circulation 1060

YEP, YOU GUESSED IT, WE MOVED AGAIN! This time to a "permanent" P.O. Box.

Please note our new address-
KIM-1/6502 USER NOTES
P.O. Box 33077
North Royalton, Ohio 44133

new phone number also! but not yet known.

.....

RENEWAL TIME IS HERE!!!!!!

Your response has been so gratifying that I've decided to go for 6 more!

When extending your subscription, please mark RENEWAL on the envelope and your check.

The new rates for #7 - #12 are: For U.S. & Canada - $5.00 (includes 1st class postage) International - $10.00 (includes air mail postage and envelope).

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ARTICLE CONTRIBUTORS PLEASE NOTE.....To alleviate possible typographical errors, please submit typed originals, single-spaced on white bond with 8 inch wide columns.

.....

CALCULATOR INTERFACE information:
I neglected to mention in iseue #4 that all keystroke data entries(starting at $0300) should be preceded by two (2) CA/CE commands ($B4) to properly initialize the calc. chip. EXAMPLE: suppose you wanted to add 3 and 6---- at address $0300 you'd enter B4 B4 31 12 61 62 FF.

FROM THE FACTORY!

Arnie Karush, Commodore Business Machine Co., (new owners of MOS Technology), has passed along the following interesting bits of info-

-Production is stopped on the KIM-2, and 3 memory boards. These boards will still be available on a special order, cash in advance basis. A new memory board will be introduced around August at a lower cost per byte than KIM 2 or 3.

-The KIM-4 motherboard production is also halted awaiting some design changes and will be re-introduced around August.

-The KIM-5 ROM board and the ROM set (Assembler, Editor, Mathpack, etc.) are being postponed indefinitely.

-COMPUTER STORES-The Commodore Business Machine Company wants more computer stores to stock KIM-1's, so they have announced a better markup margin for dealers at smaller quantities than before. (Check with C.B.M. for more details).

-Around 7500 KIM's are purportedly in the field at this time and Commodore states that they are working on increasing KIM production to meet demand. (I guess they just can't make 'em fast enough!)

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p. 1

A LOW-COST RTTY TERMINAL UNIT (send and receive) was featured in the May '77 issue of 73 Magazine. It utilizes a Digital Group cassette interface board and looks like a very reasonable approach to bridging the gap from single-sideband gear to your computer for not too many bucks. Anyone working on an RTTY program for KIM?

KIM-1/6502 SOFTWARE

Got the latest flyer from 6502 Program Exchange (2920 Moana, Reno, Nev., 89509). They say that their FOCAL (FCL-65) package is now available for KIM, TIM or any 6502 system. The flyer goes on to say that FCL-65 takes a little over 4K of memory, comes on paper tape, and that the complete source listing is available. The EXCHANGE also listed several games and a Scientific Math Package for FCL-65. They want $.50 for their complete program list, and I can recommend them.

ARESCO (314 Second Ave., Haddon Hts., N.J. 08035) lists several programs available for KIM, TIM, etc.. on paper tape or KIM cassette.
The flyer lists FOCAL ($40) a 2.5K resident assembler ($30) and XPL# (a COMPILER) for ($40). According to ARESCO, all program packages include complete source listings as well as object code and user manuals. They want $2.00 for a complete information package.

MICRO-SOFTWARE sent me a card announcing immediate availability of an MOS compatible assembler/editor which resides in just over 2K. They say that it is available on KIM cassette and KIM or TIM paper tape starting at address $2000. The pricing information was a bit confusing so I'd suggest contacting them for more info:
MICRO-SOFTWARE SPECIALISTS, P.O. Box 3292, E.T. Station, Commerce, TEX 75428

.....

To all user's of MICROCHESS, Please note the change of address to MICROCHESS (KIM-1), 27 Firstbrooke Road, Toronto, Ontario, Canada, M4E 2L2. Copies of MICROCHESS are still available at $10.00 from the above address. For paper tape add $1.00, for cassette add $3.00.

WOW!!! LONG LIVE THE 6502!!!!!!!

MORE KIM STUFF!

Gary Mayhak sent along a very neat LED display cover for KIM. It's a red plexiglass piece that fits over and around the displays, makes them easier to read, and dresses up KIM in process.
If you'd like to spiff up your KIM, send Gary an SASE and $2.00 for one (or $3.00 for 2). His address is 1347 Turrett Drive, San Jose, Ca. 95131. I'd suggest sending him a self addressed stamped cassette box so there's no chance of the cover being re-configured in the mail.

.....

"I have interfaced a T.I. 5050M PRINTING CALCULATOR to my KIM-1. The printer is 10 column numeric only but price is $90.00. If any of your subscribers are interested, please have them contact me." David G. Rainey, 103 Roosevelt St., Grants, New Mexico 87020. Send S.A.S.E.

.....

VIDEO DISPLAY MODULE & KIM EXPANSION application notes are available from Riverside Electronics (see ad in this issue). Four of the application notes (MVM-1,2,3,4) concern hardware & software considerations for their MVM-1024 video display module, and one application note (KIM1-1) outlines design ideas for KIM memory & I/O expansion. (This one's particularly useful). If your looking for a memory-mapped video display module, the MVM-1024 deserves a look-see. These 5 application notes (MVM-1,2,3,4 & KIM1-1) are available from Riverside for $1.00 (to cover postage). If you just want application note KIM1-1, it's free. They also have a package of software listings for KIM to drive the MVM-1024, available for $3.00 (KIM -2). These application notes make interesting reading.

.....

KIM-1 software and hardware new product announcements have often been found in ON-LINE, a classified ad newsletter dedicated to the computer hobbyist. It's published every three weeks and subscription rates are 18 issues/$3.75, 36 issues/$7.00 (for N. America). ON-LINE, Dave Beetle, Publisher, 24695 Santa Cruz Hwy., Los Gatos, CAL 95030

KIM-1 PROGRAM: BAGELS
(MASTER MIND/JOTTO)

Jim Butterfield
14 Brooklyn Avenue
Toronto Ontario
M4M 2X5 Canada
September 1976

Background

This game of guessing a "secret word" has appeared in many forms. BAGELS has appeared on many time-sharing systems and pocket calculators, usually as a digit-guessing game. JOTTO follows similar rules, but is concerned with guessing a five-letter (English) word. Recently, a game called MASTER MIND has been commercially marketed; the objective is to guess colours.

Starting the Program.

Load the program, and start at address 200 (AD 0 2 0 0 00).

The Play.

The computer has chosen four letters, all of which are A, B, C, D, E, or F. Letters may be repeated - for example, the computer's 'secret' combination might be CACF or BBBB.

You get ten guesses. Each time you guess, the computer will tell you two things: how many letters are exactly correct (the right letter in the right place); and how many letters are correct, but in the wrong position.

For example, if the computer's secret combination is CEFB, and you guess BAFD, the two numbers will be 1 and 1 (the F matches exactly; the B matches but in the wrong place). These numbers will show on the right hand side of the display; the code you entered will appear on the left.

Make a note of your guesses and the computer's response. With a little mental work, you should be able to break the code exactly in seven or eight words. A correct guess will produce a response of 4 - 0. If you don't guess right in ten moves, the computer will give you the answer.

