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# IMSAI

## does it again !

NEW

PERIPHERALS

INTERFACES

SOCKET SETS

SOFTWARE

*IMSAI* is pleased to announce twelve new products. They are designed to enhance your enjoyment and extend the application flexibility of your *IMSAI* computer.

Multiple I/O board

Printer

AP - 44

Breadboard Console

Programmable Parallel I/O Board

Socket Sets for each board

Software

8048

RAM

TCOS

BASIC - E

CP/M

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**IMSAI MIO  
ALL YOUR INPUT/OUTPUT  
ON ONE BOARD**

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The new *IMSAI* five-port Multiple I/O board combines the most commonly used I/O interfaces on a single board with a control port, serial channel, cassette, interface and 2 parallel I/O ports. A keyboard, printer, tape cassette and teletype (or CRT) can all be controlled by a single MIO board simultaneously!

Compatibility with *IMSAI* and Altair software is assured through the flexible addressing and control features. Tape cassette applications are enhanced through the inclusion of the Byte/Lancaster and Tarbell recording modes.

**Tape Cassette I/O Features**

Byte/Lancaster standard recording mode of approximately 30 bytes/second.

Tarbell recording mode of 187 bytes/second. Can be substantially increased when using high quality audio equipment.

Data bit rates available are 488 to 62,500 bits/second.

Two tape recorders can be connected -- you can output to both simultaneously or read from one at a time.

Little software control required. Serialization and deserialization are done in hardware for the Tarbell mode. A small software driver for the Byte/Lancaster mode is provided.

Instructions and test programs on a tape cassette for tuning the recorder and interface for optimum performance are included.

Additional control of the recorder can be implemented using the lines from the control port.

**Serial I/O Features**

Compatible with *IMSAI* and Altair software.

Teletype or RS232C I/O port using a UART.

Control lines available from the control port.

Baud rate continuously selectable from 40 to 9600 asynchronous.

Byte length, parity enable and even/odd parity is selectable.

Instructions and test programs for checking the port are included.

### Parallel I/O Features

Two 8-bit parallel I/O ports.

All input and output data lines latched for interfacing simplicity.

"Handshaking" is convenient with the control lines for input and output.

Instructions and test programs for checking the port are included.

### Control I/O Features

This port provides the necessary control and status of the other four I/O ports.

Output lines are latched for convenience.

Controlling other devices is easy with TTL, EIA, current loop lines and high voltage high current drivers.

(Specifications subject to change without notice.)

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## 44-COLUMN PRINTER

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*IMSAI's* new 44-column dot matrix printer offers hard copy output at an affordable price. The printer interfaces to many different computers using an 8-bit parallel output port. Programming and installation is simple, as the printer is completely self-contained with case, cable, power supply, timing, control and character generation included. System efficiency is enhanced using the interrupt driver mode.

### Features

44 columns.

Dot matrix.

75 lines/minute.

Automatic line wraparound -- output lines with more than 44 characters are automatically printed on two physical lines.

Font is the standard 64-character ASCII subset.

Double size characters are software selectable.

Uses standard 3½" roll paper.

Multiple copy printing using carbon or NCR paper.

Interfaces to a parallel output port with handshaking, such as the *IMSAI* PIO 4-1 or MIO boards.

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(Specifications subject to change without notice.)

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INTELLIGENT BREADBOARD SYSTEM

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Learn how to replace discrete devices in digital logic circuits with microprocessors and computer software. Develop new I/O interfaces and memory systems that connect directly to, yet are physically outside, the computer. Study tradeoffs between hardware and software implemented circuits. Exercise comprehensive test procedures on new circuits under computer control. Set up a sophisticated classroom laboratory for logic design courses.

The *IMSA* Intelligent Breadboard System offers these benefits and more with its sophisticated breadboard console connected directly to an *IMSA* 8080 computer. The new Programmable Parallel I/O board (PIO-6) is the computer interface to the breadboard console. It brings out the computer's address lines, data lines, miscellaneous control lines and power lines to the breadboard console, as well as allowing TTL data communication between a computer program and the breadboard. Thus breadboard circuits can be built upon the bus logic of the 8080 while remaining outside the computer chassis for ease of construction and analysis.

Features

Integrated circuits, resistors and capacitors can be plugged into the solderless terminal strips.

Up to forty 16-pin IC's may be inserted.

Easy access to all signals for quick probing.

On board 5-volt voltage regulator.

Power supplied is +18, -18 and +5 volts.

LED's are provided as latched and unlatched level indicators.

All pin numbers are identified.

Two computers may be connected to one breadboard to study multiprocessor circuit design.

Six 8-bit parallel I/O ports from the computer's PIO-6 board can be connected to the breadboard via two 50-pin cables.

