MICROKIT MICROCOMPUTER

DEVELOPMENT SYSTEMS

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MICROKIT-8/16 MICROCOMPUTER DEVELOPMENT SYSTEMS

FIRST UNIVERSAL MICROCOMPUTER DEVELOPMENT SYSTEM FOR BOTH THE 8080 AND THE 6800

The MICROKIT-8/16 is a complete stand-alone development system for writing, debugging, and executing programs on the 8080 or the 6800 microprocessor. The system can be ordered as an 8080 based system or a 6800 based system. Conversion packages consisting of a plug-in processor module and software are available so that either system can be switched to handle the other processor.

Either basic system comes complete with an 8K memory, an alphanumeric CRT display, an ASCII keyboard, two cassette tape units, and software. Its excellent software includes a monitor/debugger, editor, and assembler designed to take full advantage of the high-speed multi-line CRT display and the tape I/O.

The MICROKIT-8/16 CRT display holds 960 characters formatted as 24 lines of 40 characters. Since the display is refreshed directly from the microcomputer memory, the full 960 character screen can be written at 20,000 cps. Using the fast CRT the interactive debugging program can generate a full screen hexadecimal memory dump display instantaneously. This kind of quick system response speeds the debugging task.

The MICROKIT editor also makes use of the fast CRT display. The screen based editor is quickly learned and easy to use, because changes are displayed instantly and in full context on the CRT.

To keep cost low, the MICROKIT-8/16 uses a standard television set for the high-speed display, and audio cassette units for mass storage. Because of MICROKIT's proprietary recording technique, data is transferred to the audio cassette units at the rate of 2000 bps with data reliability comparable to digital cassette units.

MICROKIT-8/16 FEATURES

The MICROKIT-8/16 incorporates a number of standard features, some of which are unique among microcomputer systems:

    8K bytes of RAM memory--expandable to 32K bytes.

    Memory write protect where each 1K page of memory can be write protected under software control.

    960 character CRT display refreshed from system memory.

53 key ASCII keyboard with 2-key roll over.

Two audio cassette tape units, fully supported by the
software.

A crystal controlled programmable real-time clock with 32
microsecond resolution.

Interrupt driven I/O. All I/O devices including the
real-time clock can interrupt the CPU. All interrupts can be
masked under software control.

Vectored interrupt.

Bootstrap loader in PROM.

Two EIA RS-232C serial interfaces - one for modem, one for
teleprinter.

1 megabyte/second dMA capability.

Six extra card slots for custom interfaces.

OPTIONS AND ENHANCEMENTS

The MICROKIT-8/16 is backed up with a full line of enhancements.
These include In-Circuit Emulators, EPROM programmers, add-on RAM
or EPROM memories, line printers, "semiconductor disk" memory
resident operating systems, and single or dual drive floppy disks
with disk operating systems.

With all these peripherals, the MICROKIT-8/16 is also well suited
for laboratory and industrial applications such as: 1) a complete
inexpensive computer, 2) a programmable controller, or 3) a data
acquisition system.

MICROKIT-8/16 HARDWARE CONFIGURATION

The MICROKIT-8/16 system consists of the following elements:
mainframe, keyboard, CRT display, and two cassette tape units.
The mainframe is packaged in a compact desk-top enclosure and
contains power supplies, a card cage, and the four system modules:
CPU, RAM, CRT-Keyboard I/O, Tape-EIA I/O.

The MICROKIT system is built around a universal system bus through
which all the system modules communicate. The CPU module
interfaces to this bus and controls the operation of the system.
The 8080 and 6800 are only the first of a series of processors to
be supported by the MICROKIT-8/16 system. The modular nature of
the system makes it adaptable to other popular 8 and 16 bit

Processors.

The 8K byte memory of the standard system is contained on one
memory module. The system memory is easily expanded by plugging
in additional 8K modules. Each 1K page of memory is separately
write protectable under software control.

Input/output from the MICROKIT-8/16 is provided by the two I/O
modules. The CRT-Keyboard I/O module contains the interface logic
for the keyboard and the CRT display. The keyboard interface
supports the mini-operator console located on the keyboard. The
console functions include two switches: "system reset" and
"initial program load" (from cassette tape), and two status
displays: "run", and "interrupt enabled". All other front panel
functions and debugging aids are provided by an interactive
debugger through the CRT display.

The second I/O module, which is the Tape-EIA module, contains a
number of interfaces as follows:

Tape Interface - The tape interface connects the microcomputer to
        the two audio cassette tape units.

Dual RS-232C Interface - This allows bit serial communication with
        both a terminal and a modem. Speeds up to 1200 Baud are
        possible, under program control.

Crystal Controlled Real Time Clock - The real time clock is used
        by the RS-232C interfaces for accurate bit timing. The clock
        is also available for other timing applications.

8-Bit Parallel I/O Port - This TTL port is unassigned and allows
        for interfacing a user designed device. It provides a
        bidirectional test port that can interface with user
        equipment.

Bootstrap PROM - The 256 byte PROM contains a bootstrap loader
        which may be invoked by the initial load button on the
        keyboard-console. It loads the system software from cassette
   tapes.
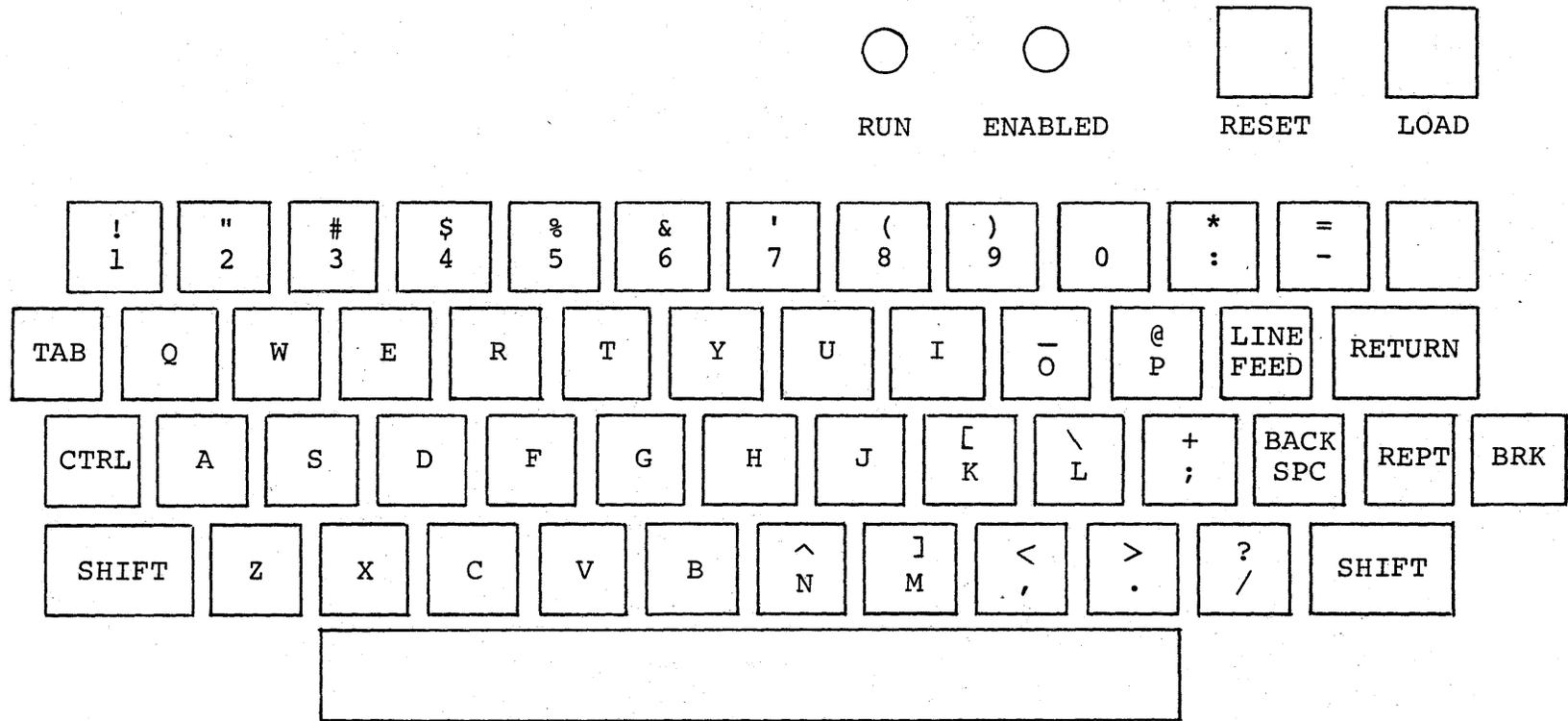
Fig. 2 MICROKIT KEYBOARD

