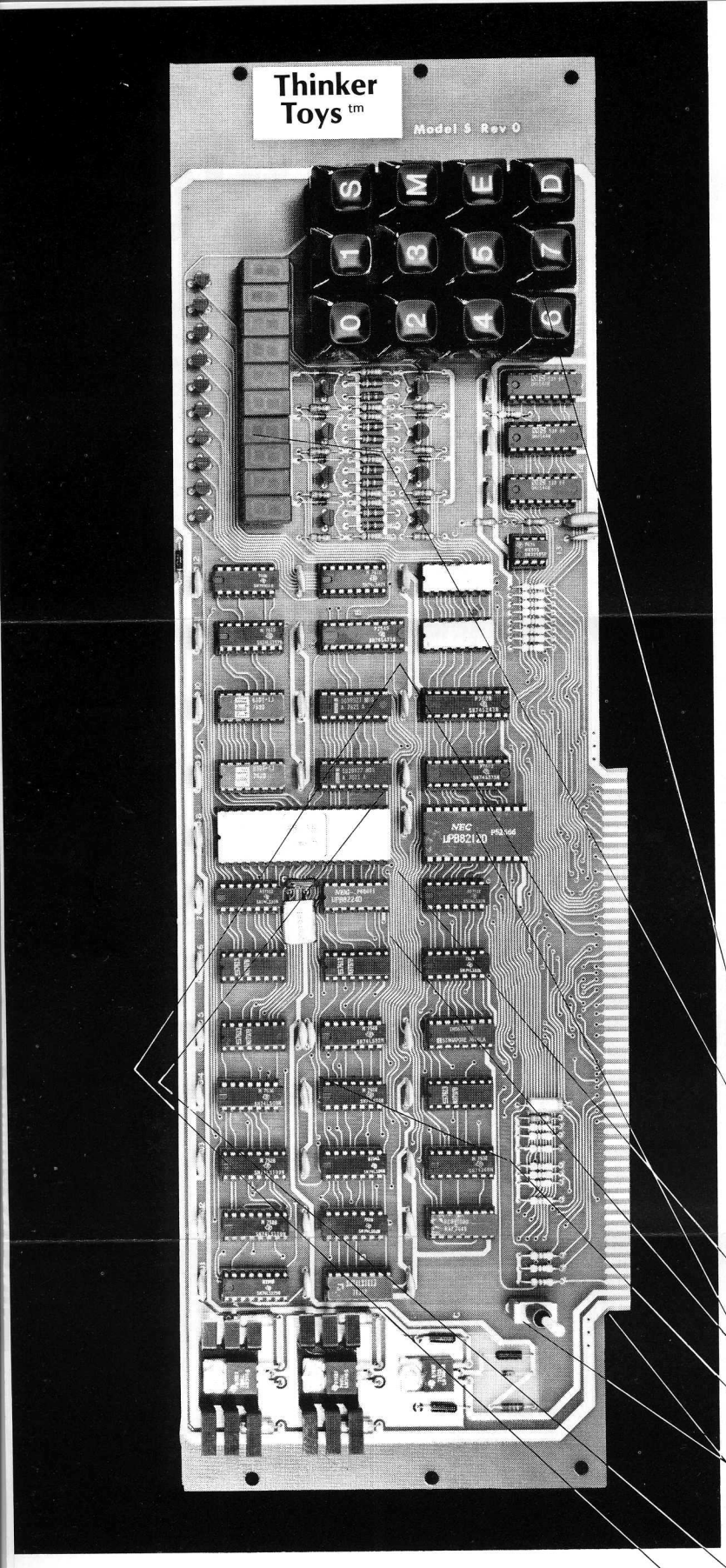
The Keyed-Up 8080™

S-100 minicomputer CPU/control console

One of the most powerful CPU/front panel
systems in the world . . .
ready to plug into your S-100 buss!



The Keyed-Up 8080tm

CPU/control console kit

GOLD CONTACT KEYBOARD puts programming and de-bugging right at your fingertips... numerals 0-7 and 4 function keys (Stop/Start, Mode, Examine, Deposit) can be used to alter data anywhere in your system!

LED DIGITS display the contents of any CPU register, I/O device or memory location in concise octal format... allows you to monitor any part of your program when halted or as you step through your program!

8080A CPU is latest version. Gives you complete plug-in compatibility with Altair/IMSAI mainframes and the widest choice of peripherals and software, including BASIC.

8224 CLOCK DRIVER for reliable operation.

ALL OUTPUTS use high-power tri-state drivers.

RESET SWITCH. Automatic reset when power is turned on.

ALL INPUTS are fully buffered.