After a correct guess, or after the computer tells you the answer, it will start a new game (with a new secret code) the instant you touch a new key.

```
                        ;       LINKAGES TO KIM MONITOR
                        ;
                        KEYIN   =$1F40
                        GETKEY  =$1F6A
                        TABLE   =$1FE7
                        PADD    =$1741
                        SBD     =$1742
                        SAD     =$1740
                        ;
                        ;       WORK AREAS
                        ;
0000                    SECRET  *=*+4   computer's secret code
0004                    WINDOW  *=*+6   display window
000A                    INPUT   *=*+4   player"s input area
000E                    EXACT   *=*+1   # of exact matches
000F                    MATCH   *=*+1   # of other matches
0010                    POINTR  *=*+1   digit being input
0011                    MOD     *=*+1   divisor/delay flag
0012                    RND     *=*+6   random number series
0018                    COUNT   *=*+1   number of guesses left
                        ;
                        ;       MAIN PROGRAM STARTS HERE
                        ;
                        *=$200
0200 E6 16      GO      INC RND+4       randomize
0202 20 40 1F           JSR KEYIN       on pushbutton delay
0205 D0 F9              BNE GO
0207 D8                 CLD
0208 A9 0A      NEW     LDA #$0A        ten guesses/game
020A 85 18              STA COUNT       new game starting
020C A9 03              LDA #3          create 4 mystery codes
020E 85 10              STA POINTR
0210 38         RAND    SEC             one plus...
0211 A5 13              LDA RND+1       ...three previous
0213 65 16              ADC RND+4          random numbers,
0215 65 17              ADC RND+5
0217 85 12              STA RND         =new random value
0219 A2 04              LDX #4
021B B5 12      RLP     LDA RND,X       move random numbers over
021D 95 13              STA RND+1,X
021F CA                 DEX
0220 10 F9              BPL RLP
0222 A6 10              LDX POINTR
0224 A0 C0              LDY #$C0        divide by 6
0226 84 11              STY MOD         keeping remainder
0228 A0 06              LDY #6
022A C5 11      SET     CMP MOD
022C 90 02              BCC PASS
022E E5 11              SBC MOD
0230 46 11      PASS    LSR MOD
0232 88                 DEY
0233 D0 F5              BNE SET         continue division
0235 18                 CLC
0236 69 0A              ADC #$0A        random value A to F
0238 95 00              STA SECRET,X
023A C6 10              DEC POINTR
023C 10 D2              BPL RAND
023E C6 18      GUESS   DEC COUNT       new guess starts here
0240 30 7A              BMI FINISH      ten guesses?
0242 A9 00              LDA #0
0244 A2 0C              LDX #$0C        clear from WINDOW...
0246 95 04      WIPE    STA WINDOW,X       ...to POINTR
0248 CA                 DEX
0249 10 FB              BPL WIPE
                        ;
                        ;       WAIT FOR KEY TO BE DEPRESSED
                        ;
024B 20 CE 02   WAIT    JSR SHOW
024E F0 FB              BEQ WAIT
0250 20 CE 02           JSR SHOW
0253 F0 F6              BEQ WAIT        debounce key
0255 A5 08              LDA WINDOW+4       new guess?
0257 F0 08              BEQ RESUME         no, input digit
0259 29 60              AND #$60
025B 49 60              EOR #$60        previous game finished?
025D F0 A9              BEQ NEW         ...yes, new game;
025F D0 DD              BNE GUESS       ...no, next guess
0261 20 6A 1F   RESUME  JSR GETKEY
0264 C9 10              CMP #$10        guess must be in
0266 B0 E3              BCS WAIT          range A to F
0268 C9 0A              CMP #$0A
026A 90 DF              BCC WAIT
026C A8                 TAY
026D A6 10              LDX POINTR      zero to start
026F E6 10              INC POINTR
0271 B9 E7 1F           LDA TABLE,Y     segment pattern
0274 95 04              STA WINDOW,X
0276 98                 TYA
0277 D5 00              CMP SECRET,X    exact match?
0279 D0 03              BNE NOTEX
```

BAGELS

```
027B E6 0E          INC EXACT
027D 8A             TXA         destroy input
027E 95 0A    NOTEX STA INPUT,X
0280 A5 07          LDA WINDOW+3  has fourth digit arrived?
0282 F0 31          BEQ BUTT      ...no
0284 A0 03          LDY #3        ...yes, calculate matches
0286 B9 0A 00 STEP  LDA INPUT,Y   for each digit:
0289 29 18          AND #$18      ..has it already been
028B F0 12          BEQ ON          matched?
028D B9 00 00       LDA SECRET,Y
0290 A2 03          LDX #3        if not, test
0292 D5 0A    LOOK  CMP INPUT,X   ...against input
0294 F0 05          BEQ GOT
0296 CA             DEX
0297 10 F9          BPL LOOK
0299 30 04          BMI ON
029B E6 0F    GOT   INC MATCH  increment counter
029D 16 0A          ASL INPUT,X   and destroy input
029F 88       ON    DEY
02A0 10 E4          BPL STEP
02A2 A2 01          LDX #1        display counts
02A4 B4 0E    TRANS LDY EXACT,X
02A6 B9 E7 1F       LDA TABLE,Y
02A9 95 08          STA WINDOW+4,X
02AB CA             DEX
02AC 10 F6          BPL TRANS
02AE 20 CE 02 DELAY JSR SHOW      long pause for debounce
02B1 E6 0F          INC MATCH
02B3 D0 F9          BNE DELAY
02B5 20 CE 02 BUTT  JSR SHOW      wait for key release
02B8 D0 FB          BNE BUTT
02BA F0 9F          BEQ WAIT
                    ;
                    ;     TEN GUESSES MADE - SHOW ANSWER
                    ;
02BC A2 03    FINISH LDX #3
02BE B4 00    FIN2  LDY SECRET,X
02C0 B9 E7 1F       LDA TABLE,Y
02C3 95 04          STA WINDOW,X
02C5 CA             DEX
02C6 10 F6          BPL FIN2
02C8 A9 E3          LDA #$e3    'square' flag
02CA 85 08          STA WINDOW+4
02CC D0 E0          BNE DELAY   unconditional jump


                    ;     SUBROUTINE TO DISPLAY
                    ;     AND TEST KEYBOARD
                    ;
02CE A0 13    SHOW  LDY #$13
02D0 A2 05          LDX #5
02D2 A9 7F          LDA #$7F
02D4 8D 41 17       STA PADD
02D7 B5 04    LITE  LDA WINDOW,X
02D9 8D 40 17       STA SAD
02DC 8C 42 17       STY SBD
02DF E6 11    POZ   INC MOD     pause loop
02E1 D0 FC          BNE POZ
02E3 88             DEY
02E4 88             DEY
02E5 CA             DEX
02E6 10 EF          BPL LITE
02E8 20 40 1F       JSR KEYIN
02EB 60             RTS
                    END
```

BAGELS

Program notes:

1. Program enforces a pause of about 4 seconds after displaying counts or answer. This guards against display being 'missed' due to bounce, hasty keying.
2. After count displayed, or at end of game(s), user can blank display, if desired, by pressing GO or any numeric key. Game operation is not affected, but user may feel it 'separates' games better.
3. When a digit from the user's guess is matched, it is destroyed so that it will not be matched again. There are two significantly different types of 'destruction', however (at 27D and 29D); the test at label STEP is sensitive to which one is used.