MICROEMULATOR

The Microemulator provides the design engineer and programmer with
editing, assembling and debugging facilities directly in to the
hardware system that is being designed. The designer/programmer
is able to exercise all of the user system I/O devices, memory,
interrupt structure and direct memory access facilities through
the Microemulator plug. With the Microemulator, the MICROKIT-8/16
will respond to user system interrupts, ready line, reset line,
hold line and clocks. It will generate addresses, status signals
and strobes and it will send to and receive data from the user
system.

The complete Microemulator consists of four distinct modules.
These are: 1) the Microemulator logic board, which mounts in the
MICROKIT and controls the connection between the microprocessor
within the MICROKIT and the user system; 2) the Microemulator plug
assembly, which provides the processor at the end of a remote
cable that can be plugged directly into the system microprocessor
socket; 3) the hardware break single step and PROM programmer
interface module, which also mounts in the MICROKIT card cage; and
4) the PROM programming assembly, which is connected via 26 pin
flat cable to the PROM interface module.

The Microemulator package can then be considered to provide three
separate functions. These are: 1) the extension of the
MICROKIT-8/16's microprocessor into the user system; 2) the
analysis features of hardware breakpoint and single step; and 3)
the ability to program PROMs -- specifically the 2704 (512 x 8)
and 2708 (1024 x 8) PROMs. This combination of tools is
especially useful in the task of combined hardware and software
development. It should be particularly valuable during product
development, hardware software integration, production test, and
depot maintenance of microprocessor systems. With such features
as the MICROKIT RAM operating system or disk operating system, it
provides tools unmatched in systems costing many times more.

BASIC OPERATION OF THE MICROEMULATOR

The Microemulator uses the same microprocessor for both the host
functions of program development: including source code editing,
program assembly, program loading, PROM programming and
peripherals management; and the user functions of emulating the
microprocessor in the system under test. Commands are included in
the microemulator monitor that allow the designer to switch over
various of the microprocessor functions into the user system.
Thus, there is separate software control of 1) the source of
clocks; 2) the source and response to interrupts, reset line and
ready line; 3) response to user DMA requests; and 4) memory

mapping functions.

The Microemulator software package is extremely simple to use and
easy to learn. In addition to the basic MICROKIT monitor commands
(DISPLAY, STORE, EXECUTE, WRITE, FIND and BREAKPOINT SETTING), the
Microemulator monitor adds three additional functions: SINGLE
STEP, CONTROL (for setting the mode of operation) and TRACE.

During the initial phases of a design program (before the hardware
is available), the MICROKIT will be used in the host mode to
develop software. Gradually, as the hardware system is brought
up, various functions can be switched into the user system.

   Thus, first the clocks would be switched over to see if the
   clock circuits, sync., etc., were working properly.

   Second, control would be passed to the user system and
   response to interrupts, reset and ready line can be tested.
   User DMA mode would be connected and enabled as required.

   Third, a NOP program would be executed to verify
   microprocessor operation in the user enviornment.

   Fourth, diagnostic programs would be developed and run using
   the Microemulator feature to test the operation of I/O
   devices and verify the hardware design.

   Fifth, the user system would be exercised with all program
   and data memory in the MICROKIT using PROM simulator and RAM
   simulator memory within the MICROKIT system.

   Sixth, the memory functions would be switched over to the
   user system with user RAM and user PROM taking the place of
   MICROKIT PROM and RAM simulator memory.

   Finally, seventh, the MICROKIT would be completely
   disconnected and the user microprocessor will be installed in
   the system.

This stepwise approach to debugging hardware and software is
extremely effective since each step is a relatively small
extension of the preceding step.

MICROEMULATOR DEBUG COMMANDS

Only three commands have been added to the basic Monitor-Debugger
described on pages 3-1 and 3-3 of MICROKIT MICROCOMPUTER
DEVELOPMENT SYSTEMS.   These three commands are:

C p,p,p   Set operating mode (Control).   Three parameters can
                  be specified.

                  C   switch to user clocks.
                  U   switch to user control lines.
                  D   enable user DMA request.

T   Begin trace execution at present cursor location.

T addr   Begin trace execution at hexadecimal address
                  "addr".

T$ Recall last trace display.

E(control)   Single-step the program.

OS/8080

MEMORY RESIDENT OPERATING SYSTEM FOR MICROKIT-8/16 MOD 8080
MICROCOMPUTER DEVELOPMENT SYSTEM

OS/8080 is a complete "in memory" operating system for developing
8080 microcomputer programs using the MICROKIT-8/16. OS/8080
provides a program development tool unmatched by any other
software development system. It consists of a monitor/debugger,
editor and assembler all co-resident in memory along with a 14K
byte source code workspace and 4K byte object code work space.
This is sufficient to store a 1000 line source program.

Since the system software, the source program and the object code
are simultaneously in memory, the user is able to instantaneously
switch from editing to assembling to debugging. This facilitates
rapid programming in two ways since (1) overhead for loading
programs and data is reduced to zero and (2) the user is able to
rapidly test many changes and options.

OS/8080 makes use of MICROKIT's unique 8K RAM memory boards with
write protection registers. This allows each 1K page of memory to
be individually protected and unprotected under program control.
Without this feature, the user could inadvertently "clobber" his
source program during execution and destroy hours of work.

Non-volatile storage of debugged programs (source and object) is
provided by the MICROKIT-8/16 system cassette tape units. Loading
and dumping to cassette tape takes less than 3 minutes and is
usually done only once per session. Thus OS/8080 provides the
microcomputer programmer with tools that were previously available
only on the largest of computer systems, and makes the
MICROKIT-8/16 superior to systems costing more than twice as much.
Yet the MICROKIT-8/16 with OS/8080 is still the least expensive
8080 development system with peripherals.

MEMORY CONFIGURATION

OS/8080 runs in 32K of main memory. User programs can occupy the
first 4K of memory. (X'0000' -- X'0FFF') The systems' programs,
Editor work area, and Symbol Table occupy the region from X'1000'
to X'7FFF'.

OS/8080 SOFTWARE

The OS/8080 software package uses the standard MICROKIT Editor,
Assembler and Monitor prrograms with a series of enhancements as
will be described. These fall into four categories: 1) System
commands, 2) Editor commands, 3) Assembler commands, and 4)
Monitor commands. These commands will be described in that order.

SYSTEM COMMANDS

Three System Commands have been added. These allow the user to
switch between the three system programs: Editor, Assembler and
Monitor.   They are:

    JA - Jump to the Assembler when in Editor or Monitor mode.
    JM - Jump to the Monitor when in Assembler or Editor mode.
    JE - Jump to Editor when in the Assembler or Monitor mode.

