KIM-1 microcomputer system

- A COMPLETE MICROCOMPUTER
- ONLY ~~$245~~ 175.
- NOT A KIT!
  FULLY ASSEMBLED
  FULLY TESTED
  FULLY WARRANTED
- OPERATES WITH
  KEYBOARD & DISPLAY
  AUDIO CASSETTE
  TTY
- INCLUDES
  FULL DOCUMENTATION
  MONITOR SOFTWARE

MOS TECHNOLOGY, INC.

KIM-1 microcomputer system

KIM-1 SYSTEM DESCRIPTION

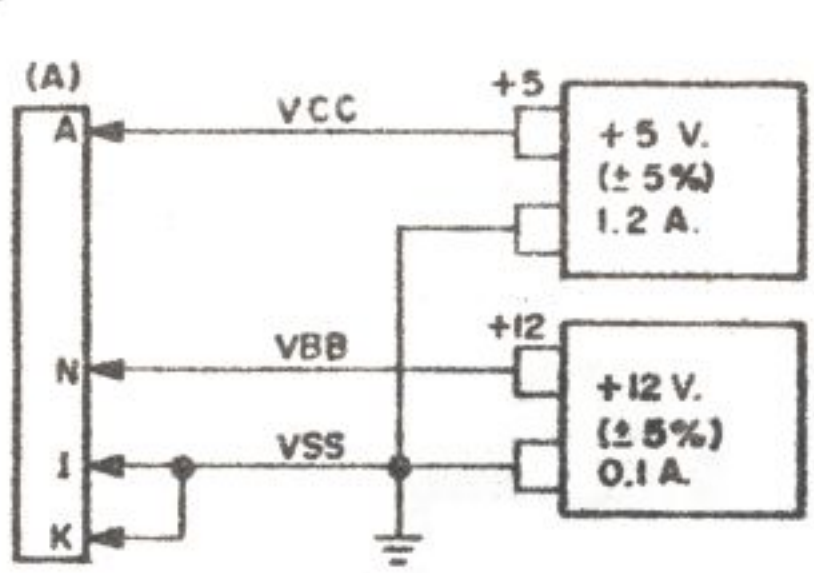
The MCS 6502 Microprocessor Array acts as the central control element for the system. This unit is an 8 bit microprocessor which communicates with other system elements on three separate buses. First, a 16 bit address bus permits the 6502 to address directly up to 65,536 memory locations in the system. Next, an 8 bit bidirectional data bus carries data from the 6502 array to any memory location or from any memory location back to the 6502 array. Lastly, a control bus carries various timing and control signals between the 6502 array and other system elements.

At the heart of the KIM-1 system is an MCS 6502 Microprocessor Array which operates in conjunction with two MCS 6530 arrays. Each MCS 6530 provides a total of 1024 bytes of Read-only Memory (ROM), 64 bytes of Random Access Memory (RAM), 15 input/output pins, and an Interval Timer. Stored permanently in the ROM's of the MCS 6530 arrays are the monitor and executive programs devised by MOS Technology, Inc. to control the various operating modes of the KIM-1 system.

The KIM-1 system is intended to provide a capable microcomputer for use in a "real-world" application. Accordingly, the system includes a full 1024 bytes of RAM to provide data and program storage for your application program. The 15 bidirectional input/output pins allow interface control of your specific application. One of the interval timers included in the system is available for generation of time base signals required by your application.

The KIM-1 system comes complete with all components mounted and tested as a system. You need not worry about timing signals (we've included a 1MHz crystal oscillator on the module), interface logic or levels between system components, or interface circuitry to peripheral devices. You need only apply the indicated power supply voltages to the designated pins to achieve full operation of the KIM-1 system.

