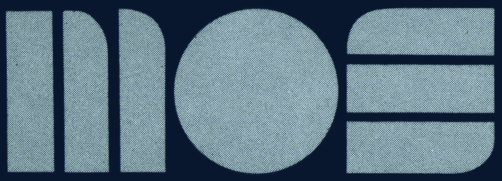

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KIM-2/3/4 USER MANUAL
EXPANSION MODULES
MEMORY - ERRATA SHEET - MOTHERBOARD

November/1976

KIM 2/3 MANUAL ERRATA SHEET

Please change your KIM 2/3 Manual as follows:

1. Page 14/Section 3.3/Sentence Three

   "To operate the program, load the lowest address which you wish to test in location 0000 and 0001, then load the highest memory address you wish to test in location 0002 and 0003."

2. Program 1/Page 15 - Change lines 42, 43 and 69 as follows:

   ```
   42 - 022B  20 1D 02  JSR INIT
   43 - 022E  A0 00     LP1 LDY=$00
   69 - 0268  4C 2E 02  JMP LP1
   ```

3. Program 2/Page 17 - Change lines 71, 76, 77 as follows:

   ```
   71 - 0264 D0 09 BNE LOOP
   76 - 026F 20 25 02 LOOP JSR RESET
   77 - 0272 4C 34 02      JMP WRLOOP
   ```

Publication Number 6500-16

USERS MANUAL
MEMORY EXPANSION MODULES
KIM-2 AND KIM-3

SEPTEMBER 1976

First Edition

MOS TECHNOLOGY · Frankfurter Str. 171–175 · D–6378 Neu-Isenburg
Telefon (06102) 8003 · Telex 04 185663

CHAPTER 1

INTRODUCTION

Congratulations on your purchase of a KIM memory expansion board. It has been carefully engineered to provide high reliability and a long service life. Please make sure you take a few minutes and read this User's Manual completely. You will then be familiar with all the features of your memory expansion board and will find it easy to connect the board to your existing KIM-1 System.

A single memory expansion board may be wired directly to your KIM-1. By using the KIM-4 motherboard you may add additional memory modules to expand your memory space by an additional 58,000 bytes.

Like all MOS Technology, Inc. microprocessor modules, your memory expansion module is completely assembled and tested. Even if you are not using a KIM-4 motherboard, all you will have to do is wire a simple cable. Your KIM memory expansion module is covered by a complete 90-day warranty and, like all KIM modules, factory repair services are available even after the expiration of your warranty.

Your KIM memory expansion board has its own +5v regulator and requires only 8 to 10 VDC unregulated for satisfactory operation. If you already have a regulated +5v supply, you may use it with your expansion board and bypass the regulation circuitry.

All the necessary circuitry has been included to make your memory expansion module completely compatible with KIM-1. By setting the switches on the memory expansion board, you can select the address locations in memory where you wish your expansion memory to reside.

The integrated circuit memories used on your board are high-speed static memory modules. No refresh cycles are required and access to this memory will not require any slow-down of your KIM-1.

Chapter 2 of this manual explains how to install your new memory expansion module in your KIM system. Chapter 3 explains how to check out your memory expansion module and how to test it if you ever suspect that is has failed. Chapter 4 contains information on your memory expansion module warranty, and Chapter 5 explains the theory of operation. If for any reason you are unable to get your memory expansion module operating satisfactorily, follow carefully the checkout instructions in Chapter 3. If you are still unable to get satisfactory operation, return the module as described in Chapter 4 or contact the manager of KIM Customer Support at MOS Technology, Inc. corporate headquarters, 950 Rittenhouse Road, Norristown, Pennsylvania 19401.

CHAPTER 2

INSTALLATION

2.1 INTRODUCTION

How you install your KIM memory expansion module will depend on whether or not you are using a KIM-4 motherboard to interface your expansion module to KIM-1. The pin configuration on your KIM-2 or KIM-3 allows you to plug your memory expansion module directly into the KIM-4 motherboard and begin operation immediately. You may insert as many KIM-2 or KIM-3 memory expansion modules into the motherboard as you wish, taking care that each is set to a different memory location. If, however, you are connecting your memory expansion module directly to KIM-1, only one KIM-2 or KIM-3 may be connected in this manner. In this case you will have to wire a cable for your memory expansion module which connects to the KIM-1 expansion and application connectors. (See Figure 1)

2.2 CONNECTING YOUR MEMORY EXPANSION MODULE TO THE MOTHERBOARD (KIM-4)

If you have already installed a KIM-4 motherboard in your KIM system, it is only necessary to plug the KIM-2 or KIM-3 into any slot on the motherboard. Make sure that your motherboard power supply has sufficient capacity to supply the needs of your memory expansion module. See your KIM-4 User Manual for power supply connections. The KIM-2 4K memory expansion module draws 1.5A and the KIM-4 8K memory expansion module draws 3.0A. Your KIM memory expansion module should be inserted in the motherboard so that the component side of the board faces away from the end of the motherboard to which KIM-1 is connected. Prior to inserting the memory board in the motherboard set the address switches located on the memory board to the correct position for the address in KIM's memory space where you wish to have the additional memory reside. Setting the address switches is described below.