These commands allow the user to rapidly switch from one of the
system software packages to the other. This means that when
errors are detected in the Monitor program, they can be
immediately corrected in the source program rather than using
machine language patches.

NEW EDITOR COMMANDS

A small number of commands have been added to the Editor program.
In most cases, they are designed to reduce the opportunity for
operator error.

The commands are as follows:

    CLR - Clear the Workspace.   This avoids the possibility of
    inadvertently clearing the workspace by typing a "C".

    REW - Rewind the Input Tape.   This avoids the possibility of
    inadvertently rewinding the tape with an "R".

    A RETURN during READ will interrupt the READ routine.

    A RETURN during WRITE will generate the message RESTART
    WRITE?.   This allows the operator to interrupt a WRITE
    command without losing the contents of the workspace.   Thus,
    if the cassette has been inserted upside down, or the
    recorder is not in the write mode, correction is possible
    without losing the workspace contents.   After the RESTART
    WRITE message appears, the programmer may type either a "Y",
    in which case the output tape will be rewound and the work
    area will not be cleared, or the programmer may type RETURN,
    in which case the write will be interrupted and may be
    restarted.

    E C - Outputs to tape and writes and end-of-file, but does
    not delete the data from memory.   Useful for checkpointing
    work in progress without deleting it so that it has to be
    read in again.

Three commands have been included that allow the programmer to write two tapes on the initial entry of the program. This provides the same sort of redundancy that the "old" and "new" tapes provide after the first set of tapes have been written. In this case, the programmer inserts cassettes into both recorders and puts both recorders into the write mode. He then has available the following three commands:

> WB - Output to both tapes. A write command, just like any other write command.
> WB$ - Write the top half of the workspace to both tapes.
> EB - Output to both tapes and End-file.

Two more commands have been added that allow the user to scroll through the workspace. They are:

> Control A - Advance one line.
> Control A Repeat - Scroll up.
> Control B - Back-up one line.
> Control B Repeat - Scroll down.

NEW ASSEMBLER COMMANDS

A series of commands have been added to the Assembler in OS/8080. These primarily are used to accomplish assemblies out of memory. The default input is from memory, the default object is to memory. Pass 1 and pass 2 are both run in response to a RETURN after invoking the Assembler. The following input/output option parameters have been added to Pass 1 and Pass 2:

> 1 - 1 is a parameter used to run Pass 1 from tape. It is used in conjunction with the I command that indicates a tape input.
> 2 - 2 is a parameter, again required only for input from tape. It can be used with assemblies from memory also to avoid re-running Pass 1.
> I - I is a parameter required both in Pass 1 and Pass 2 when input is from tape rather than from memory.

The following parameters apply to Pass 2 only. NOTE: when assembling from memory, the 1 and 2 parameters are not necessary. Also, it is not necessary to have both the L and T commands in order to get a truncated listing on the CRT. The T command alone will produce a truncated listing. The parameters are as follows:

> L - List the program to the CRT; non-truncated.
> T - List the program to the CRT; truncated.
> E - List errors only.
> O - Produce an object tape.
> N - Inhibit the object load to memory.

P - Print the listing on an Okidata Printer (the default
print option is now for the Okidata Printer).
Bn - Print to EIA Port 1.   The n following is an optional
parameter specifying Baud rate as described in the assembly
manual.   NOTE: The default Baud rate is 110 Baud.

One other modification of the Assembler involves a missing end
statement.   If the Assembler encounters an End-of-file without an
End statement, it will print the message NEXT TAPE . . .   "E" TO
END. If the programmer then types "E" the Assembler will
automatically insert an End statement.   Otherwise, the programmer
may insert another tape into the reader and continue the assembly.

NEW MONITOR COMMANDS

A number of new debugging commands have been added to the Monitor
program.   They are:

    FD,D,. . . - Find command, used to search memory for
    hexidecimal strings.
    F - Find command without parameter, uses the last parameters
    loaded.

    B Sn - Set breakpoint 1 through 4, allows the programmer to
    set up to 4 breakpoints in the program.   The instructions
    clobbered with the software breakpoint (FF) will be saved so
    that they may be restored.
    B Dn - Display breakpoint command, positions the cursor at
    the specified breakpoint.
    B R - resets the breakpoint at the breakpoint location just
    displayed.
    BC - Clears all temporary storage of breakpoints.   Allows the
    programmer to again set from 1 to 4 breakpoints.

    Control A - Advance the memory display 8 locations.
    Control B - Backup the memory display 8 locations.   NOTE: The
    repeat key will scroll in combination with these commands.

The Store (S), Find (F) and Zap (Z) commands have been modified to
allow either HEX or ASCII characters as arguments.   Thus, the
following commands are valid:

    S 'A'
    F 'B', 'C'
    Z A='A'

The Display (D), Execute (E), and Write (W) commands have been
modified to allow for expression evaluation of the address using
the following operators: "+" for adding parameters,   "-" for
subtracting parameters,   "*" to point to an indirect address, and

finally a new operator "#" indicating a symbolic label.   This last
operator allows the programmer to position the cursor at the
location of a label stored in the Label Table.   For example, if
the label LOOP has the hexadecimal address 113, then the command
D#LOOP will cause the cursor to be positioned at address 113.   All
operators will be scanned from left to right.   There is no
hierarchy in any of the operators.

MICROPRINT/65

65 LPM PRINTER FOR MICROKIT-8/16 MICROCOMPUTER DEVELOPMENT SYSTEM

The MICROPRINT/65 is a 65 lpm line printer for use with
MICROKIT-8/16 Microcomputer Development System.   The MICROPRINT/65
prints bidirectionally at 65 lines-per-minute on standard TTY roll
paper.   The printer utilizes a 5 x 7 dot matrix to produce highly
legible characters.   Standard TTY ribbons are also used, thus the
user is free from the bother and cost of special paper or special
ribbons.

The MICROPRINT/65 is a simple, proven and reliable line printer
capable of heavy duty operation.   It can print single and
multipart forms.   Options are available for form feed fan-fold
paper, and upper and lower case printing.

The MICROPRINT/65 is delivered complete with interface and
software to run with the MICROKIT-8/16 microcomputer system.
Optional software includes a Word Processor package for use with
the upper/lower case printer.

MICROKIT DISK OPERATING SYSTEM

The MICROKIT Disk Operating System -- MICRODISK -- consists of a dual floppy disk drive, interface and software package.

With MICRODISK the user is now able to edit and assemble large programs 160 times faster than is possible with TTY based systems. The MICRODISK combined with the unique screen based editor, interactive debugger, high speed assembler and In-Circuit Emulator make the MICROKIT-8/16 the most powerful microcomputer development system available.

Each diskette has 77 tracks. The first track is always reserved by the system for the directory of files. Thus, there are 76 tracks available for system and user files. Each track is 26 sectors of 128 bytes.

DISK OPERATING SYSTEM FEATURES

The MICROKIT Disk Operating System incorporates a number of features which make it unique among microcomputer systems:

Overlapped I/O and high-speed assembler doubles assembly throughput.

File management system provides up to 76 files per diskette.

Dual drive system provides 500 kilobytes of on line storage.

Minimum resident Monitor reduces main memory requirements

Disk management functions allow user to create "load and go" system files for production programs.

High speed CRT display and interactive debugger automatically generate full screen "snapshot" register and memory dumps faster than the blink-of-an-eye.

Interactive screen based Editor eliminates blind editing. User receives instantaneous feedback on the results of each editing command.

Utility package is provided for translation of media to and from; telecommunication ports, paper tape, cassette tape, EPROM's, and diskette. Utility package is provided in source form allowing users to include all or part in their programs.

All Monitor functions -- creating, accessing for read and

write, deleting, copying and renaming of disk files -- are
accessible by user programs.   These powerful file management
functions provide the complete capabilites of disk operating
system for any application the user may envision.