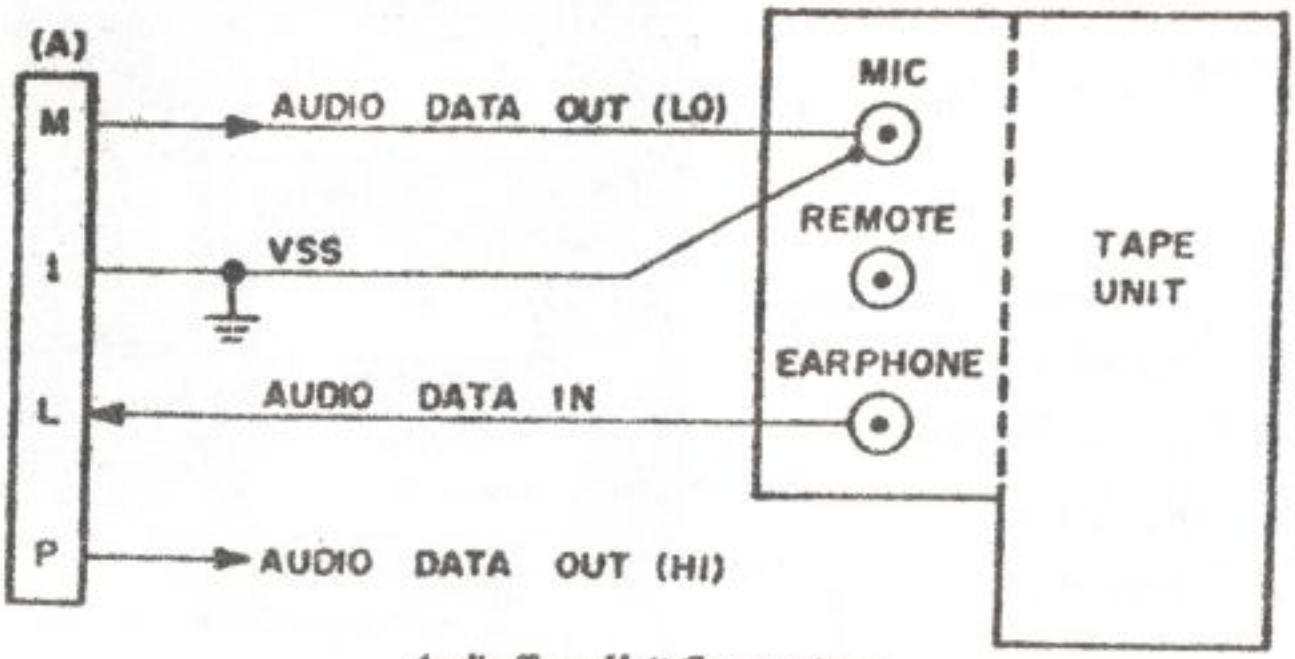
You may expand the KIM-1 system to incorporate more memory, different types of memory, or additional input/output capability. System expansion is simple with all required interface signals brought out to a special connector on the module.



Power Supply Connections

The +12 volt power supply is required only if you will be using an audio cassette recorder in your system.

The recording technique used by the KIM-1 system and the interface circuits provided have been selected to insure trouble-free operation with virtually any type and any quality level audio cassette unit. (We have demonstrated correct operation with a tape unit purchased for less than $20.00 from a local discount outlet). In addition, tapes recorded on one unit may be played back to the system on a different unit if desired.