100-PIN CARD EDGE plugs directly into S-100 buss (Altair, IMS Equinox 100, etc.).

RAM/ROM MEMORY on board contains the unique software which gives the control console its poweful capabilities. 65,024 bytes of memory are available for user programs.

CIRCUIT BOARD is finest quality epoxy glass base, double sided with plated through holes and solder mask. Sockets are provided for all integrated circuits.

FRONT PANEL INTELLIGENCE

The key to easy programming and de-bugging

Suddenly, the inner workings of a running computer program can be explored at will.

You can actually watch the contents of CPU registers, register pairs, memory locations or I/O devices displayed in clear, unambiguous digits. Right on the front panel of your mainframe.

You can halt your program at any time, alter the program or data anywhere in your system using a 12-key keyboard, and resume your run. Right on your front panel.

And you can control time, programming your processor to run one step at a time . . . or slowly step through your program at any rate you determine. Right on your front panel.

These are startling and immensely convenient new capabilities for the programmer, powerful tools for the development, modification and de-bugging of programs.

And yet, all of these capabilities and more can be part of any personal computer mainframe built on the S-100 buss. All it takes is The Keyed-Up 8080[tm] CPU/control console, an easily-built kit by Morrow's Micro-Stuff for ThinkerToys[tm].

Simply plug in The Keyed Up 8080[tm] board in place of the typical two-board configuration: CPU board and Front Panel board or CPU board and ROM Monitor board.

And you've got the key to easy programming and de-bugging . . . plus front-panel control over your computer so complete it surpasses any minicomputer!

THE KEY CONCEPTS

When so much is gained with so little hardware, it's obvious that there has been a conceptual breakthrough. In fact, inventor/designer G. Morrow incorporated two important new concepts in the design of The Keyed Up 8080[tm]

The first was the combining of the CPU board functions and front panel functions into a single, integrated module. This allowed Morrow to utilize the power of the 8080A Processor to drive an intelligent and highly functional control console. Special circuitry was designed to allow the use of halts (HLT) as breakpoints. Then, on-board RAM and ROM memory was preprogrammed with software to apply untapped CPU intelligence to front panel operation.

The result is a tremendous amount of capability with a minimum of hardware and cost.

The second important design decision was to eliminate the confusing arrays of flashing lights and tedious toggle switches which are used on most front panels. Instead, Morrow opted for the most user-oriented system available: octal (base 8) numbers displayed on concise digital LEDS and entered via a 12-key keyboard.

Aside from the obvious speed and convenience of digital readout and keyboard entry, the system offers a significant advantage: Octal is the natural number base of the 8080A instruction set. The programmer can read instructions directly, without memorizing an entire set of hex or binary equivalents. This represents a saving of the programmer's time and energy on every step of every program!

The Keyed-Up 8080[tm] is also a useful tool in the on-going operation of your personal computer system. Since the keyboard and LED display function under program control, they can also serve as additional general purpose I/O devices. Your programs can call for an operator entry at the keyboard. Or the display can be used as a digital clock.

As incredible as these capabilities seem, they are all simple and natural by-products of Morrow's intelligent front panel concept and octal configuration. It's a very intelligent solution.

UP WITH QUALITY

Physically, the board contains 39 integrated circuits. The CPU is an improved 8080A with the associated 8224 clock driver and 8212 data buffer. Some of the most advanced low-power Schottky devices available are utilized, as well.

The octal display offers ten 7-segment high-brightness LED readouts. Each segment is individually addressable for use as a general purpose display under user program control.

The high-reliable gold contact keyboard offers 12 keys, configured for 8 digits (0-7) and four functions (SMED). The keyboard, too is available for general purpose functions; the keys are structured as two input ports which are latched and reset under program control.

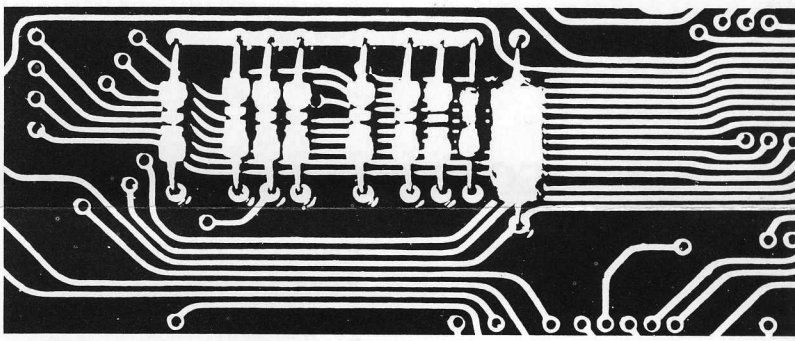
There are 256 bytes of RAM and 256 bytes of ROM on board which is dedicated to the control console program. 65,024 bytes are available for user programs. The keyboard occupies the last two I/O device addresses, with 254 I/O addresses available for other peripherals.