Bootstrap loader in EPROM eliminates clumsy manual
operations.

Disk interface board also contains a full interface for
high-speed paper tape reader.

MICRODISK SOFTWARE

The software package is organized into six modules as follows:

MONITOR   Provides the basic disk management functions that are
               used to: create, delete, copy and rename files.

EDITOR   Creates and updates source (text) files stored on
               diskette.

ASSEMBLER   Converts editor created source files to machine
               executeable object files.

LOADER   Loads and dumps object files.

DEBUGGER   Generates the monitor "snapshot" dump display and
               provides interactive program debugging features.

UTILITY   The utility module allows the user to transfer files
               from media to media.   Includes routines for cassette
               tape, diskette, EPROM, telecommunication lines, and
               paper tape.

OPERATING PROCEDURES

The MICRODISK system allows the user to invoke any of the system
modules from the present module he is using with the following
commands:

JM   Jump to Monitor
JE   Jump to Editor
JA   Jump to Assembler
JL   Jump to Loader
JD   Jump to Debugger
JU   Jump to Utility

The user may create up to 30 other system files of this type.

MONITOR

The disk monitor is loaded from diskette into the top end of
memory by the EPROM bootstrap loader.   The MICRODISK Monitor is
used for file management functions.   The Monitor commands are
summarized below.

C filename,
init, ext   Creates a file with name "filename", size "init",
                     and extension size "ext".

S filename   Delete (scratch) "filename".

A filename,
attributes   Change the attributes of "filename".   attributes
                     are:

                     O - object file
                     S - source file
                     W - write protected file
                     P - permanent file
                     Z - system file

D (unit)   Display the directory for "unit" which may be 0 or
                     1.   Unit may be omitted with default to unit 0.

I   Initialize and clear all files on unit 1.

M fromfile,
tofile   Copies (move) "fromfile" to "tofile" the
                     destination file "tofile" may have the prefix "N:"
                     to indicate the file is to be created.

X fromunit,
tounit, parm   Copies all files from diskette in "fromunit" to
                     diskette in "tounit".   "parm" indicates which files
                     are to be copied as follows:

                     No "parm"copy all user files
                     A   copy all files
                     S   copy all system files

R oldname,
newname   Rename the file "oldname" to "newname"

EDITOR

The MICRODISK Editor has all of the features of the tape and O/S

8080 Editors described on pages 3-3 and 3-4 of "MICROKIT
MICROCOMPUTER DEVELOPMENT SYSTEMS".   In addition the MICRODISK
Editor has the following file management commands:

W filename   Write all data from the editor work area to
                  "filename".

W   Write all data from the editor work area to the
                  previously opened write file.

W*   Write all data from the editor work area to the
                  previously opened write file.   Do not clear the
                  work area.

                  Note that combinations of the above parameters are
                  allowed.

L filename   Load the editor work area from "filename".

L   Load additional data from previously specified read
                  file.

N   Write work area to previously specified write file
                  and load additional data from previously specified
                  read file.

ASSEMBLER

The MICRODISK Assembler is quite similar to the tape and O/S 8080
Assemblers described on pages 3-5 and 3-6 of "MICROKIT
MICROCOMPUTER DEVELOPMENT SYSTEMS".   tHE MICRODISK Assembler will
request (upon assembly process request) the name of the Input File
(source file) and the name of the Output File (object file).   The
MICRODISK Assembler will allow the user to create a new file for
the object code without return to the Monitor.

LOADER

The MICRODISK Loader is used to load and dump object files.   The
loader has three commands:

L filename   Loads data from "filename" into memory.

E filename   Loads data from "filename" into memory and begins
                  execution at entry point.

W filename,
addr1,addr2,...   Writes data from memory at specified addresses into
                  "filename".   File may be created without return to
                  the Monitor.

DEBUGGER

The MICRODISK Debugger has the same functions as the Tape System
Monitor described on pages 3-1 and 3-3 of "MICROKIT MICROCOMPUTER
DEVELOPMENT SYSTEMS"; with the exception of the tape commands.
These functions have been implemented in the Loader.

UTILITY

The MICRODISK Utility contains a number of functions which provide
for the transfer of data between the various media (diskette,
cassette tape, paper-tape, telecommunication ports and EPROM
programmer) supported by the MICROKIT system.

The only function required is a copy function and the operator
need only specify input device, source or object data, output
device and "filename" if the disk is to be used.
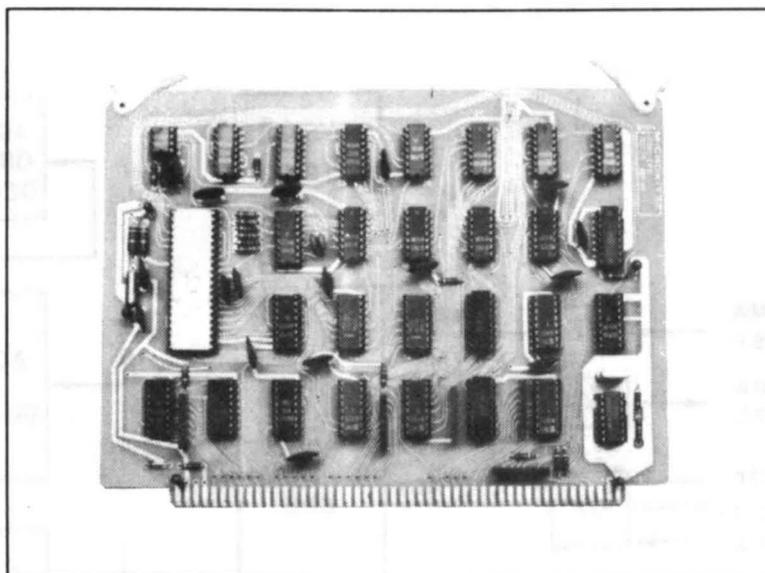
Processor	8080
Instrucion Set	78 including conditional branching, binary and BCD arithmetic, logical operations, subroutine stack, 7 registers
Memory Addressing	16 bits, up to 64K bytes
I/O Addressing	8 bits, up to 256 input and 256 output addresses
System Clock	Crystal Controlled, 2.0 MHz +/- 0.1%
Interrupts	8 level vectored priority interrupts
Power-on Restart	Automatic bootstrap load
Connector	Dual 50-pin on 0.125 centers Wirewrap P/N CPH8100-100 (SAE)
Board Dimensions	6.00" x 8.00" x 0.062"
Operating Temp.	10 C to 40 C
DC Power Requirements	+5 +/- 5% @ 0.75A +12 +/- 5% @ 0.2A -12 +/- 5% @ 0.05A