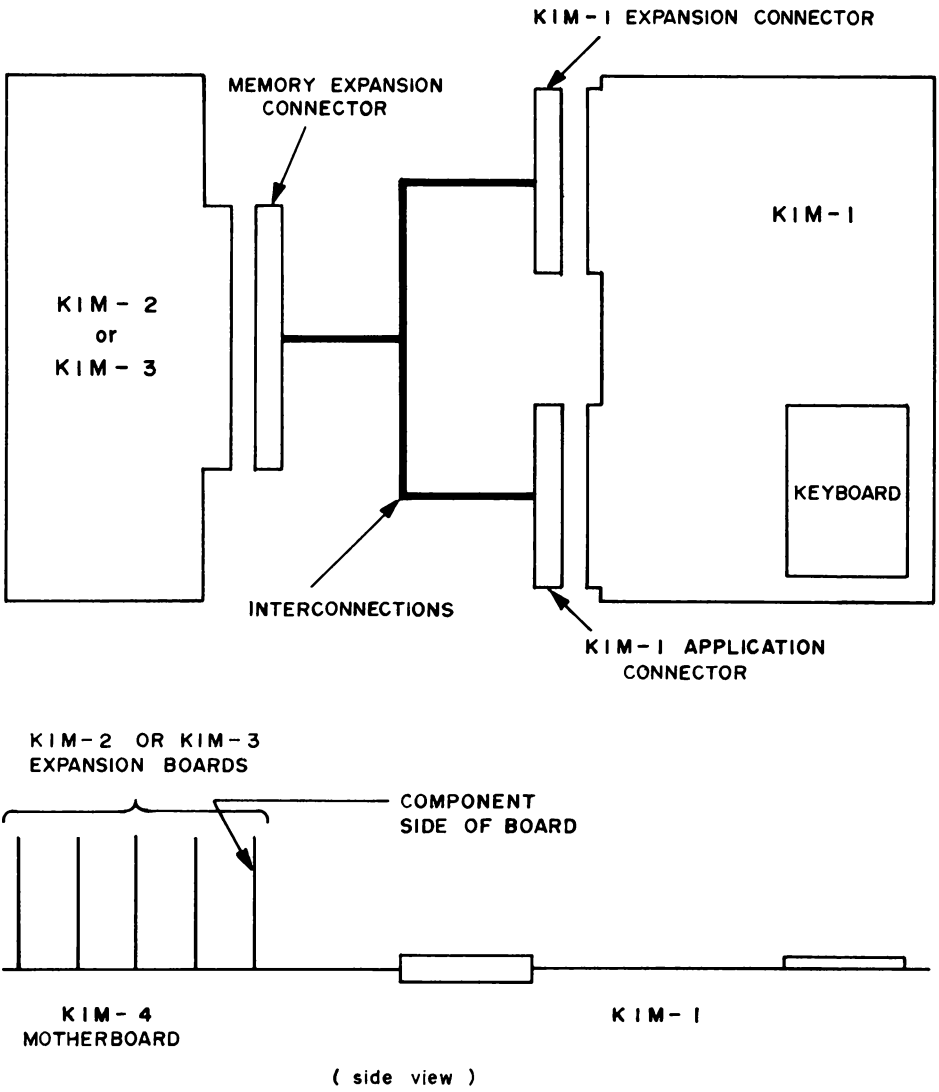

KIM-1 EXPANSION CONNECTOR
MEMORY EXPANSION CONNECTOR
KIM-1
KIM-2 or KIM-3
KEYBOARD
INTERCONNECTIONS
KIM-1 APPLICATION CONNECTOR
KIM-2 OR KIM-3 EXPANSION BOARDS
COMPONENT SIDE OF BOARD
KIM-4 MOTHERBOARD
KIM-1
(side view)

Figure 1

When the memory switches are set and the card is inserted in the motherboard you are ready to check out the operation of the board. See Chapter 3 for this operation.

2.3 CONNECTING YOUR MEMORY EXPANSION MODULE WITHOUT A MOTHERBOARD

If you are connecting your memory expansion module directly to a KIM-1, it will be necessary for you to wire a cable to connect the memory expansion module connector to the application and expansion connectors on your KIM-1. Note that if you wish to use the same +5v supply which presently powers your KIM-1, that supply should be connected to pin 21 and pin Y on your memory expansion module connector. If, however, you wish to use an unregulated +8v to +10v supply, that unregulated voltage should be connected to pins 19 and 20 on your memory expansion module. Unregulated +8vto +10v should never be connected to your KIM-1. In either case, insure that your supply can provide at least 1.5A for KIM-2 or 3.0A for KIM-3.

Table 2A and 2B show the interconnection between KIM-1 and your memory expansion module. If you do not have the appropriate connectors for the KIM-1 expansion connector and your KIM-2 or KIM-3 memory expansion module, they can be obtained from most electronic parts supply houses. They are manufactured by Vector and their part number is R644. Note that the pin designation is marked next to each pin on the connector. Once you have wired the cable interconnecting the three connectors, carefully recheck your wiring for incorrectly placed wires or inadvertant short circuits. Note that the wiring table shows the pins on the KIM-1 connectors are preceded by an "A" or "E". The "A" indicates that the connection should be made to the appropriate pin on the applications connector; the "E" indicates that the pin is on the expansion connector.

TABLE 2A

KIM-2 OR KIM-3 CONNECTOR PIN	KIM CONNECTIONS
1	A-1
2	No Connection
3	No Connection
4	No Connection
5	No Connection
6	No Connection
7	No Connection
8	E-8
9	E-9
10	E-10
11	E-11
12	E-12
13	E-13
14	E-14
15	E-15
16	A-K (Remove Jumper from A-1)
17	No Connection
18	No Connection
19	+8v
20	+8v } Connect Only +5v or +8v NOT BOTH
21	+5v
22	A-1

TABLE 2B

KIM-2 OR KIM-3 CONNECTOR PINS	KIM-1 CONNECTIONS
A	A-1
B	E-A
C	E-B
D	E-C
E	E-D
F	E-E
H	E-F
J	E-H
K	E-J
L	E-K
M	E-L
N	E-M
P	E-N
R	E-P
S	E-R
T	E-S
U	E-T
V	No Connection
W	E-V
X	E-Y
Y	To +5v (If +8v NOT USED)
Z	A-1

2.4 SETTING THE ADDRESS SWITCHES

In order to make your memory expansion module as versatile as possible, we have included four switches to allow you to place your expansion memory at any memory address. (See Figure 3) We suggest that you place your first memory expansion module starting at address 2000_{hex} and continue to expand your memory into successively higher memory locations. Tables 4 and 5 indicate the switch settings for various memory locations using your KIM-2 or KIM-3. Be sure to consult the appropriate table for the module you have purchased. Once you have chosen the memory space for your expansion module and correctly set the addressing switches,turn off all power and insert the memory module in its connector. You are now ready to test your memory expansion module.

Note: Do not set the switches so that your expansion memory has an address below 2000_{hex} as it will conflict with the memory and other circuitry in your KIM-1. It is not possible to put your expansion memory in the memory block $0400\text{-}1400_{hex}$ already decoded on KIM-1.

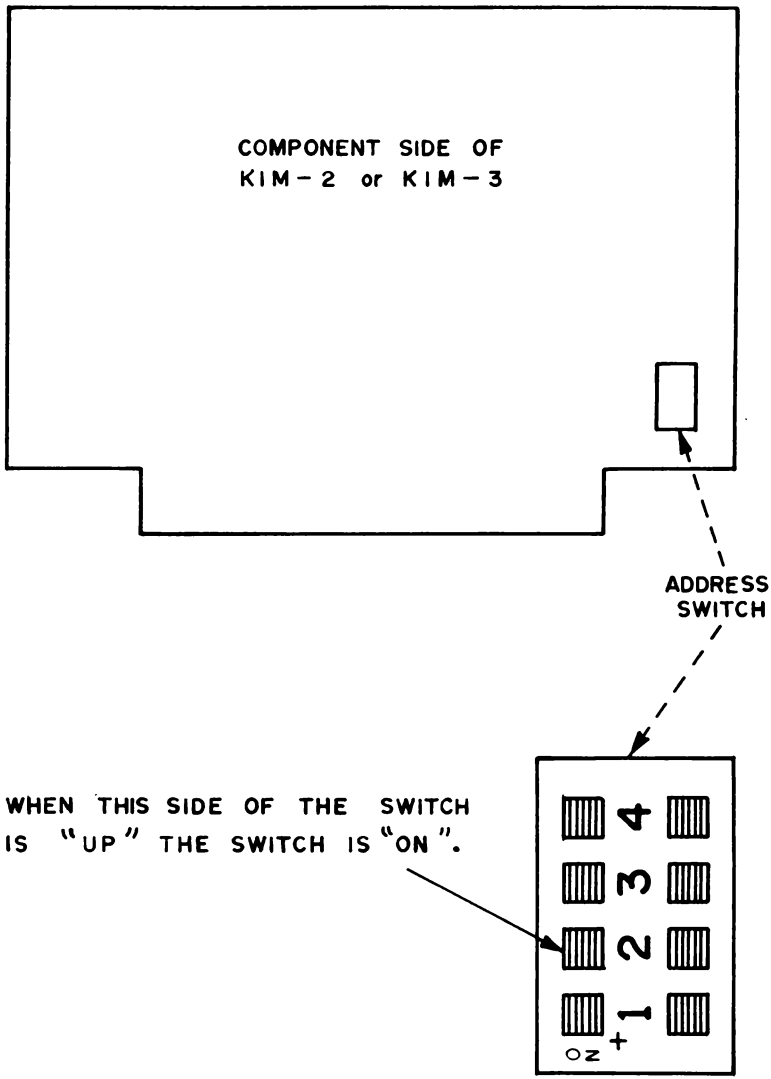

COMPONENT SIDE OF
KIM-2 or KIM-3
ADDRESS
SWITCH
WHEN THIS SIDE OF THE SWITCH
IS "UP" THE SWITCH IS "ON".
4
3
2
1
OZ
+

Figure 3

TABLE 4

KIM-2 ADDRESS SWITCH SETTING

When Address Switch is:				Lowest Address is:	Highest Address is:
1	2	3	4		
0	0	0	0	0000	0FFF (do not use)
0	0	0	X	1000	1FFF (do not use)
0	0	X	0	2000	2FFF
0	0	X	X	3000	3FFF
0	X	0	0	4000	4FFF
0	X	0	X	5000	5FFF
0	X	X	0	6000	6FFF
0	X	X	X	7000	7FFF
X	0	0	0	8000	8FFF
X	0	0	X	9000	9FFF
X	0	X	0	A000	AFFF
X	0	X	X	B000	BFFF
X	X	0	0	C000	CFFF
X	X	0	X	D000	DFFF
X	X	X	0	E000	EFFF
X	X	X	X	F000	FFFF*