Here's an excellent example of using KIM to check itself... from Lewis Edwards Jr.
1451 Hamilton Ave
Trenton, NJ 08629

"PLL SET" PROGRAM

Having trouble loading from tape, especially on "SUPERTAPE"? Suspect the PLL adjustment might be off, but were afraid to adjust it, or didn't have a meter or scope handy? Use this program and KIM's built in hardware to make the adjustment. Hold the tip of the plug you plug into the tape recorder's earphone jack to applications pin #14 and adjust the control for 0's or combinations of 7's and L's on the display. "L" means the PLL TEST line is low and "7" means it's high. The program generates a signal that alternates slightly below and slightly above the one generated by KIM at 1A6B. The regular tape input channel is utilized and decoded to control the display.

```
1780 A9 07  BEGN LDA #07          Set the input
1782 8D 42 17    STA SBD
1785 A9 01       LDA #01          and output ports
1787 8D 01 17    STA PAO
178A 85 E1       STA E1           Initialize the toggle
178C A9 7F       LDA #7F
178E 8D 41 17    STA PADD         Open display channels
1791 A2 09  MORE LDX #09          Start with the first
1793 A0 07       LDY #07          digit  Light top & right
1795 2C 42-17    BIT SBD          if PLL output
1798 30 02       BMI SEGS         is high
179A A0 38       LDY #38          otherwise left & bottom
179C 8C 40 17 SEGS  STY SAD       Turn on the segments
179F 8E 42 17       STX SBD       and the digit
17A2 2C 47 17 DELA  BIT CLKRDI    Half cycle done?
17A5 10 FB          BPL DELA      No, wait for time up
17A7 E6 E2          INC E2        Count the cycles
17A9 30 04          BMI LOTO      128 ½ cycles, send low tone
17AB A9 91     HITO LDA #91       128 ½ cycles, send hi tone
17AD D0 03          BNE CLK1
17AF A9 93     LOTO LDA #93
17B1 EA             NOP           Equalize the branches
17B2 8D 44 17 CLK1  STA CLK1T     Set the clock
17B5 A9 01          LDA #01
17B7 45 E1          EOR E1        Flip the toggle register
17B9 85 E1          STA E1
17BB 8D 00 17       STA PAO       Toggle the output port
17BE E8             INX
17BF E8             INX           Next display digit
17C0 E0 15          CPX #15       Last one?
17C2 D0 CF          BNE NEXT      No, do next
17C4 F0 CB          BEQ MORE      Yes, do more
```

Tom Wear
380 Belaire Ct
Punta Gorda, FL
33950

ADDING MEMORY TO KIM

Would you like to add 4K starting at location Ø4ØØ without address line drivers and without changing U4 to 74LS145? Maybe you can, or if you already have—Pass the word.

Prompted by a query from Wm. Dial, I pulled the drivers to my memory board and jumpered the lines at the socket. The system was then cycled continuously on a memory test program for two hours without an error. The load on KIM was 32 2102's from three different sources, and a TVT which added one TTL 'LS' input load to each address line.

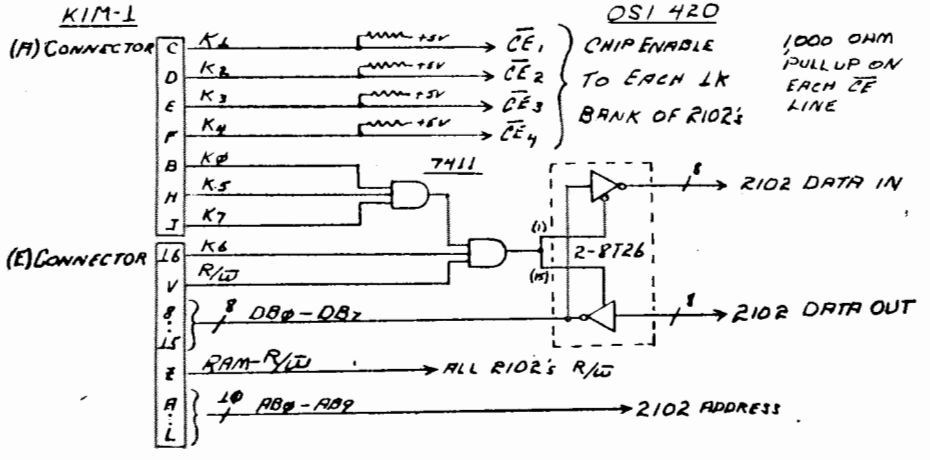
The discussion and drawings that follow will describe:

1. BARE BONES - The memory suggested by the test conducted.
2. Ø4ØØ & 2ØØØ PLUS - My current 4K and its decoding.
3. ON THE BACKPLANE - Full decoding for KIM.
4. TEST PROGRAM - My effort towards a complete memory test.

The OSI 420 Memory Board (but none of the OSI decode method) and the OSI 480 Backplane are used. However, what is shown is applicable to other available PC boards. Some of this will seem a short cut to the complexities of KIM expansion in comparision to OSI or MOS Technology approach (and it is), but there is NO short cut to good sockets in every position and a well managed power supply.

1. BARE BONES

Success or non-success may depend greatly on the individual differences of the 6502 on each KIM board, the 2102's used, and most particularly, on electrical noise environment (do not skimp on at least .01 uf and preferably .1 uf disk capicitors along that 5-volt power distribution bus). In addition to 2102's, two 8T26 data buffers and a 7411 for control of the 8T26 are used. Pad D of the 420 board is a likely place for the 7411.

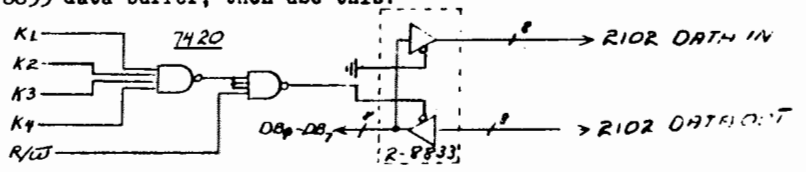


Operation: The 7411 AND gates control the 8T26 data buffers such that if any of KØ, K5, K6, or K7 are low, the 8T26 puts no signal on the data lines to KIM. When KØ, K5, K6, K7 are all high the 8T26 direction is controlled by R/W from KIM to read or write to memory selected by any of K1, K2, K3, or K4.

The check out should proceed initially with only 1K of memory installed to aid distinguishing potential inadequate drive from KIM, from other irregularities. It seems extremely unlikely that any KIM would not drive at least 1K of new memory.

Once peeking and poking succeeds via the KIM keyboard, a long cycling run with a memory test program is handy to search for those rare events or to gain confidence that there are none.

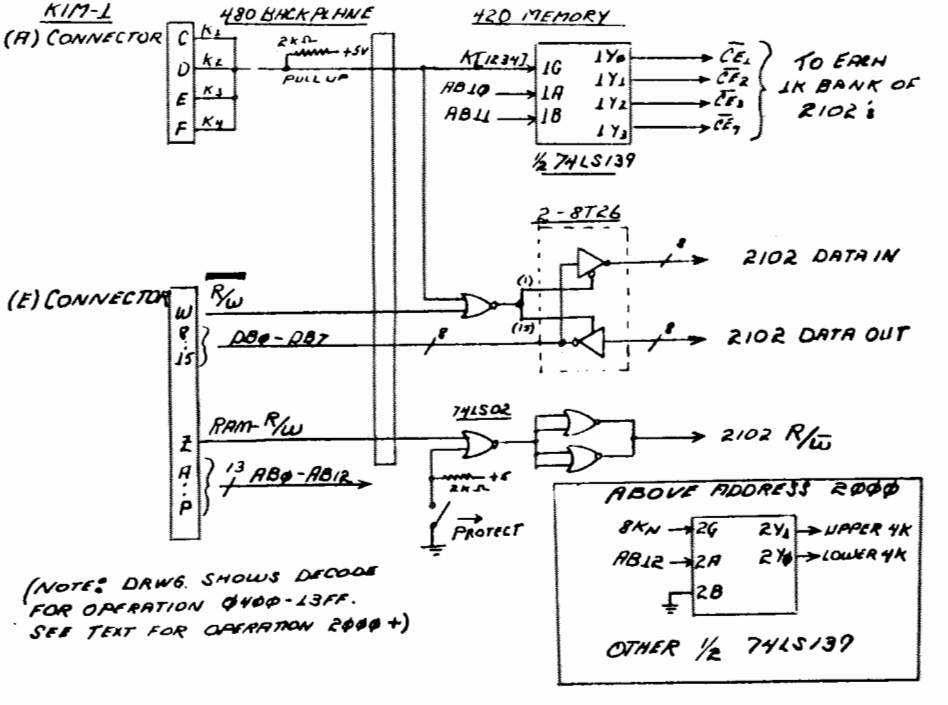
If you have selected some other memory board for you addition, like SWTP which uses the 8833 data buffer, then use this:



If for whatever reason address drivers are to be added, I would suggest that the installation effort be part of your planning for future expansion and not on the memory board. However, OSI in their Application Note #5 did describe a scheme of installing two 7417's as drivers on the 420 board.

