125 KHZ
#5	= 11.25 KHZ
#4	= 11.615 KHZ
#6	= 7812.5 HZ
#3	= 296.25 HZ
#12	= 1953.1 HZ
#14	= 976.6 HZ
#15	= 488.3 HZ
#1	= 244.1 HZ
#2	= 122 HZ
#8	= 61.03 HZ

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
7504 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	MEMONICS	COMMENTS
0100	A0 FF	MUSIC	LIT #FFF	
02	A9 00	LOOP2	LDA #800	
04	8D 03 17		STA P8DD	
07	EE 03 03		INC	
0A	A9 80		LDA #880	
0C	8D 01 17		STA PADD	
0F	EE 0B 03		INC	
12	EE 0B 03		INC	
15	A2 02	NOTER	LIX #802	
17	CA	LOOP1	DEX	
18	DO FD		BNE LOOP1	
1A	88		DET	
1B	DO E5		BNE LOOP2	
1D	A5 00	SCORE	LDA #800	IN 0 PAGE
1F	8D 16 03		STA NOTER	
22	EE 1E 03		INC	
25	A2 FF		LIX #FFF	SET LOOP COUNTER FOR
27	A0 FF	LOOP4	LIT #FFF	SPEED OF MUSIC
29	88	LOOP3	DET	
2A	DO FD		BNE LOOP3	
2C	CA		DEX	
2D	DO F8		BNE LOOP4	
2F	C5 30		CWP #830	SET FOR END OF SONG
31	DO CF		BNE LOOP2	
33	A9 00		LDA #800	RESET LOC
35	8D 1E 03		STA	031E TO 00
38	A9 02		LDA #802	RESET LOC
3A	8D 16 03		STA	0316 TO 02
3D	4C DC 1C		JMP PCWD	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

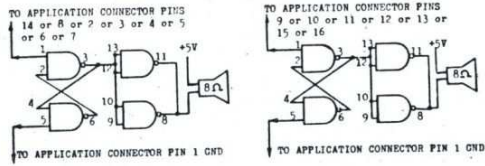
TWINKLE, TWINKLE, LITTLE STAR SET LOC 031E TO 00, SET LOC 0330 TO 30

```
0000 02 02 02 55 55 39 39 33 33 39
      40 40 45 45 40 40 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 40 40 55 02 02 02
```

RAISY 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 26 26 26
      1C 1C 1C 22 22 22 2B 2B 2B 33
      2D 2B 26 26 22 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 2B 2B 22 26 26
      39 2B 2B 22 26 22 20 1C 22 2B
005A 26 26 39 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 tried it and it works great. Is there some way to hook up a set of MAX 2 X 7 DOT MATRIX LEDS for the display?
 I am trying to get a club started in the PAYETTEVILLE area. We only have 5 members right now.

HEX CODES FOR NOTES

LOW OCTAVE	MIDDLE OCTAVE	HIGH OCTAVE
C AA	C 55	C 28
C# A#	C# 5#	C# 28
D 98	D 4C	D 26
D# 9#	D# 4#	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# 18
A 66	A 33	A 19
A# 6#	A# 3#	A# 1B
B 5A	B 2D	B 16
		C 15

KEEP UP THE GOOD WORK

Yours truly,

 ROBERT G. LLOYD

ANOTHER KIM-1 APPLICATION IDEA

AN AUTOMATIC PAPER THERMISTOR 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, 1520 Blood Road, Cowlesville, NY 14037

The KIM-1 USER'S MANUAL, page 36, last line, states that RAM locations 1700 to 17EB are available for application programs; however 1707, 1708, 1709, 171A and 171B are used for CUR1, CUR2, SAV1, SAV2 and SAV3 respectively (see page 3 of 6530-00 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 1700 to 1726".

ON TAPE # 01 # 7, 6, 9 program ID.
 HUNT THE WIMPUS

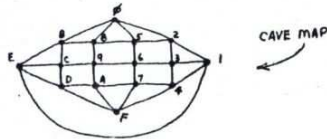
Stan Ockers
 R.F. # Box 209
 Lockport, Ill. 60461