0 = Switch NOT on

X = Switch IS on

*NOTE: Do not place your memory here because it will conflict with the RESET, NMI, and IRQ vectors stored in KIM-1.

TABLE 5

KIM-3 ADDRESS SWITCH SETTING

When Address Switch is:			Lowest Address is:	Highest Address is:
1	2	3		
0	0	0	0000	1FFF (do not use)
0	0	X	2000	3FFF
0	X	0	4000	5FFF
0	X	X	6000	7FFF
X	0	0	8000	9FFF
X	0	X	A000	BFFF
X	X	0	C000	DFFF
X	X	X	E000	FFFF *

0 = Switch is NOT on

X = Switch IS on

NOTE: Switch 4 is not connected.

*NOTE: Do not place your memory here because it will conflict with the RESET, NMI, and IRQ vectors stored in KIM-1.

CHAPTER 3

CHECKOUT AND TEST PROGRAM

3.1 Your memory expansion module has been carefully tested to assure correct operation. In this section we will describe how you can briefly check the operation of your memory expansion module. We have also included a test program which will allow you to verify correct operation of all memory cells in your memory expansion module. It should only be necessary to run this program if you suspect that the memory module has failed.

To verify that your memory expansion module has been correctly wired and that the address switches are correctly set, just address some of the memory locations and verify that you can change the contents of those locations. Using the keypad provided with your KIM-1, and assuming that you have set the address switches on your memory expansion module so that the lowest address is 2000, use the following procedure:

CHECKOUT AND TEST PROGRAM

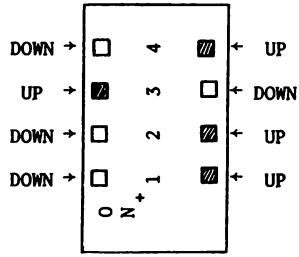
DEPRESS KEY	SEE DISPLAYED
/RS/	XXXX XX
/AD/	XXXX XX
/2/ /0/ /0/ /0/	2000 XX
/DA/	2000 XX
/3/ /A/	2000 3A
/7/ /9/	2000 79
/+/	2001 XX
/3/ /7/	2001 37

If you are unable to change the data in memory there are two possible sources of trouble:

1. The memory expansion board is not correctly connected to KIM-1. If you are using a motherboard, check that the motherboard is correctly installed and that the memory expansion card has the component side of the board facing

away from the KIM-1. If you are not using a motherboard, carefully check your wiring against the list provided in Table 2A and 2B.

2. You have incorrectly set the memory address switches. The figure below shows the appearance of the memory address switch when it is configured so that the lowest expansion memory address is 2000_{16}. Recheck the information in Chapter 2 if you are unsure of the placement of the memory expansion module.



3.2 TEST PROGRAM FOR MEMORY CHECKOUT

Although your KIM memory expansion module has been carefully tested before shipment, like any other electronic device, it can fail in use. If you suspect that your memory expansion module is not working correctly, the following program can be used to check the memory operation. It should be noted that programs for testing memory modules for all possible failure modes would be quite complex and require lengthy running time on KIM. The following programs simply write and read every possible bit pattern in every memory location. They do not check, for instance, whether writing to a given memory location may also affect other memory locations.

3.3 CHECKING YOUR MEMORY FROM A TERMINAL

The following program assumes that you have a terminal connected to the serial input and output ports of your KIM-1. To use the program, type it into KIM memory starting at location 200_{16}; make a paper tape copy once you have loaded the program using the KIM dump routine. To operate the program, load the lowest address which you wish to test in location 0001 and 0002, then load the highest memory address you wish to test in location 0003 and 0004. For instance, to check all memory locations between 2000 and 2FFF you would load 00 in location 0000, 20 in location 0001, FF in location 0002, and 2F in location 0003. To operate the program, load address 022A and hit the G key. The program will then fill the specified memory locations with 0's and then read all locations to verify that the zero has been written. It will then load the specified memory with 01 and again verify the data. The process will continue until all bit patterns from 00 to FF have been written and read correctly. If any memory location fails to read or write correctly the address of the defective cell will be written to the terminal, along with the code which would not read or write correctly. When all bit patterns have been tested in all specified cells, the

Program 1

```
CARD =  LOC     CODE        CARD
     1                  BOTLO=$0
     2                  BOTHI=$1
     3                  TOPLO=$2
     4                  TOPHI=$3
     5                  PTRLO=$4
     6                  PTRHI=$5
     7                  MASK=$6
     8                  PRTBYT=$1E3B
     9                  OUTSP=$1E9E
    10                  CRLF=$1E2F
    11  0000            *=$200
    12  0200  E6 04     INCPTR  INC PTRLO
    13  0202  D0 02             BNE END
    14  0204  E6 05             INC PTRHI
    15  0206  60        END     RTS
    16
    17                    ERROR ROUTINE FOR TTY
    18
    19  0207  A5 05     ERROR   LDA PTRHI
    20  0209  20 3B 1E          JSR PRTBYT
    21  020C  A5 04             LDA PTRLO
    22  020E  20 3B 1E          JSR PRTBYT
    23  0211  20 9E 1E          JSR OUTSP
    24  0214  A5 06             LDA MASK
    25  0216  20 3B 1E          JSR PRTBYT
    26  0219  20 2F 1E          JSR CRLF
    27  021C  60                RTS
    28
    29                     INITIALIZATION SUBROUTINE
    30
    31  021D  A9 00     INIT LDA =$00
    32  021F  85 06             STA MASK
    33  0221  A5 00     RESET   LDA BOTLO
    34  0223  85 04             STA PTRLO
    35  0225  A5 01             LDA BOTHI
    36  0227  85 05             STA PTRHI
    37  0229  60                RTS
    38
    39                     MAINLINE FOR MEMORY TEST
    40
    41  022A  D8        BEGIN CLD
    42  022B  A0 00             LDY =$00
    43  022D  20 1D 02          JSR INIT
    44  0230  A5 06     WRLOOP  LDA MASK
    45  0232  91 04             STA (PTRLO),Y
    46  0234  20 00 02          JSR INCPTR
    47  0237  A5 04             LDA PTRLO
    48  0239  C5 02             CMP TOPLO
    49  023B  D0 F3             BNE WRLOOP
    50  023D  A5 05             LDA PTRHI
    51  023F  C5 03             CMP TOPHI
    52  0241  D0 ED             BNE WRLOOP
    53  0243  20 21 02          JSR RESET
    54  0246  B1 04     RDLOOP  LDA (PTRLO),Y
    55  0248  C5 06             CMP MASK
    56  024A  F0 03             BEQ CONT
    57  024C  20 07 02          JSR ERROR
    58  024F  20 00 02  CONT    JSR INCPTR
    59  0252  A5 04             LDA PTRLO
    60  0254  C5 02             CMP TOPLO
    61  0256  D0 EE             BNE RDLOOP
    62  0258  A5 05             LDA PTRHI
    63  025A  C5 03             CMP TOPHI
    64  025C  D0 E8             BNE RDLOOP
    65  025E  E6 06             INC MASK
    66  0260  D0 03             BNE CYCLE
    67  0262  20 2F 1E          JSR CRLF
    68  0265  20 21 02  CYCLE    JSR RESET
    69  0268  4C 30 02          JMP WRLOOP
```

program will output a carriage return and line feed and begin the entire cycle over again. For a 4K memory expansion module the entire test will take about 1½ minutes.