2. Ø4ØØ & 2ØØØ PLUS

For operation above address 2ØØØ obviously what has been shown so far will not work. Further decoding of AB15 thru AB10 is needed plus a solution to KIM U4 74145 loading on AB12, AB11 and AB1Ø. I chose to install a 74LS145. Pulling a DIP with proper tools is a simple operation; without can be a nightmare. If you feel shy may I suggest a visit to the friendly TV repairman--he should have an innate curiosity about microprocessors and their application to TV games.

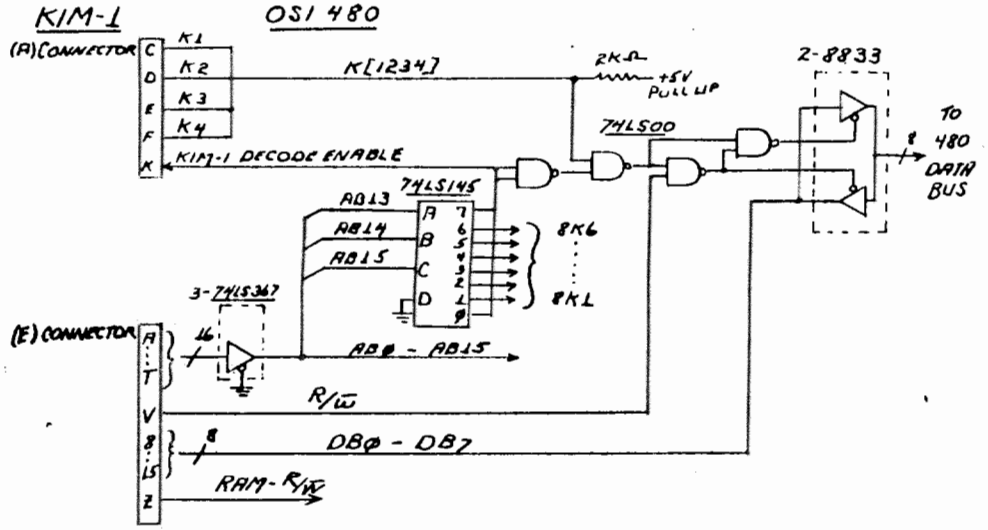


The NOR gate was necessary for the control of the 8T26. Note the negated (inverse) R/W. Also the NOR gates in the RAM-R/W line are not essential but were free. It is not good practice to parallel normal TTL gates, however, where they are on the same substrate, generally, no problems arise. Wired as shown and without the 480 Backplane, direct connection to KIM-1 would provide Ø4ØØ to 13FF operation.

With expansion decoding per KIM Manual, page 74, 8K1 could replace K(1234) at 1G of the 74LS139 and the memory would operate 2000-2FFF but then repeat 3000-3FFF. If for some reason two such 4K memories are to be operated in the same 8K block, then the other half of the 74LS139 can be used to resolve the repeat. Input to 2G would identify the block and outputs 2Y0 or 2Y1 to 1G would select upper or lower 4K. If you are adding 8K of 2102's on one board for operation above 2000 then the 74LS139 should be replaced with 74LS138. My planning suggests leaving this 4K design at 0400 to 13FF, and waiting for some of those new 4, 8, or 16K-bit chips to reach more palatable pricing.

3. ON THE BACKPLANE

Decoding AB15, AB14 and AB13 as described in the KIM Manual is about as good as any considering the restrictions imposed by the KIM ROM address locations. The approach shown here commits the 8K7 space to the interrupt vectors only. (I will try to skimp by on 56K) The data buffer is needed only for isolation in DMA operations or maybe for the full 56K.



The 8833 data buffer was selected to preclude inverting data to TVT which has its memory accessible. On the OSI 480 Backplane, pads in area B13 to B25 will accommodate the 74LS145 and 74LS00. In the area B1 to B13 the traces were pealed, stick-on pads placed and drilled for installation of the two 8833's. The Area near B25 was designed for 7417's as drivers and therefore only 14-pin pads. I prefered tri-state so drilled extra holes and installed 74LS367's.

OSI - Ohio Scientific Instruments, 11679 Hayden St., Hiram, Ohio 44234

SWTP - Southwest Technical Products Corp., Box 32040, San Antonio, TX 78284

4. TEST PROGRAM

This program takes about five seconds per 1K of memory but I believe it is thorough. Each location must hold contents while all other under test are changed. All possible combinations of contents are used. The program is self-cycling and at the end of each cycle the display flashes the total cycles accumulated. An error causes a stop and the display will show the address and contents of the error location. The programing has been selected for speed and any improvements are welcomed. Load 0000 with BEGIN ADH and 0001 with END ADH, then enter program at 0002.

```
00 XX          .BEGIN
01 XX          .END
02 A4 00    ENTRY LDY Z BEGIN
04 84 17          STY Z BASE1
06 84 23          STY Z BASE2
08 84 28          STY Z BASE3
0A A4 01          LDY Z END
0C A9 00          LDA # 00
0E 85 F9          STA Z INH
10 85 FA          STA Z POINTL
12 85 FB          STA Z POINTH
14 AA             TAX

15 9D 00 XX  (1)  STA BASE1,X   ;clear
18 E8             INX
19 D0 FA          BNE (1)
1B E6 17          INC Z BASE1
1D C4 17  CH 17   CPY Z BASE1
1F B0 F4          BCS (1)

21 DD 00 XX  (2)  CMP BASE2,X   ;check
24 D0 2E          BNE ERROR
26 FE 00 XX       INC BASE3,X
29 E8             INX
2A D0 F5          BNE (2)

2C E6 23          INC Z BASE2
2E E6 28          INC Z BASE3
30 C4 28          CPY Z BASE3
32 B0 ED  B3 F1   BCS (2)

34 69 01          ADC # 01      C=0
36 D0 12          BNE (4)
38 E6 F9          INC Z INH
3A A9 FF          LDA # FF
3C 8D 07 17       STA TMRT
3F 20 1F 1F  (3)  JSR SCAND     ;displ
42 AD 07 17       LDA TMRT
45 10 F8          BPL (3)

47 A9 00          LDA # 00
49 AA             TAX
4A A4 00    (4)   LDY Z BEGIN
4C 84 23          STY Z BASE2
4E 84 28          STY Z BASE3
50 A4 01          LDY Z END
52 D0 CD          BNE (2)       always

54 A5 23    ERROR LDA Z BASE2
56 85 FB          STA Z POINTH
58 86 FA          STX Z POINTL
5A 4C 4F 1C       JMP START
```

Note that the program begins and ends on a page boundry. For example, set BEGIN to 02 and END to 03, and the test will be conducted from 0200 to 03FF.

Want to enhance TINY BASIC? Here's a way..... from Don Box, 1250 White Oak Dr., Cookeville, Tenn. 38501

A few quick words to let you know I have Tom Pittman's TINY BASIC running on my KIM-1 & 2. I am using an old model 15 (5-level) teletype and had to do software code conversion (will furnish the routines if anybody wants; send S.A.S.E.).

TINY BASIC has a USR function to call user written sub-routines. Included are two short routines to allow the simulation of a subscripted variable.