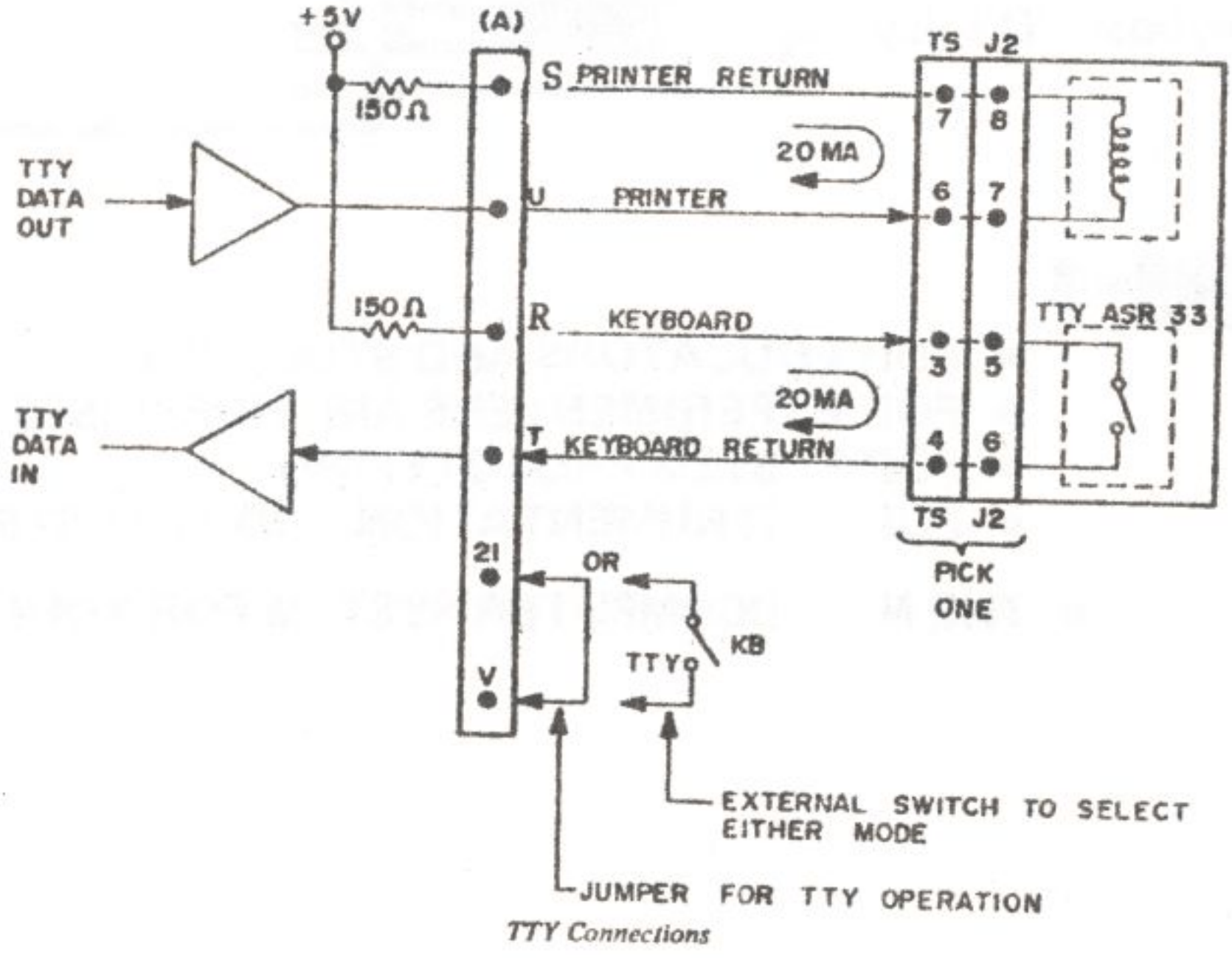


Audio Tape Unit Connections

ADDING A TELEPRINTER

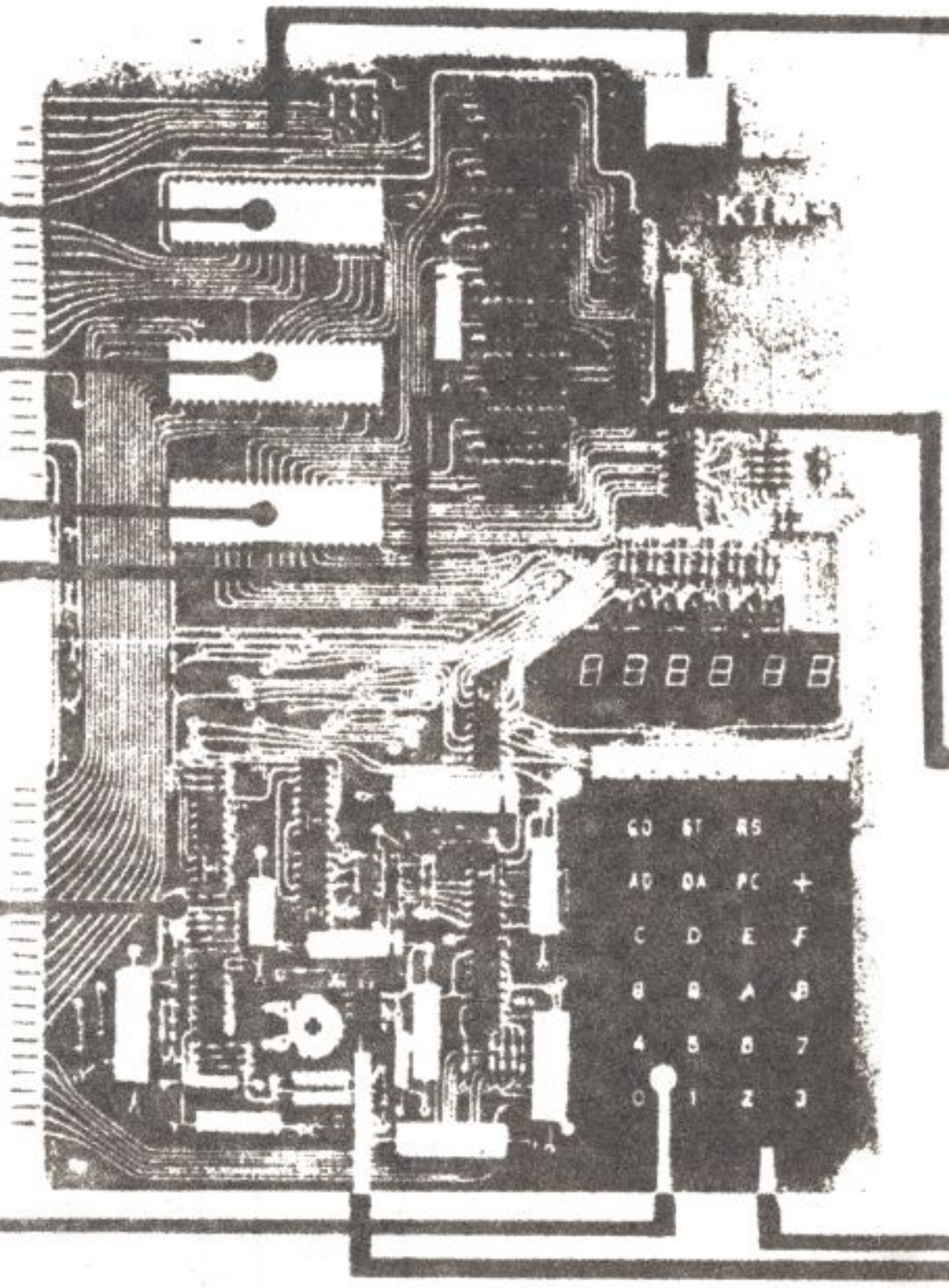
A serial teleprinter, may be added to the KIM-1 system with very little effort.