3.4 CHECKING MEMORY OPERATION WITH THE KEYPAD

Program 2 tests memory in a similar fashion, but does not require a terminal. As in the first program, the address of the lower limit and upper limit of the memory to be checked is inserted in locations 0 through 3. When the program has been keyed in, you will probably wish to record it on your audio cassette for future use. When the starting address (02ZE) is loaded and the GO button is depressed the program will check memory as described above. However, if a defective cell is encountered the address of the defective cell will be displayed on the leftmost four digits of the display and the program will halt. Pushing any button on the keypad will resume the testing operation. When all memory cells have been checked, a value of 0000 will appear in the display and the program will halt.

Program 2

```
CARD =  LOC      CODE        CARD
     1                     BOTLO=$0
     2                     BOTHI=$1
     3                     TOPLO=$2
     4                     TOPHI=$3
     5                     PTRLO=$4
     6                     PTRHI=$5
     7                     MASK=$6
     8                     POINTH=$FB
     9                     POINTL=$FA
    10                     SCANS=$1F1F
    11                     AK=$1EFE
    12                     RESVEC=$1C22
    13  0000              *=$200
    14  0200  E6 04       INCPTR  INC PTRLO
    15  0202  D0 02               BNE END
    16  0204  E6 05               INC PTRHI
    17  0206  60           END     RTS
    18
    19                      ERROR ROUTINE FOR KEYPAD
    20
    21  0207  A5 05       ERROR   LDA PTRHI
    22  0209  85 FB               STA POINTH
    23  020B  A5 04               LDA PTRLO
    24  020D  85 FA               STA POINTL
    25  020F  A5 06               LDA MASK
    26  0211  85 F9              STA $F9
    27  0213  20 1F 1F     ER1     JSR SCANS
    28  0216  20 FE 1E             JSR AK
    29  0219  F0 F8                BEQ ER1
    30  021B  20 FE 1E     ERLOOP  JSR AK
    31  021E  D0 FB                BNE ERLOOP
    32  0220  60                   RTS
    33
    34                      INITIALIZATION SUBROUTINE
    35
    36  0221  A9 00       INIT    LDA =$00
    37  0223  85 06               STA MASK
    38  0225  A5 00       RESET   LDA BOTLO
    39  0227  85 04               STA PTRLO
    40  0229  A5 01               LDA BOTHI
    41  022B  85 05               STA PTRHI
    42  022D  60                   RTS
    43
    44                      MAINLINE FOR MEMORY TEST
    45
    46  022E  D8           BEGIN   CLD
    47  022F  A0 00               LDY =$00
    48  0231  20 21 02            JSR INIT
    49  0234  A5 06       WRLOOP  LDA MASK
    50  0236  91 04               STA (PTRLO),Y
    51  0238  20 00 02            JSR INCPTR
    52  023B  A5 04               LDA PTRLO
    53  023D  C5 02               CMP TOPLO
    54  023F  D0 F3               BNE WRLOOP
    55  0241  A5 05               LDA PTRHI
    56  0243  C5 03               CMP TOPHI
    57  0245  D0 ED               BNE WRLOOP
    58  0247  20 25 02           JSR RESET
    59  024A  B1 04       RDLOOP  LDA (PTRLO),Y
    60  024C  C5 06               CMP MASK
    61  024E  F0 03               BEQ CONT
    62  0250  20 07 02            JSR ERROR
    63  0253  20 00 02     CONT    JSR INCPTR
    64  0256  A5 04               LDA PTRLO
    65  0258  C5 02               CMP TOPLO
    66  025A  D0 EE               BNE RDLOOP
    67  025C  A5 05               LDA PTRHI
    68  025E  C5 03               CMP TOPHI
    69  0260  D0 E8               BNE RDLOOP
    70  0262  E6 06               INC MASK
    71  0264  D0 0C               BNE LOOP
    72  0266  A9 00               LDA =$00
    73  0268  85 FA               STA $FA
    74  026A  85 FB               STA $FB
    75  026C  4C 22 1C            JMP RESVEC
    76  026F  20 25 02           JSR RESET
    77  0272  4C 34 02     LOOP    JMP WRLOOP
    78                     .END
```

CHAPTER 4

WARRANTY AND SERVICE

Should you experience difficulty with your KIM-2 or KIM-3 module and be unable to diagnose or correct the problem, you may return the unit to MOS Technology, Inc. for repair.

7.1 IN-WARRANTY SERVICE

All KIM series Microcomputer Modules are warranted by MOS Technology, Inc. against defects in workmanship and materials for a period of ninety (90) days from date of delivery. During the warranty period, MOS Technology, Inc. will repair or, at its option, replace at no charge components that prove to be defective provided that the module is returned, shipping prepaid, to:

KIM Customer Service Department
MOS Technology, Inc.
950 Rittenhouse Road
Norristown, Pennsylvania 19401

This warranty does not apply if the module has been damaged by accident or misuse, or as a result of repairs or modifications made by other than authorized personnel at the above captioned service facility.

No other warranty is expressed or implied. MOS Technology, Inc. is not liable for consequential damages.

7.2 OUT-OF-WARRANTY SERVICE

Beyond the ninety (90) day warranty period, KIM modules will be repaired for a reasonable service fee. All service work performed by MOS Technology, Inc. beyond the warranty period is warranted for an additional ninety (90) day period after shipment of the repaired module.

7.3 POLICY OF CHANGES

All KIM series modules are sold on the basis of descriptive specifications in effect at the time of sale. MOS Technology, Inc. shall have no obligation to modify or update products once sold. MOS Technology, Inc. reserves the right to make periodic changes or improvements to any KIM series module.

7.4 SHIPPING INSTRUCTIONS

It is the customer's responsibility to return the KIM series module with shipping charges prepaid to the above captioned service facility.

For in-warranty service, the KIM module will be returned to the customer, shipping prepaid, by the fastest economical carrier.

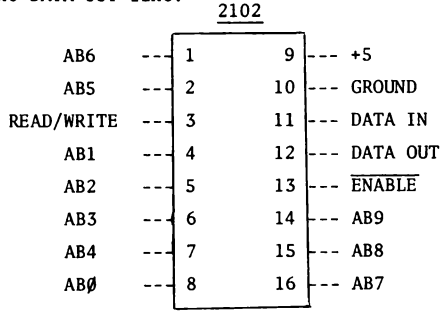
For out-of-warranty service, the customer will pay for shipping charges both ways. The repaired KIM module will be returned to the customer C.O.D. unless the repairs and shipping charges are prepaid by the customer.

Please be certain that your KIM module is safely packaged when returning it to the above captioned service facility.