STORE SUBSCRIPTED VARIABLE

```
STORE  TYA       ; Y on entry has
                   subscript
       ASL-A     ; double because
                   saving 2
       TAY       ; bytes
       LDA  B4   ; pick up first
                   byte (LSD)
       STA  ARRAY,Y ; store abs,Y
       INY       ; count
       LDA  B5   ; get second byte
                   (MSD)
       STA  ARRAY,Y ; store it
       RTS       ; return
```

RECALL SUBSCRIPTED VARIABLE

```
RECALL TYA
       ASL-A
       TAY
       LDA  ARRAY,Y
       PHA
       INY
       LDA  ARRAY,Y
       TAY             ;return MSD
                        in Y
       PLA             ;LSD in A
       RTS             ;back to TINY
```

location B4, B5 is TINY BASIC's variable Z

ARRAY is location where data can be stored (in my case 0200)

```
700  LET I=1                          note:  740 & 760 are dummy; LET's to
710  PRINT "VAR1,VAR2"                       force a call to the store
720  INPUT A,B                               routine.
730  LET Z=A
740  LET Z=USR(STORE,I*2-2)           max no. = number of pairs of
750  LET Z=B                                    values to be stored
760  LET Z=USR(STORE,I*2-1)
770  LET I=I+1
780  IF  I<=max no. GO TO 720
790  END
      .
      .
      .
SUBROUTINE
  TO SEARCH TABLE FOR T=VAR1 AND IF FOUND RETURN VAR2 in J
      .
      .
      .
900  LET J=1
910  IF T<=USR(RECALL,J*2-2) GO TO 960
920  LET J=J+1
930 IF J<=max no. GO TO 910              note:  value is returned as
940  REM ERROR RETURN HERE                      the value of the USR
950  RETURN                                     function
960  LET J=USR(RECALL,J*2-1)
970  RETURN
      .
      .
      .
```

where: STORE = decimal equivalent of address where the store routine is located

RECALL = decimal equivalent of address where the recall routine is located.

TINY BASIC programs can easily be stored and loaded from cassette tape. Location 0020, 0021 contains the starting address and 0024, 0025 will have the ending address. Set up for normal tape dump (using KIM's dump @ 1800) and write down the contents of 0024 and 0025. To reload, use KIM's tape loader (@ 1873), then reset 0024 and 0025. Warm start TINY BASIC and you're off and running.

LOCAL USER GROUPS getting started-

Somerville, N.J. area-
Frank Raymond
574 Auten Rd. #4C
Somerville, N.J. 08876 Phone 215-8743644

Philadelphia, Pa. area-
Ron Kushnier
3108 Addison Ct.
Cornwell Hts., Pa. 19020 Phone 215-757-9057

Phoenix Arizona area-
Karl Lunt
1561 W. Peoria Ave.
Phoenix, Ariz. 85029

Keep the rest of us up to date on your local KIM group activities!

.....

p.6

Here are some more real-time clock subroutines to add to C. H. Parsons program in the last issue. Simply replace the no-ops starting at $03DB with the proper subroutine calls. By the way, to start the clock, initialize the correct time in the zero page time registers and start the program at $03C0. If the clock is running, start at $03C9. By now you have an idea of the potential of an open-ended real time clock in your machine. Some further work by Parsons resulted in a temperature sensor interface that ties into the clock routines. These will be presented in future issues. By the way, if ¼ sec. interupts start playing havoc with a fully expanded real time clock, and you dont want to install a clock chip, simply use a 60 HZ. power line conditioning circuit and a divide-by-60 counter arrangement to give you 1 sec. interupts.

All routines were written by C. H. Parsons

Two Tone Sound to Indicate Hours

Line	Code	Label	Instruction	Comment
0320	A582	BEEP	LDA MIN	On The Hour?
0322	D029		BNE END	If Not Return
0324	A581		LDA SEC	Execute Until SEC = HR
0326	38		SEC	
0327	E583		SBC HR	
0329	1024		BPL END	
032B	A580	AGAIN	LDA QSEC	First ¼ Second?
032D	D006		BNE ONE	
032F	A91E		LDA #$1E	Set High Note
0331	8570		STA NOTE	
0333	D00A		BNE GO	Sound Note For ¼ Second
0335	A901	ONE	LDA #$01	Second ¼ Second?
0337	C580		CMP QSEC	
0339	D014		BNE END	
033B	A928		LDA #$28	Set Low Note
033D	8570		STA NOTE	
033F	A901	GO	LDA #$01	Set I/O Ports
0341	8D0317		STA PBDD	
0344	EE0217		INC PBD	Toggle Speaker
0347	A570		LDA NOTE	
0349	AA		TAX	Set Delay
034A	CA		DEX	
034B	10FD		BPL	
034D	30DC		BMI AGAIN	Keep Sounding
034F	60	END	RTN	

Additional Zero Page Locations

0070	NOTE	Sets Frequency of Note

This is a subroutine which when added to the clock display routine will use the real time clock data to produce one sound per hour on the hour. The output is a speaker circuit as shown on Pg. 57 of the KIM-1 Manual. It is hooked to PB0 rather than PA0. The specific notes can be changed by altering 0330 and 033C.

Consecutive Minute Timer

Line	Code	Label	Instruction	Comment
0200	A580	MTIME	LDA QSEC	Test QSEC
0202	F041		BEQ RESET	If Zero Reset State
0204	C901		CMP #$01	
0206	F048		BEQ SOUND	If One Sound Signal
0208	C902		CMP #$02	
020A	F00F		BEQ TIME	If Two Look For Delays
020C	C903		CMP #$03	
020E	D00A		BNE OUT1	If Three Initialize
0210	A573	IN	LDA STATE	
0212	D006		BNE OUT1	If State is Zero
0214	E673		INC STATE	Put State=1
0216	A581		LDA SEC	Put SEC in RSEC
0218	8572		STA RSEC	For Reference
021A	60	OUT1	RTN	
021B	A573	TIME	LDA STATE	Look For Delays
021D	C901		CMP #$01	If State=1 And
021F	D0F9		BNE OUT1	
0221	A581		LDA SEC	Second= RSEC
0223	C572		CMP RSEC	
0225	D0F3		BNE OUT1	
0227	A900		LDA #$00	Clear X
0229	AA		TAX	
022A	E673		INC STATE	Put State=2
022C	B574	AGAIN	LDA T1,X	Look For Nonzero'S
022E	F00D		BEQ NEXT	In 0074 Through 007B
0230	A905		LDA #$05	Put Number of Sounds=5
0232	8571		STA NSOUND	
0234	D674		DEC T1,X	Subtract One From Delay
0236	D004		BNE OUT2	When Delay Goes to Zero
0238	E673		INC STATE	Put State=3
023A	867E		STX EVENT	Put Tx in Event Counter
023C	60	OUT2	RTN	
023D	E8	NEXT	INX	Look at Next Tx
023E	E008		CPX #$08	Do Eight Times
0240	D0EA		BNE AGAIN	
0242	A900		LDA #$00	Clear State
0244	8573		STA STATE	
0246	60	OUT3	RTN	
0247	A573	RESET	LDA STATE	Put State=1 if it is 2
0249	C902		CMP #$02	
024B	D002		BNE OUT4	
024D	C673		DEC STATE	
024F	60	OUT4	RTN	
0250	A573	SOUND	LDA STATE	Sound if State=3
0252	C903		CMP #$03	
0254	D0F9		BNE OUT4	
0256	A901		LDA #$01	Set I/O Ports
0258	8D0317		STA PBDD	
025B	A580	KEEPS	LDA QSEC	QSEC Still=1?
025D	C901		CMP #$01	
025F	D00B		BNE DEC	If Not Subtract One Sound
0261	EE0217		INC PBD	Toggle Speaker
0264	A918		LDA #$18	Set Note
0266	A8		TAY	
0267	88	NOTE	DEY	Decrement Delay
0268	10FD		BPL NOTE	
026A	30EF		BMI KEEPS	Keep Sounding For One
026C	C671	DEC	DEC NSOUND	Quarter Second
026E	D004		BNE OUT5	
0270	A901		LDA #$01	Put 1 in State to Look
0272	8573		STA STATE	Again When Finished Sounding
0274	60	OUT5	RTN	