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

I first ran across the WIMPUS 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 WIMPUS lives in a cave of 16 rooms (labeled A-F). Each room has four tunnels leading to other rooms (see the figure). When the program is started, you and the WIMPUS are placed at random. Also placed at random are two bottomless pits (they don't bother the WIMPUS, he has sucker-type feet) and two rooms with SUPERBATS, (also no trouble to the WIMPUS, 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 WIMPUS are nearby. If you enter the room with the WIMPUS, he wakes and either moves to an adjacent room or just eats you up (you lose). In order to capture the WIMPUS you have three cans of "MOOD CHANGE" Gas. When thrown into a room containing the WIMPUS the gas causes 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 \$396. If you lose and want everything to remain the same, (except the room you are in), restart at \$316. 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 \$029 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 WIMPUS (he may move into a room already gassed). GOOD HUNTING!



```
0000 80 EE DC BE 80 F7 D0 F9 80 84 D4 80 xx 80 C0 80
0010 F8 BE D4 D4 F9 88 ED 80 88 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 E7 F3 F9 DE 80 F7 80 9C BE B7 F3 BE ED 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 06 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 87 84 ED ED F9 DE 80 C0 80 DC D4 88 8E 80 xx
00A0 80 89 F7 D4 ED 80 88 F9 F1 F8 80 80 8E 8E 80 BE
00B0 80 88 DC ED F9 80 00 80 D0 DC DC E7 D3 80 00 xx
```

(cont.)

```

0100 80 9C BE 87 F3 BE ED 80 B9 88 DC ED F9 00 80 F3
0110 84 F8 80 B9 85 CC 2D 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 87
0130 F3 BE ED 80 B9 DC F8 80 EE DC BE 80 00 80 ED BE
0140 F3 F9 00 FC F7 F8 80 ED DA F7 F8 89 F6 80 00 80
0150 EE EE 84 84 F3 F9 F9 80 F1 F9 88 88 80 84 DA 80
0160 F3 84 F8 80 00 80 B0 F7 ED 80 84 04 80 DC DC DC
0170 B7 80 00 80 DC EE F8 80 DC F1 80 B0 F7 ED 80 00

0200 84 DE 85 00 A9 07 85 DF A0 05 A2 05 B1 D0 C9 00
0210 D0 01 60 95 E5 88 CA 10 F3 D8 18 95 65 DF 85 DC
0220 20 25 02 A4 DC 4C 0A 02 A2 0A 85 08 A9 52 80 07
0230 17 20 3E 02 2C 07 17 10 F8 C6 38 30 EF 60 A9 7F
024C 80 41 17 A0 00 A2 09 B9 E8 00 84 F2 20 4E 1F 05
0250 CC 06 90 F3 20 3D 1F 60 20 8C 1E 20 3E 02 D0 F8
0260 20 3E 02 FD F8 20 3E 02 FD F6 20 6A 1F C9 15 10
0270 E7 60 A5 00 04 86 C0 00 F8 29 BE F0 05 CA 90
0280 FD F0 05 06 C0 A5 C0 60 C0 00 E6 50 A5 C0 60 A2
0290 04 D5 CB F0 03 CA 10 F9 60 20 72 02 29 0F C9 04
0300 30 00 20 B2 02 AD 06 17 29 03 A4 85 C6 85 CB A5
0310 CB 60 A6 CA 85 50 85 C6 B9 60 85 C7 85 70 85 C8
0320 B5 80 85 C9 60 A2 01 05 C6 F0 03 CA 10 F9 60 A0
0330 01 20 00 02 A0 00 A9 AC 20 00 02 4C 04 02 B0 D0
0340 F9 F7 F8 20 80 EE DC 8E 80 B0 F9 F3 80 F7 80 F6
0350 EE B0 80 F1 50 DC 87 80 9C EE B7 F3 EE B2 80 00

0360 AD 06 17 85 20 A9 FF A2 0E 95 C1 CA 10 FB A9 03
0370 85 20 A0 05 10 03 A0 00 A2 05 20 72 02 29 0F 05
0380 CA F0 F5 CA 10 F9 99 CA 00 88 10 EC 20 02 02 A0
0390 03 84 E1 B9 56 00 20 8F 02 8A 50 17 80 05 30 04
03A0 A9 19 10 0A E0 01 30 0A A9 0E 10 02 A9 00 A6 01
03B0 20 00 02 C6 E1 A4 E1 10 DA A4 CA 89 C7 1F 85 0C
03C0 A2 03 B4 C6 B9 E7 1F 95 20 CA 10 F6 A0 00 98 20
03D0 00 02 20 58 02 29 14 F0 48 20 25 02 85 CA 8A 30
03E0 EB A5 CA A2 04 D5 C1 F0 55 CA 10 F9 20 8F 02 8A
03F0 30 0A 00 05 10 17 80 01 10 1B A0 00 A9 26 20 00
0400 02 20 99 02 C5 CA 00 84 A9 26 20 CF 02 A0 01 A9
0410 3D 20 00 02 4C 16 03 A9 4F 20 CF 02 A9 65 20 CF
0420 02 A0 00 A9 87 20 00 02 20 58 02 20 C5 02 85 D1
0430 84 30 EE 45 21 46 87 95 00 C5 CB F0 15 26 80 F0
0440 1A A4 F0 D9 E7 1F 85 9F A0 00 A9 90 20 00 02 4C
0450 6C 03 A0 02 A9 DE 20 00 02 F0 F7 A9 73 20 CF 02