CHAPTER 5

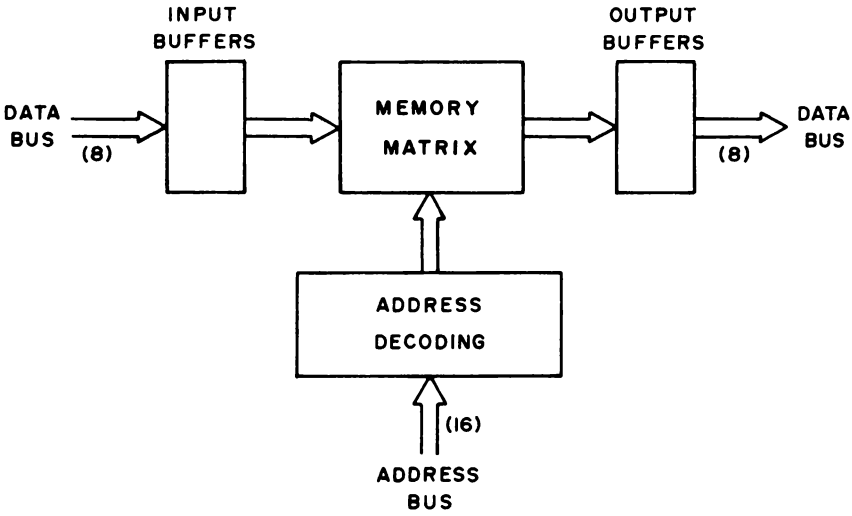
THEORY OF OPERATION

5.1 The two schematics show the interconnection of the components on the KIM-2 and KIM-3 boards. The diagram below illustrates the pin connections to the 2102-type memories used on the boards. When the $\overline{\text{ENABLE}}$ line is low, one of the 1024 bits in the package is selected. If pin 3 is high, the selected cell will have the value of the DATA IN line (1 or 0) written into it. If Pin 3 is low, the contents of the addressed cell will be placed on the DATA OUT line.



The boards are composed of the memory circuits, addressing circuitry, and buffers. An on-board voltage regulator is also provided. The following description applies to the KIM-2 board; KIM-3 differences are noted at the end.

In operation, address bus lines 0 through 9 are buffered by U4, U5, U8, and U9, and connected directly to the memory circuits. The high-order address lines (AB12 - 15) are presented to U15, a 4-bit comparator. The bit pattern on these lines is compared with the bit pattern generated by the four address switches.


INPUT
BUFFERS
OUTPUT
BUFFERS
DATA
BUS
(8)
MEMORY
MATRIX
(8)
DATA
BUS
ADDRESS
DECODING
(16)
ADDRESS
BUS

If the address switch settings and the high-order address lines match, pin 6 of U15 will go high. This signal is inverted twice in U11 and passed off the board as the BD SELECTED line. When BD SELECTED goes high it disables U4 on KIM-1, preventing the memory circuits on KIM-1 from conflicting with addresses intended for the expansion memory board.

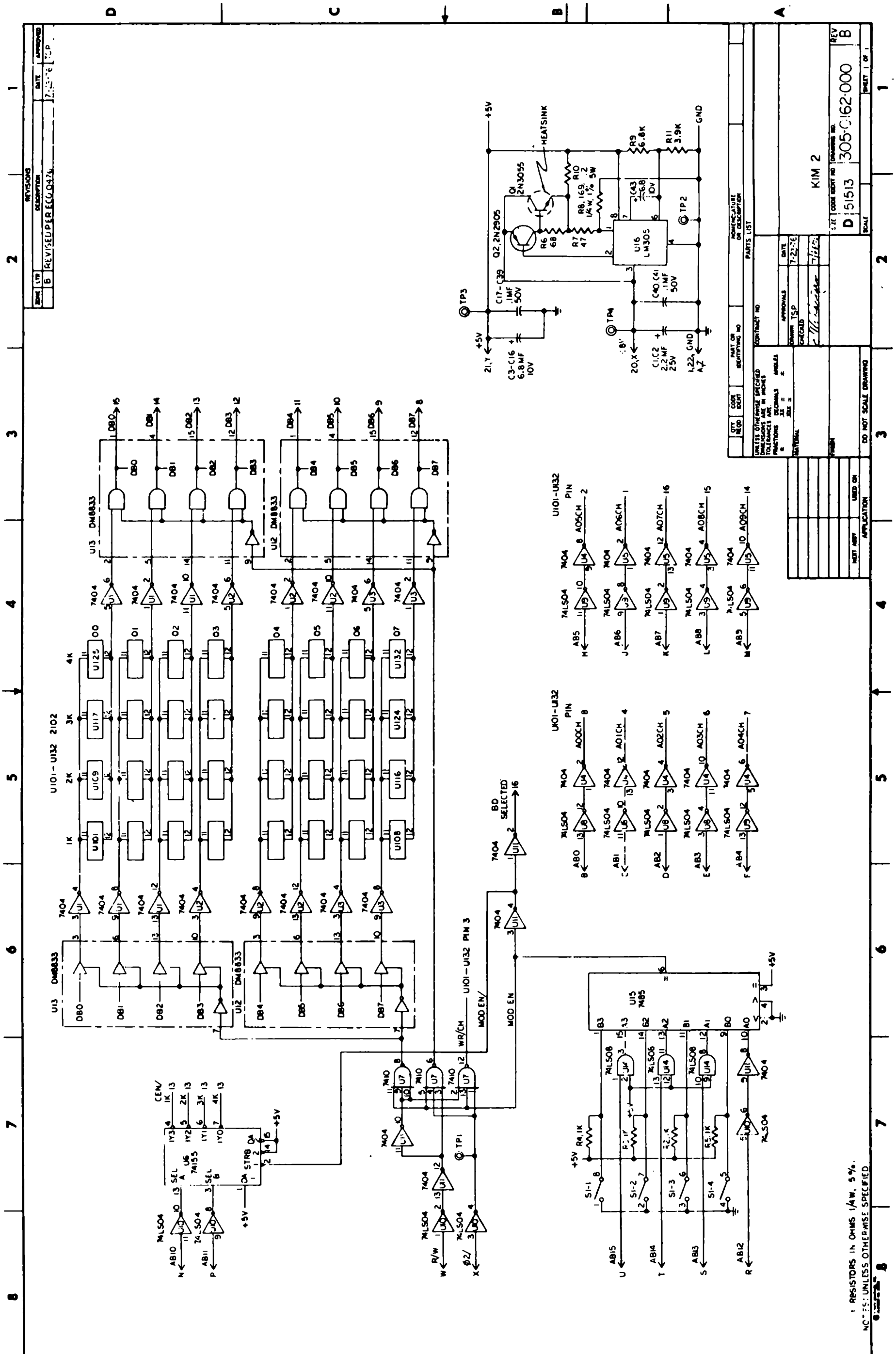
Address bus lines 10 and 11 are decoded in U6 to provide four output lines (pins 4, 5, 6, and 7). Each of these four lines is connected to a group of eight memory circuits to determine which bank of memory circuits will be active at any time. U6 will not be activated unless the proper address configuration exists on address bus pins 12 - 15. The BD SELECTED line is used to enable U6. The comparison signal from pin 6 of U15 is also used in U7 to combine with the Ø2 and R/W signals from KIM-1 to control the input and output buffers (U12 and U13).