8080 CPU BLOCK DIAGRAM (M8-80)
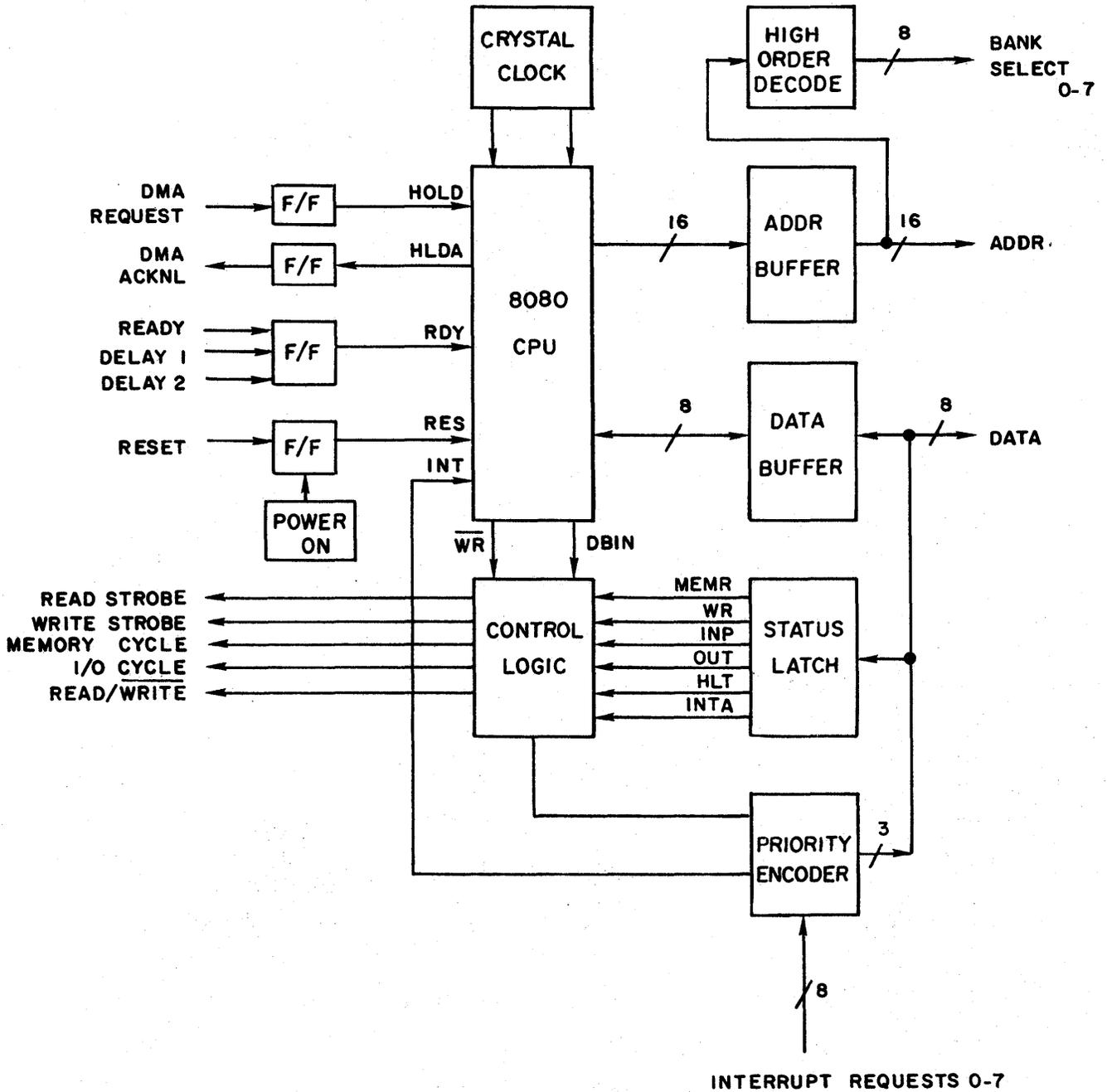
RAM MEMORY MODULE SPECIFICATIONS   M8-10
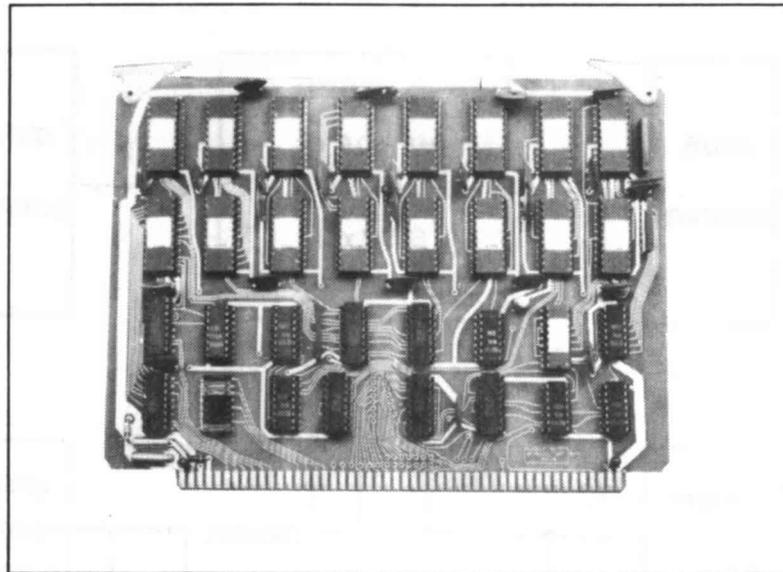
Memory Size	8K bytes
Word Size	8 or 16 bits (16 bits requires two modules)
Cycle	460 ns read; 970 ns write using 4K dynamic RAM chips
Refresh	64 us every 512 us accomplished by CRT access
Connector	Dual 50-pin on 0.125 centers Wirewrap P/N CPH8100-100 (SAE)
Board Dimensions	6.00" x 8.00" x 0.062"
Operating Temp.	10 C to 40 C
DC Power Requirements	+5 +/- 5% @ 0.5A +12 +/- 5% @ 0.25A -12 +/- 5% @ 0.05A