The KIM-1 provides for a 4 wire interface to the TTY. You need not concern yourself with full or half-duplex configurations since the KIM-1 system will work with either. You are not restricted to units with specific bit rates (10 CPS for TTY) since the KIM-1 system automatically adjusts for a wide variety of data rates (10CPS, 15CPS, 30CPS, etc.).



TTY Connections

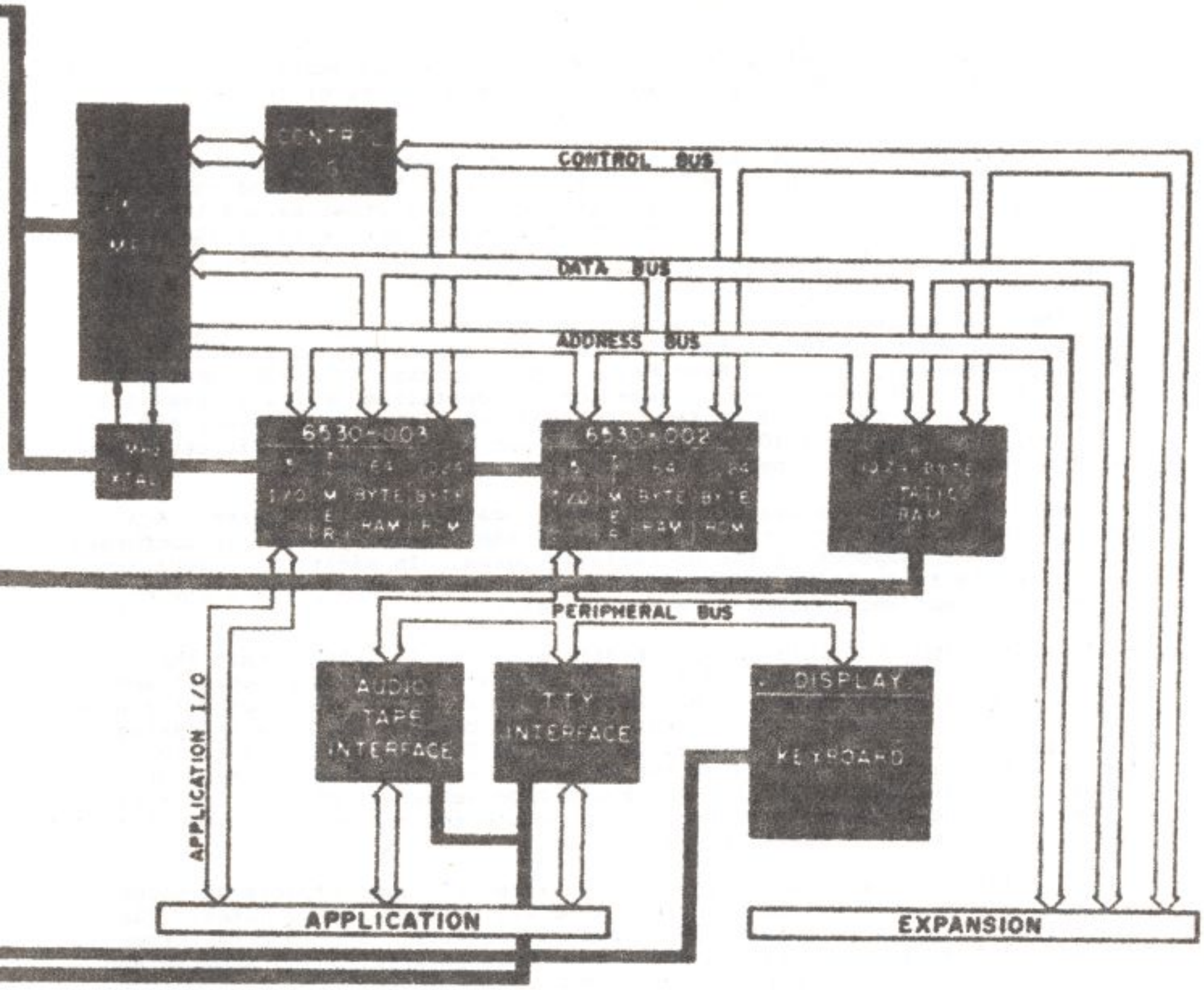
- 6502 MPU Array
- 6530 Arrays
  - 2048 ROM Bytes
  - 128 RAM Bytes
  - 30 I/O Pins
  - 2 Timers
- 1024 Byte RAM
- Interface & Control
  - Audio Cassette
  - TTY
- Keyboard/Display