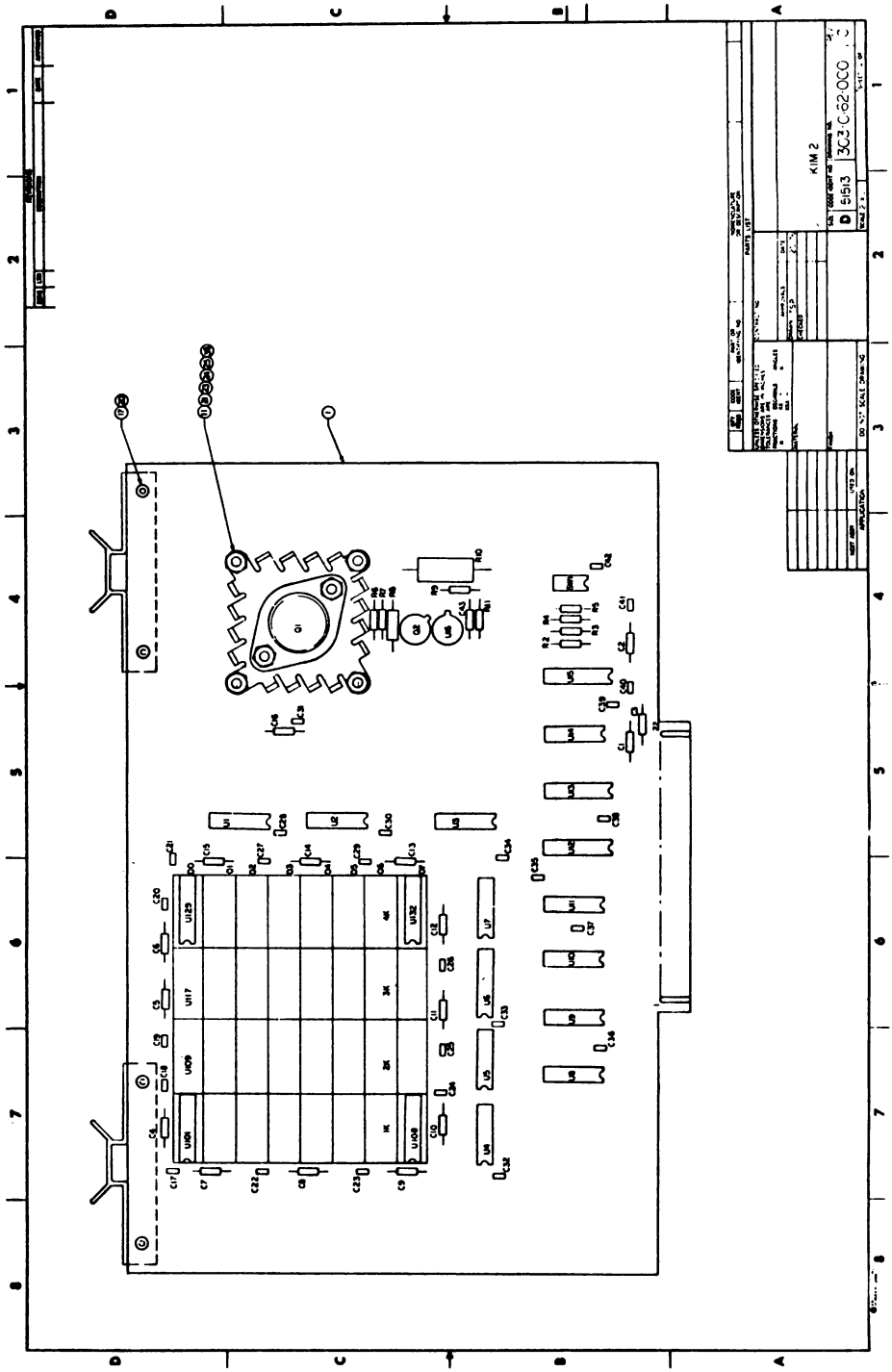
The effect of this circuitry is such that when the high order address bits match the switch settings, U6 and U7 are enabled to decode address bits 10 and 11; when clock phase 2 is present the data bus buffers will be enabled, allowing data to be fed into or out of the board, depending on the condition of the Read/Write line. U6 will enable the appropriate bank of memory circuits and the selected memory circuits will decode the ten least significant address bits to complete the Read/Write operation.

U16, Q1, and Q2 and their associated circuitry from a conventional series regulator which take the unregulated +8v supplied to the board and supply a regulated +5v for the circuitry.

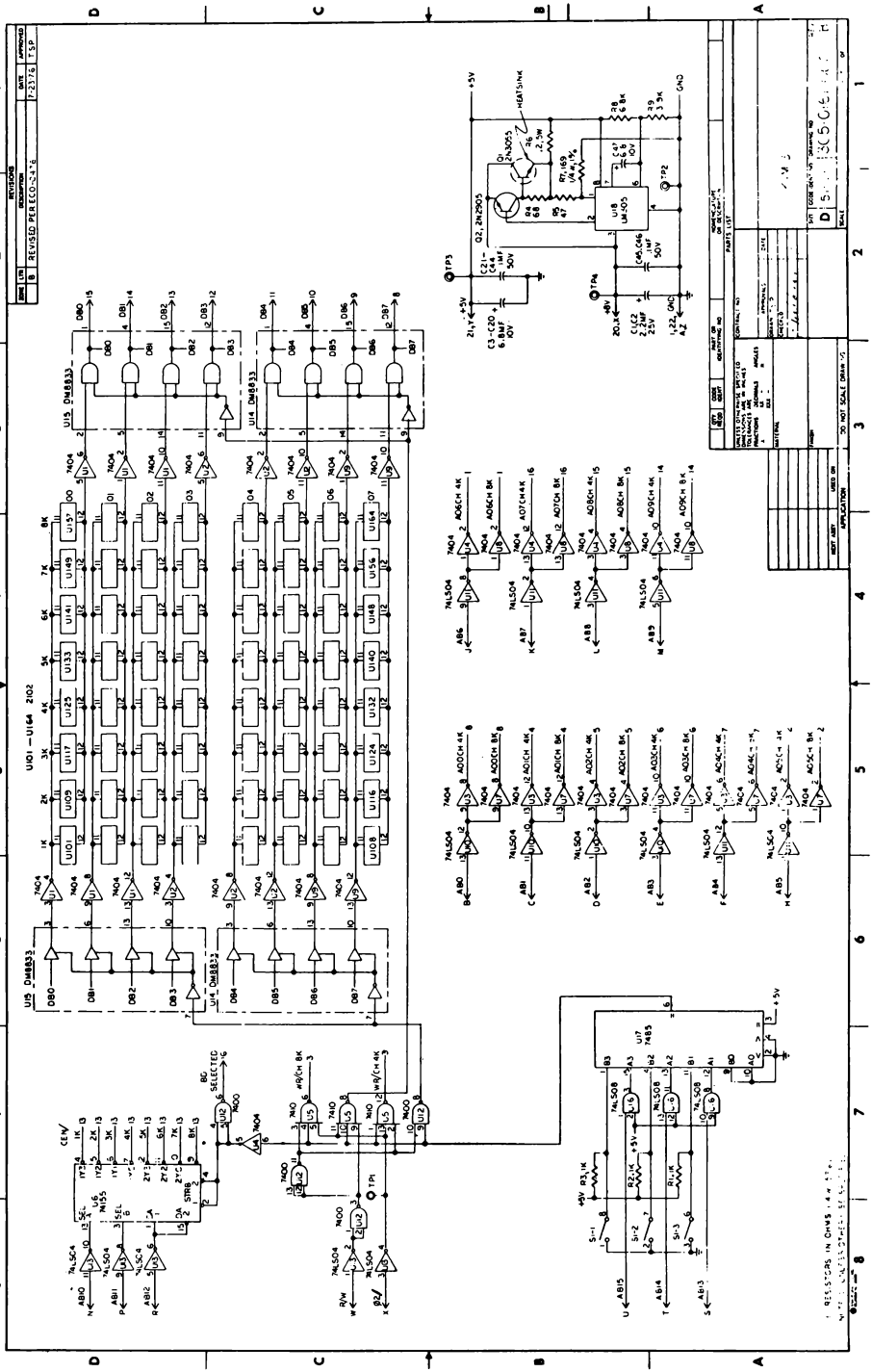
The only difference between the KIM-2 and KIM-3 circuitry is that U6 now decodes three address lines (AB10 - 12) and U17 decodes three address lines (AB13 - 15). U6 now controls which of eight memory banks is selected. Additional drivers are provided for ABØ - 9 to supply the extra drive needed for the increased number of memory circuits.