MEMORY BLOCK DIAGRAM (M8-IO)
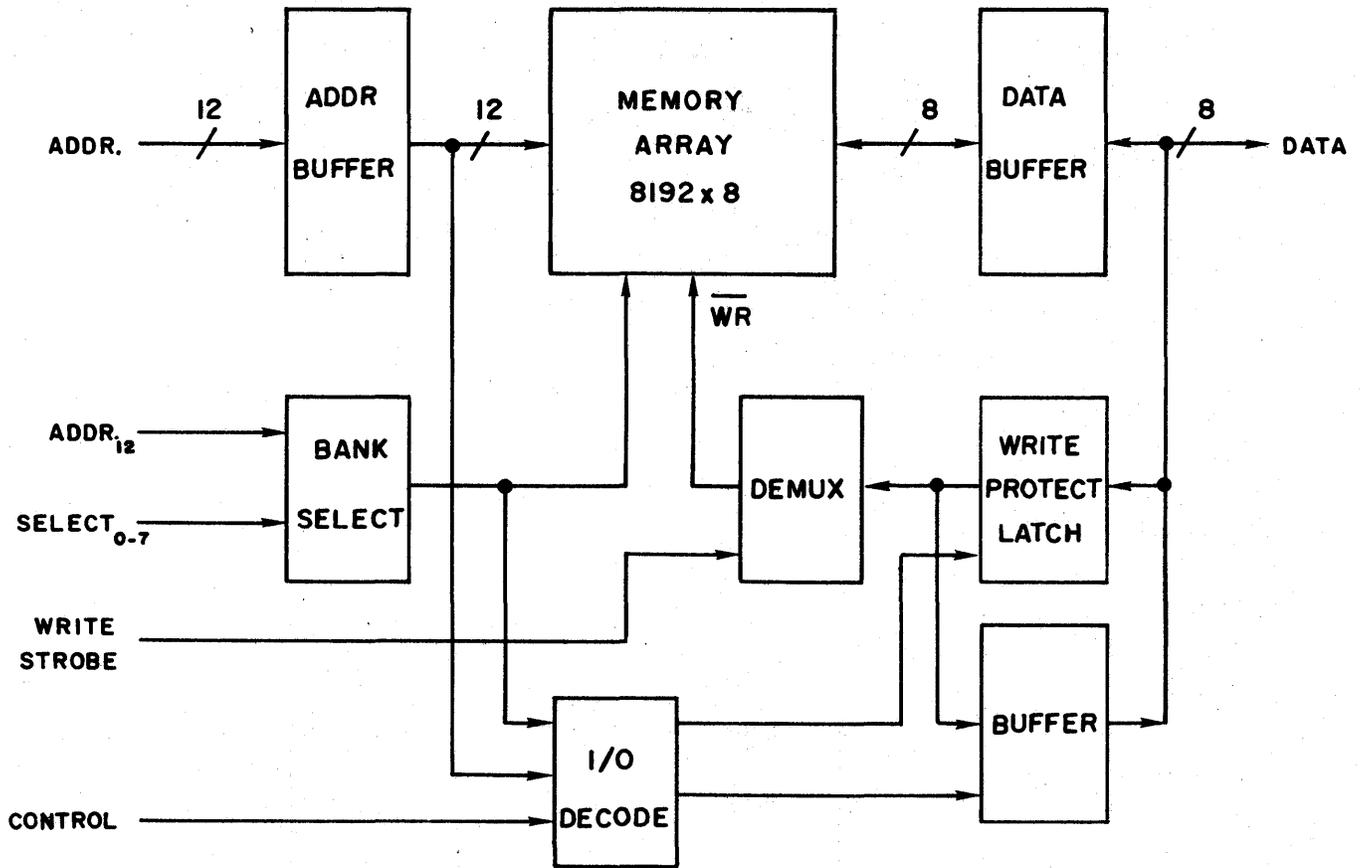
CRT - KEYBOARD I/O MODULE SPECIFICATIONS   M8-20
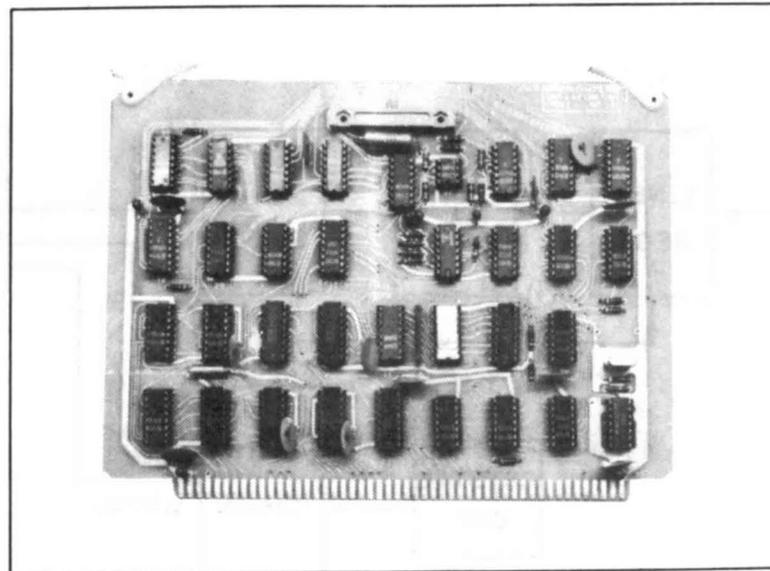
CRT Display Size	24 lines of 40 characters
Character Set	Standard 64 character ASCII set
Character Generation	5 x 7 dot matrix
Display Memory	Accesses main memory using DMA
I/O Transfer Rate	20,000 cps
Refresh Rate	60 Hz
Video Output	Composite video without interlace
Interrupts	Maskable interrupts for keyboard strobe and break interrupt (BRK) key
Keyboard Interface	7 bit ASCII with character strobe
Mini-Console Interface	Switch closures for system "reset" and bootstrap "load"; TTL outputs for driving "run" and "interrupt enabled" LED's.
Connector	Dual 50-pin on 0.125 centers Wirewrap P/N CPH8100-100 (SAE) 20-pin Scotchflex header Connector P/N 3421 (3M)

CRT & KEYBOARD I/O BLOCK DIAGRAM (M8-20)
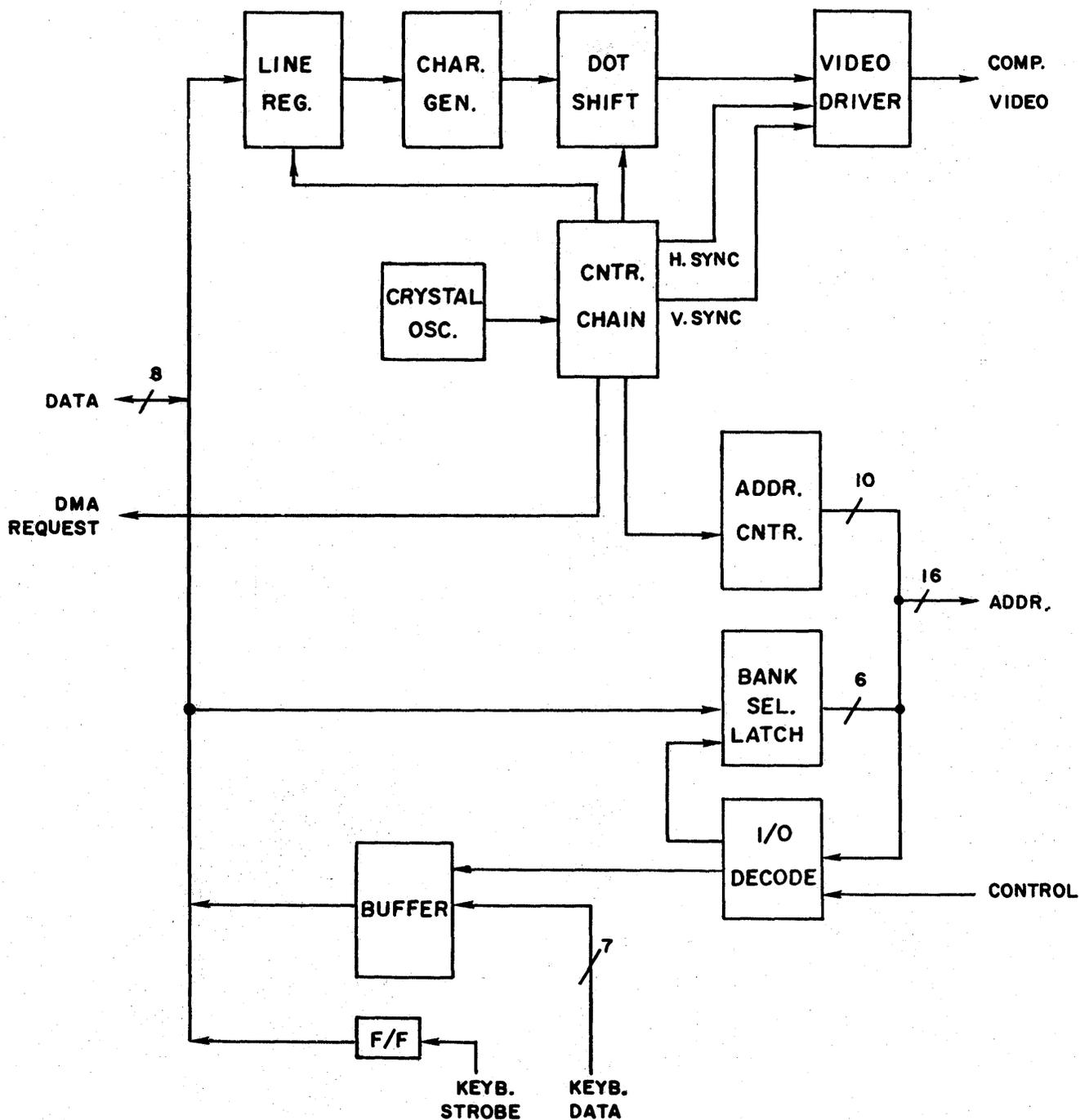
Board Dimensions   6.00" x 8.00" x 0.062"