KIM-1

- FOR EDUCATORS AND STUDENTS
- FOR EXPERIMENTERS AND HOBBYISTS
- FOR SYSTEM PROTOTYPING
- FOR INSTRUMENTATION AND TEST SYSTEMS

- THE MICROCOMPUTER SYSTEM FOR YOU!



KIM-1 **ONE LOW PRICE INCLUDES**

- **HARDWARE - KIM-1 MODULE**
- **SOFTWARE - MONITOR PROGRAMS (STORED IN 2048 ROM BYTES)**
- **DOCUMENTATION-**
  - **KIM-1 USER MANUAL**
  - **KIM-1 SYSTEM SCHEMATIC (WALL SIZE)**
  - **6500 HARDWARE MANUAL**
  - **6500 PROGRAMMING MANUAL**
  - **6500 PROGRAMMERS REFERENCE CARD**

Simply press the [RS] key on the KIM-1 module then press the RUB OUT key on the TTY. This step automatically adjusts the KIM-1 system to the bit rate of the serial teleprinter.

Associated with the 6502 array is a 1 MHz crystal which operates with an oscillator circuit contained on the 6502 array. This crystal controlled oscillator is the basic timing source from which all other system timing signals are derived. In particular, the Ø 2 signal generated by the 6502 array and used either alone, or gated with other control signals, is used as the system time base by all other system elements.

The 6502 microprocessor is structured to work in conjunction with various types of memory. In the KIM-1 system, all memory may be considered to be of the Read-only (ROM) or Read/Write (RAM) variety. The ROM portion of the memory provides permanent storage for the operating programs essential to the control of the KIM-1 system. Two devices, labelled 6530-002 and 6530-003, each include a 1024 byte (8 bits per byte) ROM with different portions of the operating program stored permanently in each ROM.

RAM type memory is available at three locations in the system. Again, each of the 6530 arrays include 64 bytes of RAM primarily used for temporary data storage in support of the operating program. In addition, a separate 1024 byte RAM is included in the KIM-1 system and provides memory storage for user defined application programs and data.

Input/output controls for the system also are included within the 6530 arrays. Each 6530 array provides 15 I/O pins with the microprocessor and operating program defining whether each pin is an input pin or output pin, what data is to appear on the output pins, and reading the data appearing on input pins. The I/O pins provided on the 6530-002 are dedicated to interfacing with specific elements of the KIM-1 system including the keyboard, display, TTY interface circuit, and audio tape interface circuit. The 15 I/O pins on the 6530-003 are brought to a connector and are available for the user to control a specific application.

Finally, each 6530 array includes an interval timer capable of counting a specific number of system clocks to generate precise timing gates. The exact time interval is present under program control. The interval timer on the 6530-003 array is available for a user defined application program and is not required by the operating programs.

The following diagram shows a major block labelled Control Logic. Included under this category are an address decoder used for generation of chip select signals for the 6530 arrays and the static RAM. Also indluded is the logic required to debounce the keys for system reset (RS key) and program stop (ST key). Lastly, special logic is included to allow operation of the system in a "single instruction" mode to facilitate program debugging.