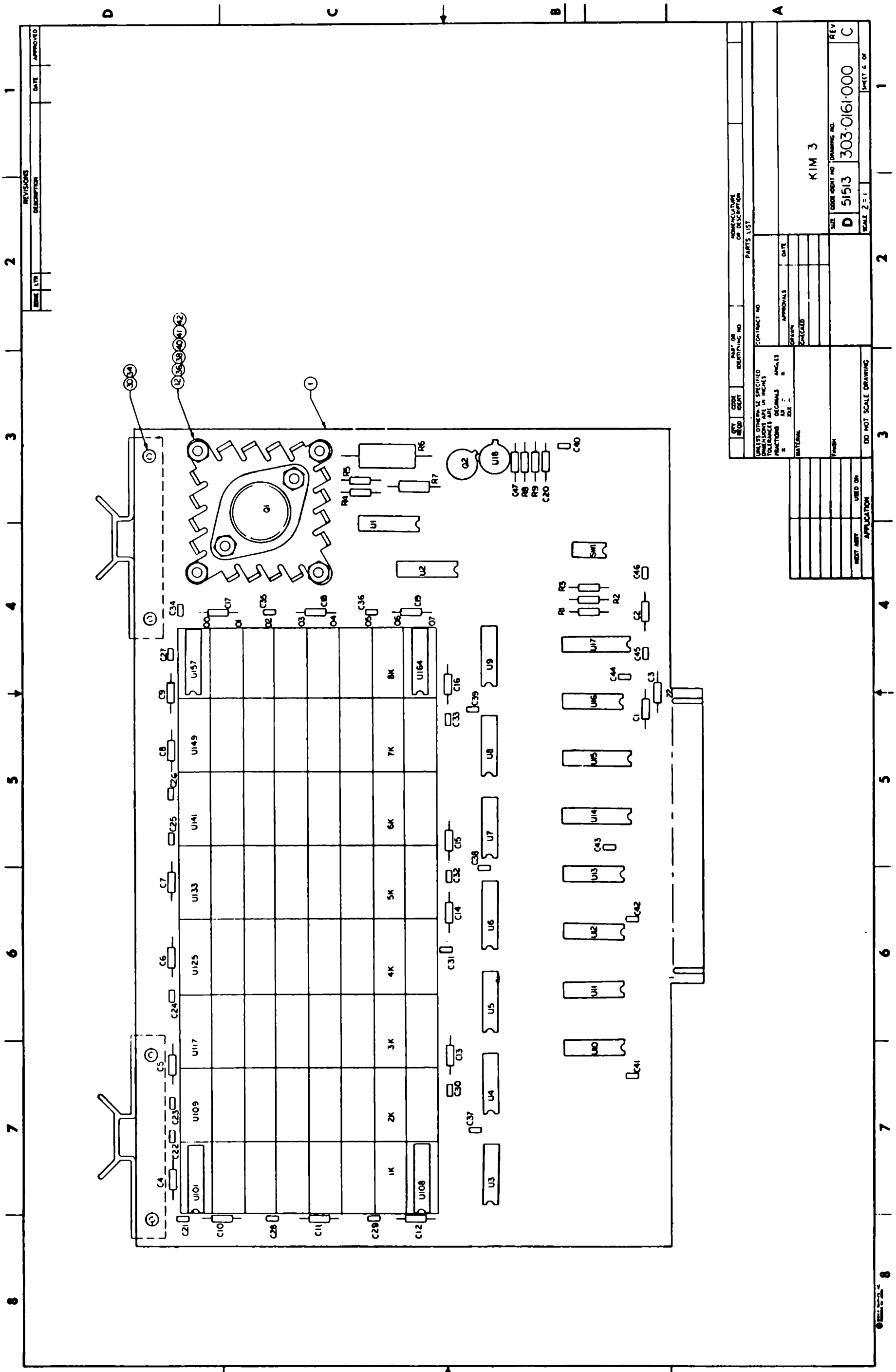
ITEM	PART	QTY.	DESCRIPTION
1.	U1-U5,U11	6	IC 7404
2.	U8-U10	3	IC 74LS04
3.	U6	1	IC 74155
4.	U12,13	2	IC DS8833
5.	U14	1	IC 74LS08
6.	U15	1	IC 7485
7.	U7	1	IC 7410
8.	R2-R5	4	Resistor 1K, ½W
9.	Q1	1	2N3055
10.	Q1	1	Heat Sink Wakefield NC-680-.5
11.	C1,C2	2	Capacitor 2.2µf 25v
12.	C3-C16,C43	15	Capacitor 6.8µf 10v
13.	C17-C42	26	Capacitor 0.1µf Blue
14.	U101-U132	32	Memory Element 2102A-4
15.		2	DEC PC BD Handles
16.		1	DIP SW. 4 Pole


KIM 2
305-0162-000
D 51513
REV B
U101-U132 2102
U15 7485
U16 LM305
Q1 2N3055
Q2 2N2905
HEATSINK
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTORS IN OHMS 1/4W, 5%.
DO NOT SCALE DRAWING


KIM 2
D 5513
363-0602-000

ITEM	PART	QTY.	DESCRIPTION
1.	U1-4,7-9	7	I.C. SN7404
2.	U10,11,13	3	I.C. SN74LS04
3.	U6	1	I.C. SN74155
4.	U14,15	2	I.C. DS8833
5.	U16	1	I.C. SN74LS08
6.	U17	1	I.C. SN7485
7.	U5	1	I.C. SN7410
8.	U12	1	I.C. SN7400
9.	U18	1	I.C. LM305
10.	Q1	1	Transistor 2N3055
11.	Q1	1	Heat Sink Wakefield NC-680-.5
12.	Q2	1	Trans. 2N2905
13.	R1-3	3	Resistor 1K, ¼W,5%
14.	R4	1	Resistor 68Ω, ¼W,5%
15.	R5	1	Resistor 47Ω, ¼W,5%
16.	R6	1	Resistor PW5-.2, 10% .2Ω, 5W
17.	R7	1	Resistor 169Ω, ¼W, 1%
18.	R8	1	Resistor 6.8K, ¼W, 5%
19.	R9	1	Resistor 3.9K, ¼W, 5%
20.	C1,2	2	Cap. 2.2µf, 25v
21.	C3-20,47	19	Cap. 6.8µf, 10v
22.	C21-46	26	Cap. .1µf, Blue
23.	U101-U164	64	Memory Element AM91L02APC
24.		2	DEC P.C. BD. Handles
25.		1	DIP SW. 4 Pole




REVISIONS
PARTS LIST
KIM 3
D
51513
303-0161-000
C
DO NOT SCALE DRAWING

MOS TECHNOLOGY, INC.
Frankfurter Str. 171–175 · D–6378 Neu-Isenburg
Telefon (06102) 8003 · Telex 04 185663

PRODUCT
ANNOUNCEMENT
BULLETIN
September 21, 1976

KIM-4 MOTHERBOARD

The KIM-4 motherboard is designed to interface a single KIM-1 microcomputer with up to six system expansion modules. The motherboard also contains circuitry for buffering all appropriate system address, data, and control lines. A +5v regulator is included to provide power for the KIM-1 module from the system 8-10v D.C. unregulated power bus. A +12v regulator is provided for powering the KIM-1 audio cassette interface from user-supplied +15v.