```

EDITOR'S NOTE: On the Bay Area TRF from The Byte Shop #2.
 This is a listing of the program and not a listing of the
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 is a listing of the program and not a listing of the program.
 The program is definitely of industrial quality.
 Initial documentation was quite poor, but I understand
 that the program is of high quality. The program is of
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 is of high quality. The program is of high quality. The
 program is of high quality. The program is of high quality.
 TRF is 15:00 - 2:00 shipper from The Byte Shop Co., the
 3400 W. El Camino Real, Santa Clara, California 95051.

A9
 0306 09 00
 0210 00 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 WUMBUS program enclosed has it fixed the right way.

I have the assembly level listing of WUMBUS (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
 WUMBUS. 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 VU-TAPE 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 synchronize 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.

VU-TAPE starts at location 0000 and is fully relocatable (so you can load it anywhere it fits).

KIM UTILITY: VU-TAPE (ONTAPE#1) (03)

```

0000 D5      START  CID
0001 A9 7F      LDA #57F
0003 3D 41 17   STA FADD set display dir reg
0006 A9 13      SYN  LDA #113 ..window 6 and tape in
0005 85 E0      STA POINT and keep pointer
000A 3D 42 17   STA SBD
000D 20 41 1A   JSR RDBIT get a bit and
0010 46 F9      JSR INH ..slip it into
0012 05 F9      ORA INH ..the right-hand
0014 85 F9      STA INH ..sider
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 ..5 bits at a time and..
0022 D0 F5      BNE TST ..if it's not an '...'
0024 A9 00      STREAM LDA #000 ..then start showing
0026 3D E9 17   JSR RDCHT ..characters 1 at a time
0029 20 24 1A   JSR RDCHT
002C 20 00 1A   JSR FACKT ..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      CFX #15 ..display position
0037 D0 02      BNE OVER (if last digit, ..
0039 A2 09      LDX #009 ..reset to first)
003B 86 E0      OVER STX POINT
003D 8E 42 17   STX SBD
0040 AA        TAX change character read
0041 ED E7 1F   LDA TABLE,X ..to segments and..
0044 3D 40 17   STA SAD send to the display
0047 D0 DB      BNE STREAM unconditional jump
-----

```

Check out the following program:

```

0000 A0 8F      CO 10Y 44F
0002 3E 43 17  LP LMA #16
0005 43 16 19  JSR CATCH
000A D0 79      BNE LT
000B 3F

```

directional...
STX characters
..out to tape

How use program VU-TAPE. The display should show a steady stream of characters. Try playing with your controls and see what happens. The wider the range, the better your cassette/recorder.

KIM-1 / TTY PRINT MOD - from Ronald Kushner, 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 "RM" on the applications connector and connect it through a 470 ohm 1/2 watt resistor to pin "M" (+12 vdc). Pin "M" 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...

SUPERTAPEI Jim Butterfield
 Toronto

How long does it take you to load a full 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 SUPERTAPEI 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 SUPERTAPEI 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 VDTAPE).

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" SUPERTAPEI along with the program you're dumping to tape. I try SUPERTAPEI 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: SUPERTAPEI is not the limit. If you wished to abandon 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, SUPERTAPEI is plenty fast for me.

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

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	O18E	O1C0
STANDARD	x 1	0C	12
FASTAPE	x 2	06	09
SPEEDTAPE	x 3	0A	06
SUPERTAPE	x 6	02	03