MEMORY AND I/O EXPANSION

In the KIM-1 system, the management of input/output data is handled exactly the same as transfers to or from any other memory location in the system. There are no instructions dealing specifically with input/output transfers. Instead, transfer of data is accomplished by reading from or writing to registers connected to the data bus and to I/O pins in specific interface devices (such as the 6530 array). These registers have a specific address in the system just as does any other memory location. Therefore, when we speak of expanding the memory of the KIM-1 system, we are defining the methods for expanding both the real memory (RAM, ROM, PROM, etc.) as well as the I/O ports since they are both treated exactly alike as far as address assignments are concerned.

KIM-1 THE NOW MICROCOMPUTER!

KIM-1 is a complete microcomputer on a single printed circuit module. It comes to you completely assembled and tested at a price far less than most kits. Just connect your power supply (+ 5V at 1.2A, + 12V at 0.1A) and KIM-1 is operational in a matter of minutes. Need technical details? Refer to the complete User Manual, Hardware Manual, Programming Manual, or wall size Schematic included with your KIM-1.

KIM-1 THE LATEST IN TECHNOLOGY!

KIM-1 includes the MOS Technology, Inc. 6502 microprocessor array. The 6502 is an 8 bit MPU with a powerful instruction set, 13 addressing modes, multiple interrupts, and a full 65K address range (16 bits).

Also included in KIM-1 are two MCS 6530 Arrays (each with 1024 bytes of ROM, 64 bytes of RAM, 15 I/O pins, and an interval timer. The KIM-1 monitor and operating programs are stored permanently in the 2048 ROM bytes provided.

KIM-1 YOUR CHOICE OF PERIPHERALS

Use the KIM-1 keyboard and bright 6-digit LED display to enter programs, read memory contents, execute programs, and control system operation.

Next, add a low-cost audio cassette unit to your KIM-1 system to provide permanent bulk storage for programs and data (no need to blow expensive PROMS!). All required interface circuits for recording and playback of audio cassettes are included in the KIM-1 system.

Have access to a TTY (or equivalent)? Just connect four wires to add the TTY to the KIM-1 system. All interface circuits are included on the KIM-1 module. Now you can control the system from the TTY keyboard, produce hard copy printout, and punch or read paper tapes.

KIM-1 TO SOLVE YOUR APPLICATION PROBLEM

Store your programs in the 1024 byte RAM included on KIM-1. Debugging your program is simplified using the single step feature to trace program execution.

Use the 16 I/O pins provided to control your specific application circuits. Each I/O pin may be defined by the program to be either an input or an output pin.

Use the interval timer included in the KIM-1 system to generate fixed or variable time delays under program control.

KIM-1 A SYSTEM TO GROW WITH

Need more memory or I/O for more complex applications? KIM-1 is only the starting point. Expansion of the system to include up to 65K of memory is simplified since all required address bus, data bus, and control signals are available at one of the KIM-1 connectors. Memory may be of any type you choose (ROM, RAM, PROM; static or dynamic; high speed or low speed). I/O expansion is just as easy since every I/O port is addressed as if it were a normal memory location.

USE THIS FORM TO ORDER YOUR KIM-1 TODAY!

Please ship me _____ KIM-1 Systems at a cost of ~~$245.00~~ 175. per system plus ~~$4.50~~ for shipping, handling and insurance (U.S. and Canada only) PA. residents add 6% sales tax.

If Ohio State Sales Tax applies, add ~~$11.03~~ 7.88.
Shipment will be made upon receipt of payment.

My check or money order is enclosed for $_____

Purchase from:

JOHNSON COMPUTER
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Medina, Ohio 44256