Additional Zero Page Locations

0071	NSOUND	Sets Number of Notes
0072	RSEC	Store Starting Second
0073	STATE	State Counter
0074	T1	First Time Delay
0075	T2	Second Time Delay
0076	T3	Third Time Delay
0077	T4	Fourth Time Delay
0078	T5	Fifth Time Delay
0079	T6	Sixth Time Delay
007A	T7	Seventh Time Delay
007B	T8	Eighth Time Delay

This is a subroutine which when added to the clock display routine will use the real time clock data to sound a signal five times after consecutive minute delays which are entered in locations 0074 through 007B. The minute delays are in HEX which will allow a maximum of a little over four hours. Locations 0073 through 007B should be cleared when starting up. Location 0073 should be cleared each time the delays are entered. The program clears the delays when they are executed. At each sounding the number of the delay is entered in location 007E for future reference. (0074=00, 0075=01, ... 007B=07).

Cass H. Lewart
Holmdel, N.J. 07733

Various Tidbits About How the KIM-1 Keyboard and Display Operate

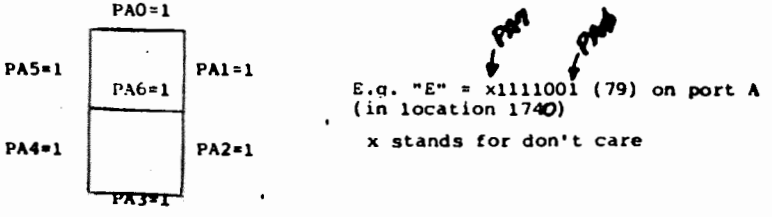
Most of the game programs written for KIM-1 use the keyboard and the display in real time interactive mode under program control rather than under control of the operating system located on the ROM. To be able to write such programs one has to understand the operation of the display and the keyboard. Referring to Fig. 3.5 on page 28 of the User's Manual one can see that four leads of the peripheral I/O bus B: PB1 - PB4 and 7 leads of the peripheral bus A: PA0 - PA6 are connected either directly or through the decoding IC 74145 to the keyboard and the 6 display digits. The peripheral buses A and B are controlled by memory locations 1740 (data on Port A), 1741 (data direction on A), 1742 (data on B) and 1743 (data direction on B). This similar to memory locations 1700 - 1703 which are controlling the non-commited application buses A and B which are the standard I/O ports to the KIM-1.

Display

The KIM-1 display consists of 6 common-anode LED digits with the corresponding cathode segments connected in parallel between all six digits. The segments are controlled by PA0 - PA6 and the digits by PB1 - PB4 decoded by the 74145 IC. For a particular segment to light up both the corresponding segment cathode and the digit anode have to be activated by the appropriate outputs on the peripheral buses A and B. The following table shows the state of PB1 - PB4 required to activate each of the 6 digits:

Digit on (left to right):	1	2	3	4	5	6
PB4	0	0	0	0	1	1
PB3	1	1	1	1	0	0
PB2	0	0	1	1	0	0
PB1	0	1	0	1	0	1
Word to be stored in loc. 1742 e.g.	08	0A	0C	0E	10	12

The following figure shows the bit pattern on the port A to activate the seven LED segments:



The segments and digits have to be activated in close succession. The bit patterns on Port B are such that the bit pattern for the next digit to the right can be obtained by adding 2 to the bit pattern for the previous digit. There can only be one digit activated at any one time due to the logic of the IC 74145 decoder. To display successive digits one would increment port B (loc. 1742) by 2 to scan from left to right or decrement by 2 to scan from right to left. The digit and the corresponding segment commands should be within a few consecutive program statements. The scan should "rest" for about 1 ms at each digit; if the scan rate is too fast then the whole display will glow including unwanted segments.

Keyboard

The PB1 - PB4 ports are also used for sending pulses to ports PA0 - PA6 via the keyboard and thus sense the key status. To set PB1 - PB4 to output and PA0 - PA6 to input you have to write 00011110 = 1E to location 1743 and 10000000 = 80 to location 1741 (addresses for data direction on ports A and B). To activate keys 0 through 6 the bit pattern on PB4 - PB1 has to be 0000, for keys 7 through D - 0001, for keys E,F,DA,AD, +,GO and PC the bit pattern has to be 0010. The remaining keys RS and ST are hardwired to the microprocessor. With no keys depressed input on port A (loc. 1740) will consist of all 1's or FF (bit 7 is automatically set to 1). Depressing a key will insert a 0 in the bit pattern. Writing xxx0010x, for example 04, on port B and depressing the key GO will result in word FD being received on port A. Of course the simplest way to check for key depression is to call ROM routines AK or GETKEY. The following table shows what these 2 routines put into the accumulator. Note that both of them destroy the contents of X and Y registers.

Key	GETKEY (decimal flag set)	GETKEY (dec. flag cleared)	AK
0	0	0	40
1	1	1	20
2	2	2	10
3	3	3	08
4	4	4	04
5	5	5	02
6	6	6	01
7	7	7	40
8	8	8	20
9	9	9	10
A	10	A	08
B	11	B	04
C	12	C	02
D	13	D	01
E	14	E	40
F	15	F	20
AD	16	10	10
DA	17	11	08
+	18	12	04
GO	19	13	02
PC	20	14	01
No Key	15	15	00

HERE'S SOME INTERESTING ITEMS FROM MIKE FIRTH:

Please mention the fact that my large type 6502 Instruction Summary Summary is missing the command B6 from the last column (LDX, z page,y),as you pointed out. If anyone else wants one, I had so many requests I had them printed on green paper to make them easier to find on the desk. Send a Self-Addressed, Stamped Envelope (#10 is best), plus a 9¢ stamp loose for one copy, or a 13¢ stamp for two copies to: Mike Firth/6500, 104 N.St.Mary, Dallas,TX 75214.

I would like to mention MIKIM, as I have labeled the system I am working on. Because I expect to be expanding my system for some time, and because I expect to develop a number of different jobs for my system, including control of things around the house, games,and data management and editing, I want to define a system which will let me put routines in memory at will (i.e. they must be relocatable). Perhaps others will find my thinking useful.

Because I expect to use some large arrays, many of my routines will use indexing and because of not wanting to move the data unnecessarily, I am going to pass the address of the data to the subroutine. However, if I ever want to put my programs in ROM, I am going to have to put this address someplace besides inside the program to index on it. Because of the variety of choices, using the Zero Page (zpage, from now on) is the logical place.

So, I need to partition up zpage a bit. Because I expect to keep KIM for some time, I will leave its reserved space at the top and reserve E0 on up for some of my system items (more on those below). Somewhat arbitrarily, I am going to define 00-0F as absolute scratch pad=Any program can use the area, no program can assume anything saved in the area. 10 on up to DF will be used for two purposes.and the limits of the two areas will be marked by pointers kept in MIKIM system area. 10 up to the lower pointer will be reservable scratch area in which a routine may keep data for its own use or to pass to another routine. DF down to the upper pointer will be for storing data addresses for various kinds of indirect addressing.

Besides these two areas, three others are available: The stack can be considered a Reservable area, if push/pull's are matched; page 1 below the pointer can be considered absolute scratch pad if the pointer location is checked, and the RAM in the 6530's can be used. I expect to limit use of the latter only to routines that also use the 6530 I/O and timers.