Operating Temp.   10 C to 40 C

DC Power Requirements   +5 +/- 5% @ 1.0A
                          -12 +/- 5% @ 0.2A
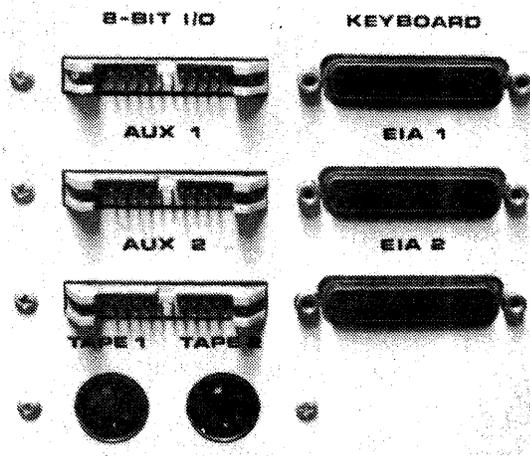
MICROKIT-8/16
I/O Connectors

TAPE & EIA I/O BLOCK DIAGRAM (M8-21)

TAPE 1 → TAPE READ DECODER

TAPE 2 → TAPE READ DECODER

TAPE 1 ← TAPE WRITE ENCODER

TAPE 2 ← TAPE WRITE ENCODER

TAPE 1 ← TAPE MOTOR CONTROL

TAPE 2 ← TAPE MOTOR CONTROL

EIA 1 ← EIA INTERFACE

EIA 2 ← EIA INTERFACE

CPU CLOCK ← RTC COUNTER

8-BIT I/O ← 8 → BUFFER / LATCH

8 → DATA

I/O DECODE

8 / ADDR.

CONTROL

BOOT PROM 256 x 8
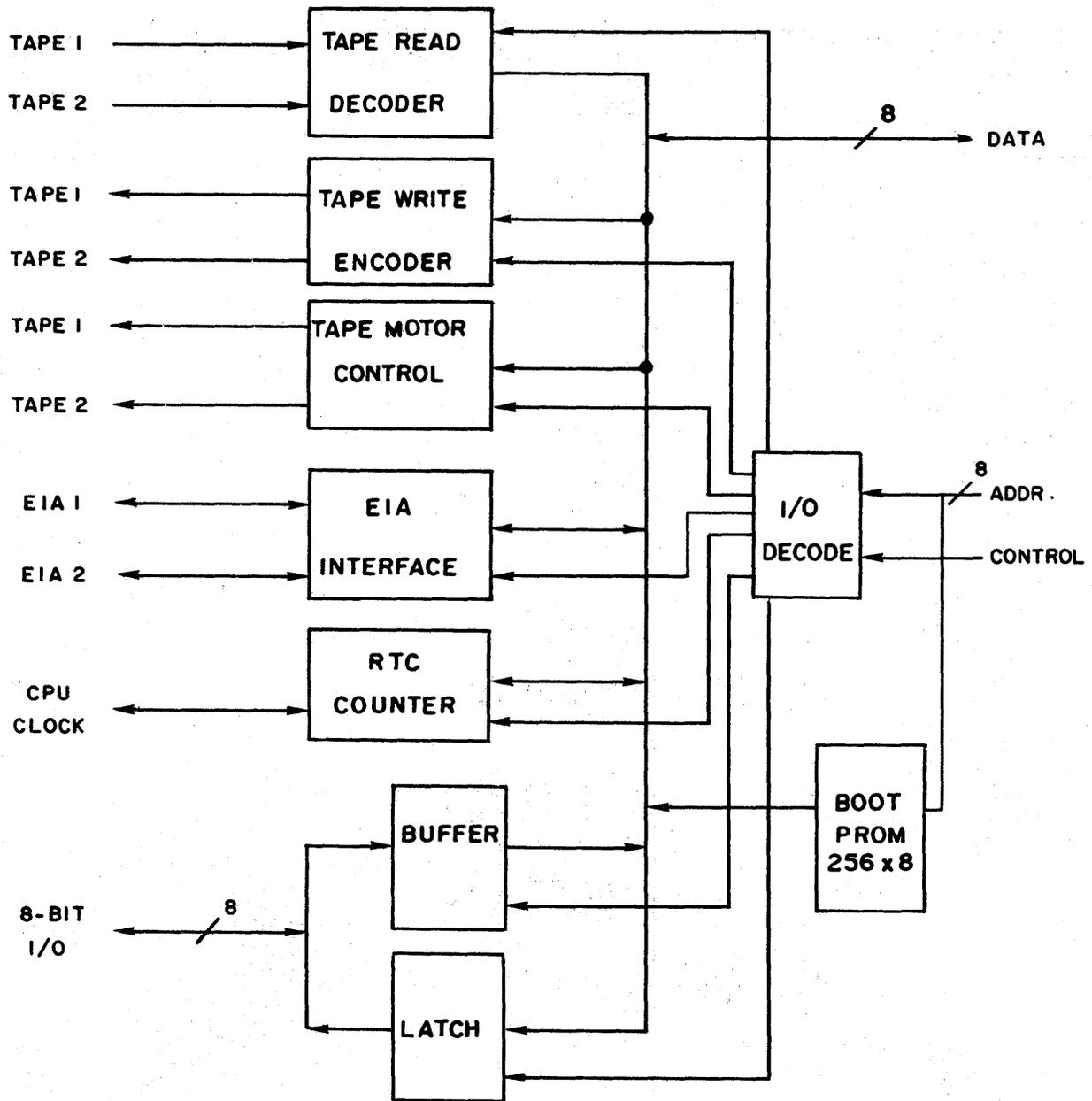
TAPE - EIA I/O MODULE SPECIFICATIONS   M8-21
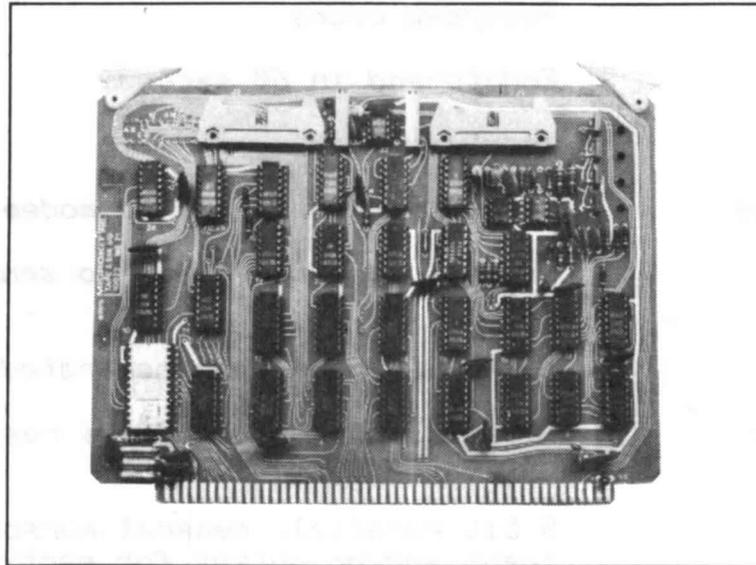
Cassette Type	Philips type audio cassettes
Tape Units	Panasonic RQ-309AS
No. of Heads	One
No. of Gaps	One
No. of Tracks	One
Recording Technique	Phase encoded (Harvard)
Bit Transfer Rate	2000 bps
Recording Density	1067 +/- 2% bpi
Character Transfer Rate	225 cps max. 100 cps average including overhead
Error Detection	16-bit checksum
Error Correction	Redundant recorded data
Error Rate	Recoverable: 1 in 1,000,000 bits Unrecoverable: 1 in 100,000,000 bits
Record Size	Variable (1 to 32K bytes)

Inter Record Gap	1.875 inch (1 second)
BOT, EOT	Recorded codes
Manual Rewind	End-to-end in 60 seconds
Write Protect	Knock out tab
No. of EIA lines	One to terminal, one to modem
Modem Control	Request to send, clear to send, carrier detect
Baud Rates	50 to 1200 software generated
Real Time Clock	Crystal controlled, 32 us resolution; overflows at 2.048 ms
I/O Port	8 bit parallel, general purpose TTL, input and/or output for party line I/O or interprocessor communication.
PROM Memory	256 bytes for loader
Interrupts	Clock overflow and I/O port request; all maskable
Board Dimensions	6.00" x 8.00" x 0.062"
Connector	Dual 50-pin on 0.125 centers Wirewrap P/N CPH8100-100 (SAE) 20-pin Scotchflex header Connector P/N 3421 (3M)
Operating Temp.	10 C to 40 C
Power Requirements	+5 +/- 5% @ 1.0A +12 +/- 5% @ 0.2A -12 +/- 5% @ 0.2A

Note on the preparation of this document:

MICROKIT WORD PROCESSOR

This report was prepared using the MICROKIT Word Processing system. The MICROKIT Word Processor allows the user to print neatly formatted reports, manuals, documents etc. It is used in conjunction with the MICROKIT Editor program. The text to be printed is first entered, along with format commands, using the Editor. The Word Processor program is then used to read the text from the Editor tape, format the data according to the imbedded commands, and print it.