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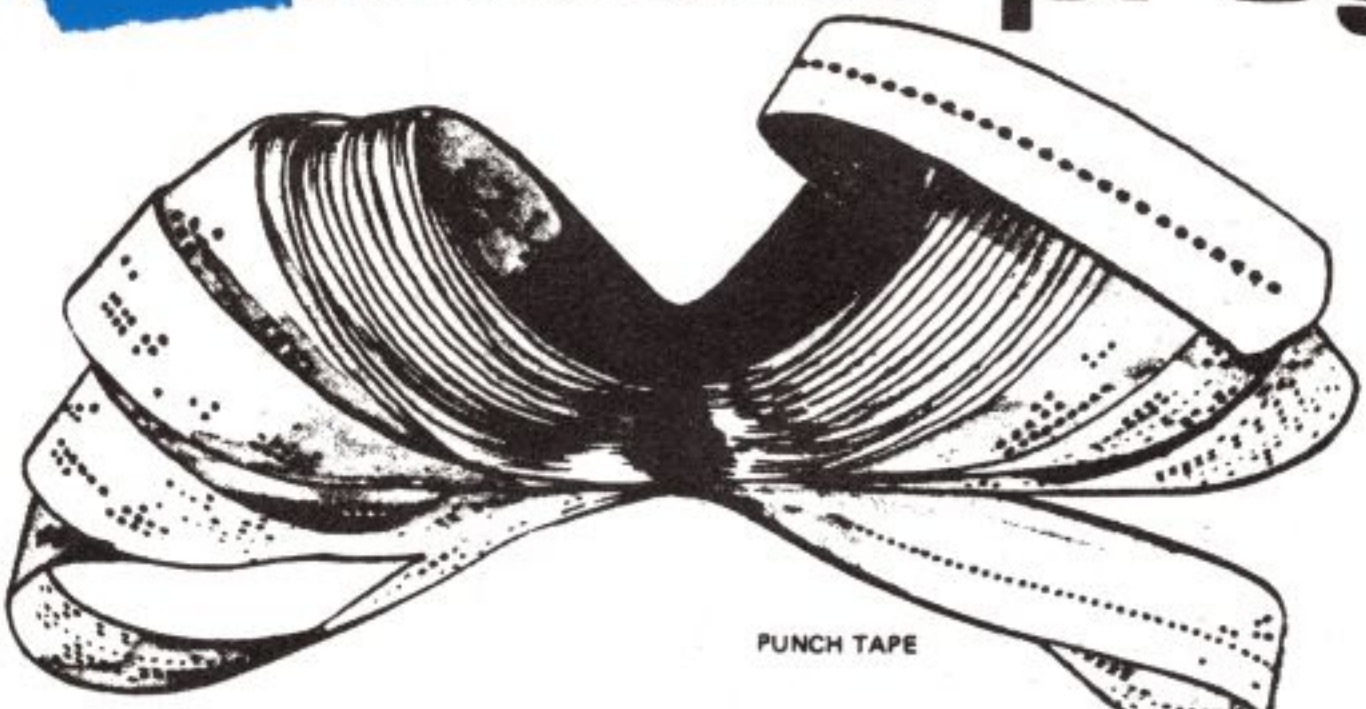
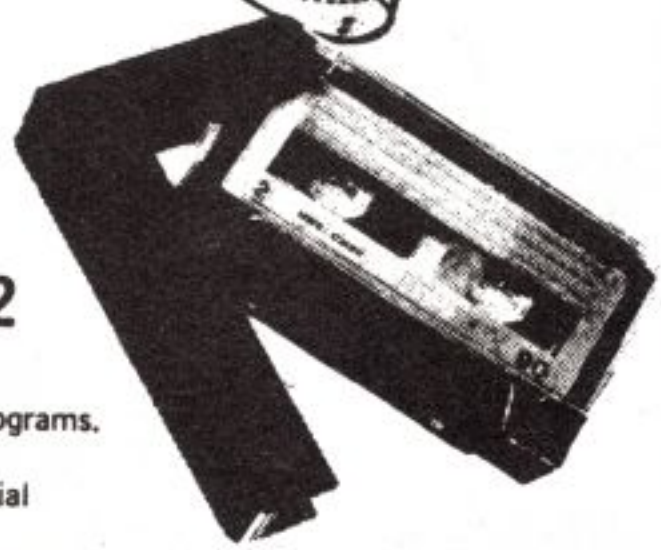
ce—see page 179

Reduce programming costs



PUNCH TAPE



ALSO AVAILABLE IN CASSETTE

DATA1-K RESIDENT ASSEMBLER/EDITOR FOR THE MOS TECHNOLOGY 6502

The DATA1-K resident assembler/editor is the new, efficient approach to the assembly of microcomputer programs. All assembler editor functions are performed entirely within memory. In most cases there is no need for a special computer system! Program with the DATA1-K on the system which will ultimately make use of the object code. This not only lowers the initial cost of a development system but greatly decreases the amount of time spent on program debugging.

The DATA1-K assembles fast—over 600 lines per minute—and uses the standard MOS Technology Assembler Language. The DATA1-K features a truly general purpose line oriented text editor with error correction and paged output capability. The DATA1-K is currently in use by: General Electric, Western Electric, Eaton, Monitor Systems, the University of Cincinnati, and many others.

It is presently available on KIM-1 format paper tape or cassette and it includes one year warranty and update.