The Keyed-Up 8080[tm] is compatible in every way with the S-100 buss (Altair, IMSAI, Equinox 100, etc), allowing free application of all S-100 components, peripherals and software.

The board measures 5" x 15", the precise size of an IMSAI front panel, for direct interchangeability. The standard 100-pin edge connector is on the bottom.

Outputs to the buss are driven by 8T97 buss drivers, powerful enough to drive 30 TTL loads. Each input from the buss is buffered by either low-power Schottky devices or PNP input TTL devices. This combination of light loading and massive drive capability produces highly reliable data transfers.

In every detail, The Keyed-Up 8080[tm] CPU/control console is a superbly executed component.



UNLOCK YOUR FUTURE

Despite its new array of capabilities, The Keyed-Up 8080[tm] is an easily-built kit, designed to be highly tolerant of home building techniques. Like all ThinkerToy[tm] kits, The Keyed-Up 8080[tm] comes complete with kit construction instructions, operating procedures, interfacing guide, schematic drawings, commented software listings, and S-100 buss design information.

The Keyed-Up 8080[tm] kit may be ordered direct from ThinkerToys[tm] by mail. Credit card orders may be phoned to our toll-free number from anywhere in the continental U.S.

Or see The Keyed-Up 8080[tm] on display and in operation at your nearest personal computer shop along with the other remarkable ThinkerToy[tm] S-100 components: The WünderBuss[tm] 20-slot buss board with the Noiseguard[tm] 2-way noise squelching system, The Speakeasy[tm] cassette/general purpose I/O Interface, by Morrow's Micro-Stuff - and Constant Voltage Power Supplies by Parasitic Engineering.

SPECIFICATIONS

CIRCUIT BOARD	5" x 15" epoxy glass base. Double sided with plated through holes. Solder mask.
EDGE CONNECTOR	100-pin gold-plated. S-100 buss compatible.
SOCKETS	Provided for **every** integrated circuit.
KEYBOARD	12- Cherry "gold point" switches with double molded embossed key caps. 8 digits assigned to input device 255; 4 functions assigned to input device 254.
DISPLAY	10-.4" 7-segment LED displays with independent memory to allow any pattern on any digit. Display shares last page of memory with the front panel ROM.
READ ONLY MEMORY	256 bytes, dedicated to front panel software.
RANDOM ACCESS MEMORY	256 bytes of front panel software and temporary front panel storeage.
CPU	Latest 8080A with 8224 clock driver and 8212 data buffer.
INTEGRATED CIRCUITS	39 total, low-power Schottky wherever possible: 8T97 buss drivers and 20-pin octal latches, buffers and PROM.
POWER CONSUMPTION	Less than 1.3 amps at 7.5 to 10V Less than 120 ma at + 14 to + 20V Less than 10 ma at -7 to -20V

The Keyed-Up 8080™

A product of Morrow's Micro-Stuff for

FOR ADDITIONAL INFORMATION:
The Keyed-Up 8080™ documentation package is available separately. It's purchase price will be refunded when the kit is purchased.

TO ORDER:

By Mail	Send check or money order to ThinkerToys™ 1201 10th. Street, Berkeley, CA 94710
By Phone	Place BankAmericard and Master Charge order **only** toll-free to 800-648-5311.
In Person	See The Keyed-Up 8080™ Kit at your local personal computer shop.

CONTROL CONSOLE/FRONT PANEL FUNCTIONS

KEYBOARD	8 numeric keys: 0-7 4 function keys: S - stop/step/Slow-Step M - mode/run E - examine/examine next D - deposit/deposit next
MEMORY MODE	Monitor or alter instructions or memory locations while stepping or slow-stepping or when a program is halted.
PROCESSOR MODE	Monitor and/or alter CPU registers or register pairs (A, B, C, D, E, H, L, PC, SP, FLAGS) while stepping, slow-stepping or when program is halted.
I/O MODE	Monitor and/or alter I/O devices while stepping, slow-stepping or when a program is halted.
HALT	Insert halt (HLT) instructions whenever hardwired break points are desired. The CPU will NOT go to sleep; instead, special circuitry transfers control to the console/front panel when HLT instructions are encountered.
SLOW-STEP	Steps your programs at a programmable rate from 1 to 64K steps per minute, while you monitor any desired CPU register, register pair, memory location or I/O device.

Specifications subject to change without prior notice.