The Word Processor recognizes a series of format commands. These format commands are of the form ↑AA (where AA represents two alphabetic characters). The Word Processor also recognizes /A (where A is any alphabetic character) as a case shift. Thus if the user is in the normal lower case mode then "/the" will print "The. "

The basic unit of text is the paragraph. New paragraphs are signalled by ↑PP at the begining. Each time the Word Processor encounters ↑PP it will skip two lines and begin a new paragraph. Text within a paragraph is entirely free form. The Word Processor will fit the maximum number of words on each line that it can without violating the line width limits. Thus all extra spaces will be suppressed on print out. Other commands such as ↑AI (As-Is Mode) are used to suppress this paragraph mode of operation.

The Word Processor has software interfaces for the MICROPRINT/65-LC line printer and the BCD version of the IBM 2741 "Selectric" terminal.

The format commands recognized by the Word Processor are:

COMMAND	FUNCTION
↑NL	Execute a carriage-return and line feed to position the print head at the beginning of a new line. Overides paragraph rules.
↑PG	Execute a form feed (line printer) or request a new page (2741 terminal).
↑UC	Set upper case mode (shift-lock).

↑LC   Set lower case mode (shift-unlock).

↑PP   Skip two lines. Position print head at the
                           first column and start a new paragraph.

↑BS   Backspace on the 2741 terminal only. Used for
                           underlining or overstriking.

↑SKnn   Skip nn lines.

↑IFnn   Conditional new page. Avoids printing of
                           headings as the last lines on a page. Skips
                           if line is within the last nn lines.

↑AI   Enter the As-Is mode. This will defeat the
                           extra space suppression feature of the normal
                           paragraph mode of operation.

↑EA   End the As-Is mode.

↑TI   Flags the following text as a title to be
                           printed on each page. (Note: title must be
                           followed by a ↑PG command to ensure printing
                           title on the first page).

↑ET   Ends the title.

↑NT   Suppresses the title on all subsequent pages.

↑IM   Indents all subsequent text. The indent will
                           be 5 spaces unless reset by the ↑IS command.

↑EI   Ends the indent mode.

↑ISnn   Set the indent to value nn.

↑LWnn   Set the line width to nn.   The default line
                               width is 66 characters.

↑PSnn   Set the number of printed lines per page to
                               nn.   The default number of printed lines is
                               53.

↑IL   Start a label at the left margin during indent
                               mode.

↑EL   Flags the end of a label.

↑TBnn   Position the print head to column nn.
                               Overides the paragraph mode.

↑RS   Reset to default Page Width, Page Length and
                               Indent.

EXAMPLE OF TEXT AS SEEN ON THE CRT SCREEN

↑PP/this is an example
of the use of the
↑UCmicrokit↑LC /word
/processor /program.
/it uses many of the
commands in the
reportiore.
/for example:
↑NL↑IM↑IS20
↑PP↑IL/label↑EL
/labeling an indented
paragraph.
/this uses the /i/l
and /e/l commands.
↑PP↑IL/tab /command↑EL
↑TB40 /moves the print head
↑NL↑TB40 to position 40. ↑EI
↑PP/these are a few
examples of the use of
the ↑UCmicrokit↑LC
/word /processor /program.
/with a little
/practice its use

should become second
nature.

EXAMPLE OF THE WORD PROCESSOR OUTPUT AS PRINTED OUT IN HARD COPY

This is an example of the use of the MICROKIT Word Processor
Program.   It uses many of the commands in the reportiore.   For
example:

Label   Labeling an indented paragraph.   This uses the
                         IL and EL commands.

Tab Command   Moves the print head
                                                 to position 40.

These are a few examples of the use of the MICROKIT Word Processor
Program.   With a little practice its use should become second
nature.

MICROKIT

MICROKIT

PRICE LIST
Effective September 1, 1976

PRODUCT	DESCRIPTION	PRICE

MICROCOMPUTER SYSTEMS

MICROKIT-8/16 MOD 8080	Microcomputer Development System for the 8080 microprocessor. Includes CRT display, keyboard, (2) cassette tape units, software and manuals.	$3,850.
MICROKIT-8/16 MOD 6800	Microcomputer Development System for the 6800 microprocessor. Includes CRT display, keyboard, (2) cassette tape units, software and manuals.	$3,850.

IN-CIRCUIT EMULATORS/PROM PROGRAMMERS

MICROEMULATOR/8080	In-circuit emulator module for 8080, and PROM programmer module for 2708/2704 EPROM. Debugging features include hardware breakpoint, single step and trace.	$1,250.
MICROEMULATOR/6800	In-circuit emulator module for 6800, and PROM programmer module for 2708/2704 EPROM. Debugging features include hardware breakpoint, single step and trace.	$1.250.*

CONVERSION PACKAGES

M8-68C	Conversion module and software for adding 6800 to 8080 system.	$ 950.*
M8-80C	Conversion module and software for adding 8080 to 6800 system.	$ 950.

PERIPHERALS

MICROPRINT/65-LC	65 lpm printer with upper and lower case.	$2,300.
MICROPRINT/65-TF	65 lpm line printer with upper/lower case and tractor feed.	$2,600.
MICRODISK/2	Dual drive floppy disk unit including interface module and DOS software.	$3,650.

MODULES

M8-10	8K dynamic RAM module with memory write protect.	$ 800.
M8-11	8K PROM/2K static RAM module. Includes sockets for (8) 2708 EPROM's and (16) 2102 RAM's.	$ 150.
M8-30	Universal prototype board.	$ 40.
M8-31	Module extender.	$ 40.
M8-41	PROM programmer for 2708/2704 EPROM. Includes hardware breakpoint, single step and trace debugging features.	$ 750.

SOFTWARE/HARDWARE PACKAGES

OS/8080	Software package with memory resident monitor, editor and assembler. Includes additional 24K RAM memory.	$1,850.
OS/6800	Software package with memory resident monitor, editor and assembler. Includes additional 24K RAM memory.	$1,850.*
BASIC/8080	BASIC interpreter. Includes additional 8K RAM memory.	$ 900.*
Word Processor/8080	Program used for preparation of documents, reports and manuals.	$ 100.
TERMINAL SIMULATOR & PL/M LOADER	Makes MICROKIT-8/16 usable as an intelligent terminal and provides a loader for PL/M object code.	$ 15.

TERMS: Net 30. All invoices payable in U.S. funds. Prices valid in U.S.A. and Canada.

FOB: Santa Monica, California 90404, U.S.A.

WARRANTY: All equipment is fully assembled, tested and warranted for ninety (90) days against defects in material and workmanship.

*Available 4th quarter 1976