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

```
SUFERTAFEI Jim Butterfield
October, 1976 Toronto
0100 A9 AD DUMPT LDA #3AD op code LDA
0102 8D EC 17 STA VEB
0105 20 32 19 JSR INTVEB set up subtrn
0108 A9 27 LDA #327
010A 95 E1 STA GANG flag to go to SBD
010C A9 BF LDA #3BF
010E 8D 43 17 STA #BDD open the channels
0111 A2 64 LDX #364 send 100...
0113 A9 16 LDA #316 ..SYNC chars
0115 20 61 01 JSR HIC send asterisk
011A 20 93 01 JSR OUTCHT then the ID
011D AD F9 17 LDA ID
0120 20 70 01 JSR OUTBT followed by
0123 AD F5 17 LDA SAL the start address
0126 20 6D 01 JSR OUTBTC (low and high)
0129 AD F6 17 LDA SAH
012C 20 6D 01 JSR OUTBTC get memory word
012F 20 EC 17 DUMPT4 JSR VEB and send it
0132 20 6D 01 JSR OUTBTC on to next address
0135 20 EA 19 JSR INCVEB
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 F3 17 SEC EAH
0144 90 E9 BCC DUMPT4 no. go back;
0146 A9 2F LDA #32F yes, send end-data
0148 20 88 01 JSR OUTCHT ..and checksum
014B AD E7 17 LDA CHKL
014E 20 01 01 JSR OUTBT ..hi and low..
0151 AD E3 17 LDA CHKH
0154 20 70 01 JSR OUTBT
0157 A2 62 LDX #302 send two..
0159 A9 04 LDA #304 EOT characters
015B 20 61 01 JSR HIC
015E 4C 5C 18 JMP DISPZ and we're finished
                   | subroutines follow here
0161 36 E0 HIC STX TIC count
0163 43 HICI PHA
0164 20 35 01 JSR OUTCHT send character
0165 63 FIA ..and bring it back
0168 C6 E0 DEC TIC
016A D0 F7 BNE HICI do it agin
016C 60 RTS
016D 20 4C 19 OUTBTC JSR CHKT compute checksum
0170 43 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
```

PAGE 13 MORE.....

KIM-1 SOFTWARE
Robert Train, editor of THE COMPUTE!IST 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 (containing) PLATES, runs on the basic KIM with no additional memory of I/O and sounds very interesting. It is available from Micro-Common, Ltd. Direct reader 1997, etc., etc. Number 010000

KIM-1 SOFTWARE
6502 Program Exchange, 2900 Nouva Ln., Reno Nevada, 89509
(\$25 for program list.) Next program was written for the KIM-1 with the monitor presented to KIM by changing I/O subroutines calls. You need a TTL or TTL for change active order TTL (SBNK) subroutines list and you will receive a list of I/O subroutines and their descriptions. This collection of I/O subroutines and it's cheaper than buying a TTL manual!

```

017D 29 0F      HEXOUT AND #50F remove unwanted bits
017F C9 0A      CMP #50A change to ASCII by..
0181 15 02      CLC adding;
0182 30 02      EMI HEX1
0184 69 07      ADC #507 $37 if A to F
0186 69 30      HEX1 ADC #530 $30 if numeric
0188 A0 08      OUTCHT LDY #509 for the eight bits..
018A 84 E2      STY COUNT
018C A0 02      TRY LDY #502 send 3 units
018E 94 E1      STY TRIB starting at 3600 hertz
0190 BE E1      LDX NFULY number of half cycles
0193 45 02      FMA keep the character
0194 2C 47 17 ZON1 BIT CLKRD1 Wait for the previous..
0197 10 FB      BFL ZON1 ..cycle to complete
0199 B9 BF D1      LDA TIMG,Y Get the time to the..
019C 3D 44 17      STA CLK1T ..next pulse ($7E or C3)
019F A5 E1      LDA GANG
01A1 49 50      EOR #530 Flip between 1 and 0
01A3 8D 42 17      STA SRD
01A6 35 E1      STA GANG
01A8 CA E1      DEX have we sent all the cycles?
01A9 D0 E9      BNE ZON1 nope, send another one
01AB 68 02      PLA get back the character
01AC C6 E3      DEC TRIB one less unit to send
01AE F0 05      BEQ SET2 and the last one's here
01B0 30 07      EMI ROUT none left? quit
01B2 4A 02      ISF A Take next bit
01B3 90 DB      BEQ ZON ..and if it's a one..
01B5 A0 00      SETZ LDY #500 switch to 2400 cycles/sec
01B7 F0 D7      BEQ ZON unconditional return
01B9 C6 E2      ROUT DEC COUNT one less bit
01BB D0 CF      ENE TRY any more? go back
01BD 60 02      RTS
; frequency/density controls
01BE 02 02      NFUL .BYTE #02 two pulses; one cycle!
01BF C3 03 7E TIMG .BYTE $C3,$03,$7E
end

```

.....

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.

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 volume 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. Rehake
7656 Broadview Rd. #207
Farm, Ohio 44136

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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

Kim-1 USER NOTES
c/o ERIC C. REHNKE
425 MEADOW LANE
SEVEN HILLS, OHIO
44131

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CLASS