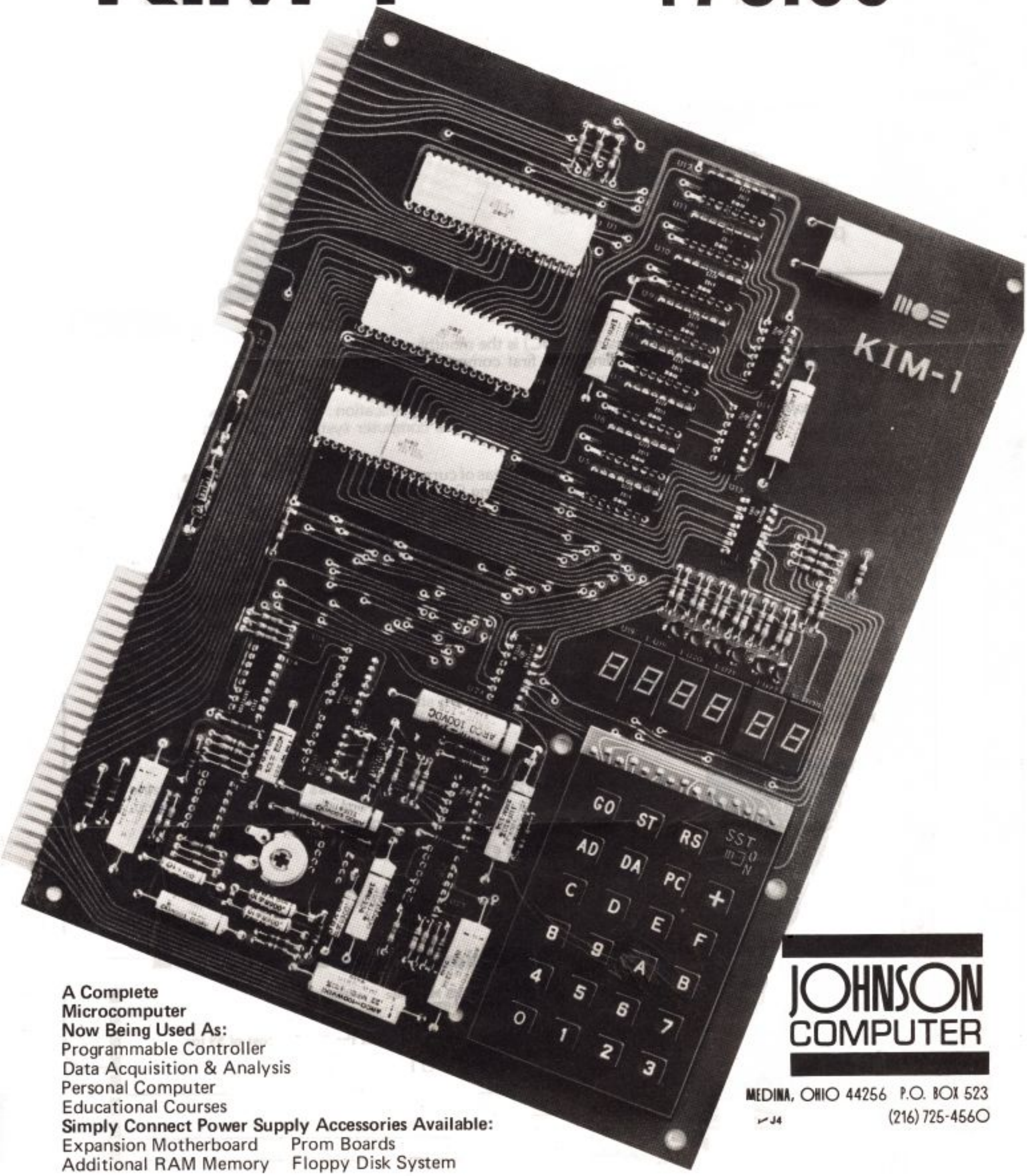
Price: $250.00

Available from Johnson Computer, P.O. Box 523, Medina, OH 44256. Phone: (216) 725-4560.
Terms: Payment with order/add $2.00 shipping and handling/add $10.00 for cassette version.
Delivery: stock to 30 days.

JOHNSON COMPUTER P. O. BOX 523 MEDINA, OHIO 44256 ✓J4

✓ Reader Service—see page 179

KIM-1 175.00



A Complete Microcomputer Now Being Used As:
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Personal Computer
Educational Courses

Simply Connect Power Supply Accessories Available:
Expansion Motherboard
Additional RAM Memory
Prom Boards
Floppy Disk System

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Reader Service—see page 179