No matter what I call a routine, I will get to it with a JSR and use an RTS to return. The difference will only depend on how I get the variables to the routine. So, here is my thinking so far:

FUNCTION: Variables are passed in the registers, usually one variable and that in the accumulator. Includes things like random, sine, time, hashing.
ZFUNC: In the accumulator is a zpage address of the start of the data, with the number of items in X when needed. If a specific order is required,the calling program must provide it. Might include averaging, maximum, minimum, multiply. Answer is returned as a zpage address in A, with the number of items in X.
ZSUB: A contains the zpage address of the start of the addresses of the data, X contains the number of addresses. All addresses, even Z page, stored as two bytes. Changed data is stored at addresses assigned to variables. (IND,X)
SUBROUTINE: A contains the address of the Subroutine Stack Pointer, a two byte address in zpage. The SSP indicates where in memory to find the beginning of the addresses containing the data. For example (and this can get messy, but it is the most flexible):

A might contain E0
and E0 and E1 might contain 25 23
then location 2325 would have an address for the first variable used by the Subroutine. This might be the start of an array.
So, if 2325 is moved to zpage, I can index on it to access the whole array without including it in my program,[(IND),Y], without knowing where it is in memory, without knowing where the pointer is in memory.

A quiet examination will reveal that many Subroutines could be Zsubs with housekeeping to get the addresses into zpage and that Zsubs could be Zfuncs with housekeeping to get data into zpage, but in either case, with large blocks of data, like I expect to use, it would be possible to outgrow the smaller routines rather quickly.

I may have more later, but now, having thought out some of the possibilities, I am going to write some of the simpler display and game programs and see if what I hope can happen will happen.

Good Idea! →

My standard connections for peripherals (which I would love to see put in the corner of every card of any system) are shown at the right. It is a 16 pin DIP viewed from the plugin side.

	Pins		
Ground	1	16	+5 (may be other if
Data Bit0	2	15	B1 labled)
B2	3	14	B3
B4	4	13	B5
B6	5	12	B7
Data status	6	11	R/W when needed
Clock or 16x rate	7	10	2nd clock,if needed
Int or optional	8	9	2nd volts or optional

In many applications, the last pair or pairs of pins are not needed. My keyboard has this standard plug and goes very nicely to the sockets wired to A port. (B7 is odd parity) If I am going to do interput drive, either on a socket or (more pleasing) on the keyboard, I am going to have to connect the available data stable strobe (now on pin 6) to bit7 (for port use) or pin 8 and create an interupt buss.

My address standard socket, simply alternates lines back and forth across the socket, LSB first. This permits use of an 8,10 or 12 pin plug to take those lines if that is all that is needed.

	Pins	
Bit0	1	16 B1
Bit2	2	15 B3
...and so forth.		

ITEM
If you bought your KIM early and have the early manual, you may not have the note on page H-7 of the later ones. There it says that if you want to use the interupt mode of the timer, you have to run a wire from pin 15 of the application connector to either pin 4 (IRQ) or pin 6 (NMI) of the expansion connector and PB7 should be programmed for input (normal after RESET).

I would like to ask for help on one problem. Sometimes when I am plugging in to my setup, or when I touch the aluminum plate that is at ground, the display suddenly switches to one very bright digit. It may then display a location after a few moments, usually in the middle of the tape write routine. My first thought was a pwoer loss, but memory remains intact (I have a clock program that sometimes gets interupted but resarts and runs fine.

If you live in the Chicago area and want to help me, I would really appreciate it. I am running a panel on the use of Small and Timesharing Comuters in Theatre at the American Theatre Association Convention, August 16. I would like to show off some really low cost working systems, but I have no budget. I will be hauling as much of my system as I can. If you have a KIM rigged to a teletype, especially with an editing routine that might show how the system could read info from a cassette and type labels AND you could help me get it into the Palmer House in the middle of a weekday and then out again, please let me know. Any other intermediate help would be useful. Mike Firth, 104 N. St. Mary, Dallas, TX 75214.

USE OF KIM-1 KEYBOARD WITH USER PROGRAMS

Ralph W. Burhans
161 Grosvenor St.
Athens, OH 45701

We have found a simple way of using the KIM-1 keyboard monitor software to load hex numbers into memory while operating some user loop program continuously. The KIM GETKEY subroutine located at 1F6A recognizes hex numbers from $0 to $15. A $15 is loaded into the accumulator if no key is pressed, and a key operated loads the hex numbers according to the table:

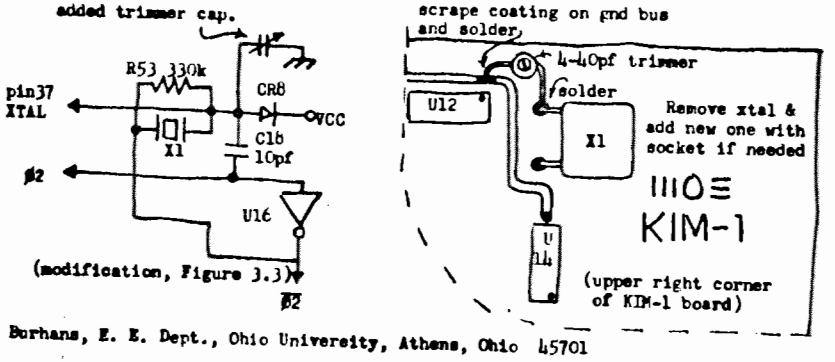
KEY OPERATED	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	AD	DA	+	GO	PC
HEX NUMBER	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12	13	14

A simple example subroutine for page zero use might involve:

	ADDRESS 001F	DATA XX	LABEL	COMMENT Location of data desired
START	0020	20	JSR	to KIM GETKEY at 1F6A
	0021	6A		
	0022	1F		
	0023	C9	CMP	compare immediate with 15
	0024	15		
	0025	F0	BEQ	branch if 1, otherwise store key
	0026	02		
	0027	85	STA	in memory location 1F
	0028	1F		
	0029	4C	JMP	back to START
	002A	20		
	002B	00		

One use we have made is to locate a program like this as a return loop after servicing some interrupt request involving perhaps several pages. When not servicing the interrupt, the program keeps scanning through this loop looking for a new number to enter into some memory location which is used in the interrupt routine or main user program. When an interrupt comes along the program jumps to the desired routine, services the interrupt which may include some new command entered just previously from the keyboard, but then jumps back to this loop after servicing the interrupt with an RTI. A somewhat more complex routine could be used to enter a larger batch number of several hex digits, and even to keep track of several different memory locations using the 5th bit with the AD DA + GO or PC keys. The above example has one peculiarity in that when the routine is first initialized at START, an automatic hex 13 is entered because the GO key is this number. However the user can immediately enter some other number as required in the interrupt service program originated by the user. For more general use with any memory location an absolute STA of 8D should be used which adds one more cycle before jumping back to START.

The 1 MHz crystal on my KIM-1 board was 200 Hz too high. This results in a 4 Hz error when using the frequency counter routine at 20 KHz and similar small errors for precision time interval measurements. We needed to set the clock to within ± 10Hz for some Loran-C timing experiments. The original crystal was removed, a new one from JAMES ELECTRONICS was obtained and soldered in place with a right-angle crystal socket. A subminiature trimmer capacitor with a negative temperature coefficient of about M-1600 was obtained (MEPCO CT5A6R5L0A - 6-40pf) and soldered in parallel with the input side of the crystal to the ground bus running adjacent to the U-12, U-14 IC's on top of the board (see sketch and circuit modification below). The mod allows trimming the KIM clock oscillator to within ± 1 Hz with respect to an external standard and it is somewhat temperature compensated for room temperature variations, holding the frequency within ± 5 Hz for a ± 5°C change.