Dimensions: 11.0" x 11.5" (see attached drawing) inclusive of connector tabs.

Connectors provided: (6) 44 pin female (similar to Vector R644) for expansion modules.

(2) 44 pin female connectors for interface to KIM-1.

(1) 44 pin male connector duplicating the function of KIM-1 application connector.

(1) 44 pin male with standard bus pinout for connection to expansion motherboard or backplane.

Expansion module pin connections: (See Diagram)

Power Connections:

+8v unregulated system power to be connected to motherboard jack and bussed to all expansion module connectors.

+15v and -15v (optional) to be connected to motherboard jack and bussed to all expansion module connectors. Regulator provided to derive +12v for audio cassette interface from user-supplied +15v.

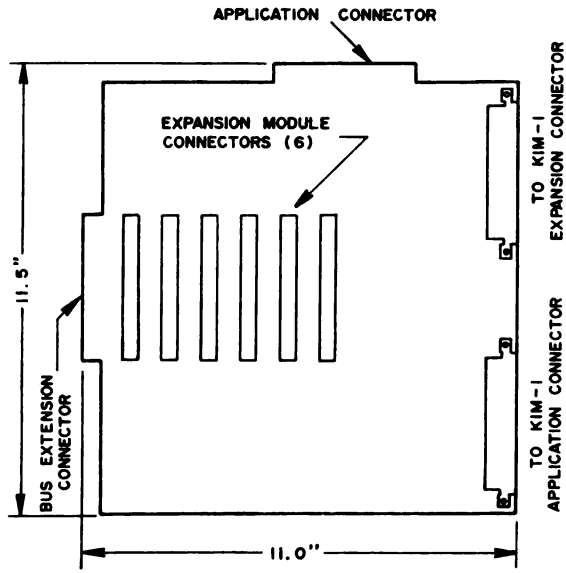
Note: +5v regulated is not bussed to expansion module connectors. Each module will have on-board regulators powered from the system +8v unregulated bus.

KIM-4
STANDARD BUS CONNECTIONS

1	GND	A	GND
2	B SYNC	B	BAB Ø
3	B RDY	C	BAB 1
4	B IRQ	D	BAB 2
5	– 15V	E	BAB 3
6	B NMI	F	BAB 4
7	B RST	G	BAB 5
8	BDB 7	J	BAB 6
9	BDB 6	K	BAB 7
10	BDB 5	L	BAB 8
11	BDB 4	M	BAB 9
12	BDB 3	N	BAB 10
13	BDB 2	P	BAB 11
14	BDB 1	R	BAB 12
15	BDB Ø	S	BAB 13
16	BD SELECTED	T	BAB 14
17	+ 15V	U	BAB 15
18	$\overline{\text{DMA}}$	V	B Ø 2
19	+8v RAW DC	W	B R/W
20	+8v RAW DC	X	$\overline{\text{B Ø 2}}$
21	+5v	Y	+5
22	GND	Z	GND

* The "B" prefix indicates the same signal output by KIM-1 but buffered on the motherboard. E.G. the B RDY line is the KIM-1 RDY line.

KIM – 4 MOTHERBOARD



Notizen

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MICROCOMPUTER-INFORMATION

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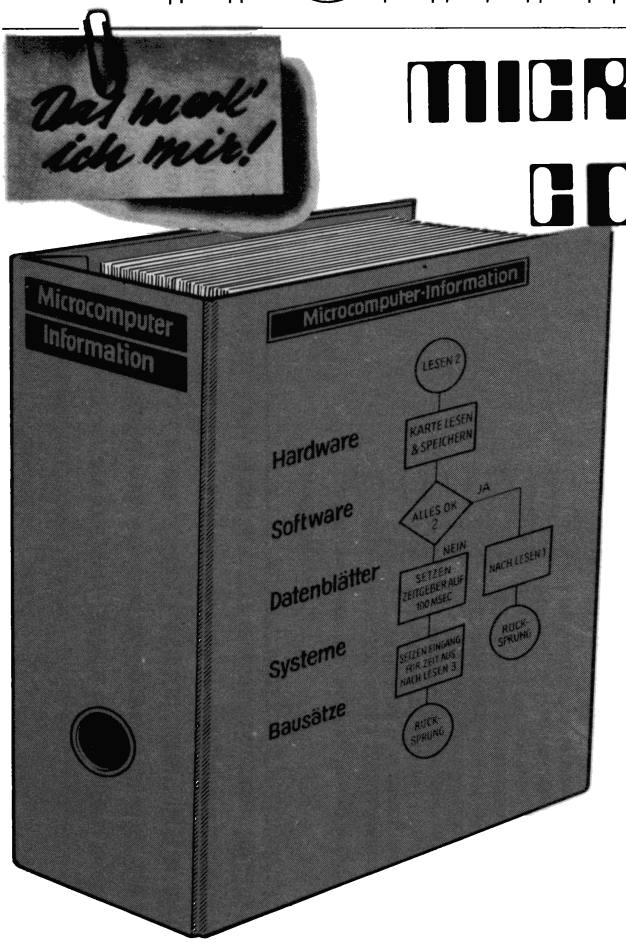

MICRO-COMPUTER: ALLES ÜBER IHN

Herausgeber:

MCDS Microcomputer

Datensysteme GmbH

Was Sie wissen sollten

bringt Ihnen diese Loseblattsammlung ins Haus. Das Sachgebiet wird mit Originaldaten und den jeweils neusten Informationen behandelt. Die Texte sind in deutsch und englisch abgefaßt. Der Ausgabenumfang bewegt sich zwischen 1 und 250 Seiten. Um immer up to date zu sein, können Sie als Abonnent kontinuierlich unsere Ergänzungen beziehen.

Der Seitenpreis beträgt 0,10 DM.

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MCDS Microcomputer-Information

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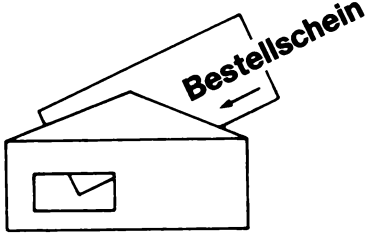
Eine Information, auf die Sie nicht verzichten können. Allein das Suchen nach einem Begriff, einer Aussage oder einem Programm wird Sie das Vielfache des Abonnentenpreises kosten. Sie sind immer über den neuesten Stand der Microcomputer-Technik unterrichtet. Diese Loseblattsammlung deckt das gesamte Spektrum des Sachgebietes „MOS-Microcomputer" ab. Vom Datenblatt, über die Hardware zur wichtigen Software, über Bücher, Bausätze, Fachberichte, vollständige Systeme finden Sie alles in unserer MCDS Microcomputer-Information



Anforderung

Ich/Wir möchten per Nachnahme zugeschickt bekommen:

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Stck.	101 MOS-KIM 1 Microcomputer-Handbuch	englisch	DM 19,80
Stck.	131 MOS-Programmier-Fibel	deutsch	DM 28,60
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D-6100 Darmstadt

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datensysteme gmbh·

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d 61 darmstadt·
☎ 06151/23959