R. W. Burhans, E. E. Dept., Ohio Univereity, Athens, Ohio 45701

THE TRENTON COMPUTER FESTIVAL

RONALD RUSHNIER
3108 ADDISON COURT
CORNWELLS HEIGHTS, PA. 19020

There are only a few words to describe the Trenton Computer Festival. WOW! FANTASTIC! I think you can learn more from one day of "Computer Festing", than from several months of reading and experimenting. If there is a similar festival or show in a 100-mile radius of where you live, by all means go! I'm sure it will be worth your while.

The real star of the Trenton Festival was none other than good old kim. From a demonstration of Peter Jennings Micro-shee to Rod Loofbourrow's Microcomputer controlled robot (see April'77 Interface), it was Kim's day all the way. I feel that the most fantastic demonstration was Hal Chamberlain's computerized music. With just a basic Kim and a handful of parts, Chamberlain got the computer to play Exodus - in four part harmony! Now, the audience was used to computer music sounding like little more than a group of disjointed beeps put together to sound something like a melody of a song, so you can well imagine the reaction when Hal pressed the "Go" button and out from the speaker came the most beautiful, melodious, rich pear-shaped organ music I have heard in a long time. When the composition was finished, there was a moment of absolute silence as the audience tried to comprehend the full impact and significance of what they had just heard - then came a round of thunderous applause. Once again, the power of Kim shattered my mind. It was just unbelievable. At that point, I think I would have done just about anything to get my hands on that program! Hal assured us that it was being published in the September issue of BYTE. To paraphrase a song "It's gonna be a long long time from May to September..."

By the way, if you're giving out the back issues to new members, It might be prudent to mention than in issue #1, Robert Lloyd's light blinking connection to Kim is a definite no-no. You're asking kim to sink about 20 ma. per LED. This is much more than the ports can take (1.6 ma.) I suggest the driver circuit using the 75492 as per issue #3 be employed.

One thing that became quite obvious at the Trenton Computer Fesitval, with all the Kim's floating around, was that no one has yet found a decent way to package their computer - with the exception perhaps of Tod Loofbourrow, who built a robot around his.

Since the user's notes cannot publish photographs, I would like to suggest that those members who do feel that they have found a reasonable approach to packaging Kim, send me a spare photo. I'll collate them and send them off to BYTE or Interface for possible publication. I think a pictorial article of novel packaging ideas would be quite useful.

RONALD RUSHNIER

Now that we have a frequency counter for KIM, it's only fitting that we get a square wave generator program also. Bob also has a bit of info for those of us who have a Burroughs Airline Terminal...

from: Bob Slagle, K4GR
3515 25th St. North
Arlington, Va. 22207

SQUARE WAVE GENERATOR. Output on PA0.

```
GO      0000  D8              CLD.  Clear Decimal.
        01    18              CLC.  Clear Carry.
        02    A9 FF           LDA.  Load Accumulator with #FF.
        04    8D 01  17       STA.  Set PADD to output.
START   07    A9 01           LDA.  Load Accumulator with #01.
        09    8D 00  17       STA.  Set PAD to PA0, "ON"
        0C    20 40  00       JSR.  Delay
        0F    A9 00           LDA.  Load Accumulator with #00.
        11    8D 00  17       STA.  Set PAD to PA0, "OFF"
        14    20 40  00       JSR.  Delay again.
        17    20 07  00       JSR.  Do it again.  Go back to START
EXIT    001A  20 5C  18       JSH.  If "0000  00" shows, you goofed.

DELAY   0040  A0 FF*          LDY.  Load Y Index with #FF.
        42    A2 FF*          LDX.  Load X Index with #FF.
        44    CA              DEX.  Decrement X.
        45    D0 FD           BNE.  If result not 0, go back to 44.
        47    88              DEY.  Decrement Y.
        48    D0 F8           BNE.  If result not 0, go back to 42.
        4A    60              RTS.  Go back to where you were in the
                                    main program.
```

*Change to make higher frequency. 'FF' in each gives slightly faster than 1 Hz, '01' in 'Y', and '1B' in 'X' gives 3.069 Khz.

PS: I bought the Burroughs Airline Terminal being advertised in KILOBAUD - If anyone else does they should know that pressing the CLEAR and the Processing Keys will bring up the 'P' symbol on the scope - pressing the CLEAR key alone will not do it. Not knowing this probably cost me twoweeks in trouble shooting before I got it playing. The book says pressing the CLEAR key only will bring up the symbol.

An industrial application for KIM from: Charles P. Pizura, Director of Marketing, Hundley Controls Inc.,183 Columbia Rd., Hanover, Mass. 02339 Phone (617) 826-5019

I thought you might be interested in our application for the KIM boards - so here is a brief rundown on what we are doing: We are putting-together a KIM-1 and a KIM-3, packaging it within a brief case (~~deerskinlooed picture~~) and offering it to the fuel oil industry as a degree day dispatching computer. The device includes a main and an auxilliary power supply (4 NI-CAD batteries), a cassette recorder, a TI 5050M, thermal, 10-digit calculator and a temperature probe. The system is programmed to take an hourly temperature sample and at a predetermined time each day, it spits-out a list of customers that the fuel oil dealer should deliver that day. The list represents a degree day calculation, based on the daily mean temperature, showing the gallons required by a particular customer. A tiny 3-byte master record is maintained for each customer, showing tank size, usage factor, etc. The file is scanned each day to determine which customers are below a tank threshold level that is defined by the user. The tank threshold level is variable, allowing the fuel oil dealer to select different delivery schemes, based on his particular requirements for the day. In other words, if he wants to deliver more customers, he raises the tank reserve factor; if he wants to deliver fewer customers, he lowers it. The printed listing routes the customers by zone and truck run, showing the fuel oil dealer a recommended run scheme for the day.

We call the system " the degree day dispatching computer, (3DC) ". Future enhancements are planned, including general accounting functions, wind chill and solar monitoring, a high speed printing capability and a floppy disk hook-up. In brief, it is a revolutionary device at an unheard of price. We are excited about it.

Your readers may be interested in the printing calculator hook-up and we want to make it available to them. We will provide the calculator, plus all hardware and software which is necessary to interface it. It will go for approximately $250.00. Please have interested parties contact me directly.

KNOWN KIM-1 DISTRIBUTORS - for your information.

Johnson Computer, P.O. Box 523, Medina, Ohio 44256 Phone (216) 725-4560

Contemporary Marketing Inc., 790 Maple Lane, Bensenville, Ill. 60106 Phone (312) 595-0461

Cybersystems, Inc., 4306 Governors Dr., Huntsville, Ala. 35805 Phone (205) 837-2080
(they have a nifty KIM enclosure and may or may not sell the basic KIM)

Newman Computer Exchange,1250 N. Main St., Ann Arbor, Mich. 48104

Computer Warehouse Store,584 Commonwealth Ave., Boston, Mass. 02215 Phone (617) 261-2701

PERSONAL COMPUTING 77

Personal Computing 77 will be two full days of seminars, major exhibits and demonstrations in home and personal computers to be held 27 and 28 August in Atlantic City, NJ. Last year over 4,000 computer hobbyists and radio amateurs enjoyed Personal Computing 76. This year, Personal Computing 77 hopes to be able to sponsor a part of the microprocessor module to be included in the Phase III satellite that the Radio Amateur Satellite Corp. (AMSAT) is building for launch in 1979. By attending Personal Computing 77, you will help this organization to extend its support to AMSAT and you will see many fine radio and computer exhibits. For a free TRIP-KIT, write PC 77, Rt. 1, Box 242, Mays Landing, New Jersey 08390.

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