The computer's address, data, power and miscellaneous control lines are made available via the PIO-6 board and a 26-pin cable.

Extensive user documentation.

Test module available.

(Specifications subject to change without notice.)

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## PROGRAMMABLE PARALLEL I/O

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This new parallel I/O board is designed for applications requiring broad flexibility in TTL interfacing of the computer peripheral devices. Extensive program control over the direction and action of the parallel I/O lines is provided through the new INTEL 8255 integrated circuit chip. Development of circuits requiring fast interaction with the computer is simplified with the extension of many bus lines from the computer to the board's edge connectors and cable.

### Features

Contains six programmable 8-line parallel I/O ports. (Three are optional).

Extends a fully buffered microprocessor bus interface to a peripheral device.

Contains two connectors for 50-pin cables and one for a 26-pin cable.

Each 50-pin cable contains the 24 I/O line from an INTEL 8255, low order address lines, data bus, miscellaneous microprocessor control lines, +8, +18, and -18 volts unregulated, and ground.

The 26-pin connector contains the high order address lines, miscellaneous microprocessor control lines and ground.

Complete technical and user's documentation is provided.

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(Specifications subject to change without notice.)

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## SOCKET SETS

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*IMSAI* now has socket sets available for each board. While sockets promote easier board maintenance, they can decrease reliability in certain cases. Use with caution in humid or salt air environments. Do not use when the computer is subject to vibration or where utmost reliability is required.

### Ordering Information

| <u>Item</u> | <u>Description</u>            | <u>Price</u> |                  |
|-------------|-------------------------------|--------------|------------------|
|             |                               | <u>Kit</u>   | <u>Assembled</u> |
| S-RAM 4A-4  | Socket set for RAM 4A-4 board | \$22         | \$33             |
| S-PIC-8     | Socket set for PIC-8 board    | \$ 6         | \$10             |
| S-PROM 4-4  | Socket set for PROM 4-4 board | \$ 4         | \$ 6             |
| S-MPU-A     | Socket set for MPU-A board    | \$ 8         | \$12             |
| S-CP-A      | Socket set for CP-A board     | \$11         | \$16             |
| S-PIO 4-4   | Socket set for PIO 4-4 board  | \$11         | \$17             |
| S-SIOC      | Socket set for SIOC board     | \$ 3         | \$ 5             |
| S-SIO 2-2   | Socket set for SIO 2-2 board  | \$12         | \$18             |
| S-MIO       | Socket set for MIO board      | \$24         | \$36             |
| S-PIO 6-6   | Socket set for PIO 6-6 board  | \$ 9         | \$14             |

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## NEW ASSEMBLY SOFTWARE DEVELOPMENT PACKAGE

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A substantially upgraded version of our current self-contained system (the assembly language package provided at no charge) is now available. The enhancements offer a powerful package for developing medium-sized sophisticated assembly language programs.

### Features

Powerful debugger with multiple dynamic and static breakpoints, number conversions, memory searches I/O port control, trace, hex arithmetic and many other features.

Symbol table space of 8192 bytes.

Facility for adding additional device drivers to support a wide variety of I/O devices. (The teletype driver is included.)

Programs may be loaded from industry standard object paper tapes.

Any I/O device may be used for the source, object or listing.

Includes a line editor using the current SCS.

Improved assembly and monitor.

Resides in high memory so that it may be co-resident with application programs and BASIC.

|           |                               |
|-----------|-------------------------------|
| B000-CFFF | System software               |
| D000-EFFF | Local memory and symbol table |
| F000-FFFF | I/O device drivers            |
| 0038-003A | Interrupt handling            |

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(Specifications subject to change without notice.)

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## IMSAI 8048

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INTEL developed the world's first single chip microcomputer. *IMSAI* has built the system to put it to work. Instantly! This Single Board Computer utilizes INTEL's new 8048 chip which contains 1K bytes of ROM or EPROM, 64 bytes of RAM, 27 I/O lines, a timer, interrupt logic, and runs on five volts. On the board is an additional 1K of ROM/EPROM and 1K of RAM, a 24 Key-keypad and 9 Hexidecimal display digits. A monitor program is included in the ROM or EPROM that allows examining memory locations, writing into memory locations, starting a program, stopping a program and various other debugging aids. Also included on the board are a cassette interface, serial interface and five high current relays that can switch up to 230 volts at two amps.

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## IMSAI 65K, 32K AND 16K RAM BOARDS

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These new, low power dynamic RAM boards are an industry first. Used in any S-100 Bus, they can be combined to form conventional memory systems of up to 65K bytes. With their "hidden refresh" circuits, no wait states are required. *IMSAI's* DMA boards work with this memory.

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## IMSAI MEGABYTE MEMORY SYSTEMS

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*IMSAI* has smashed the 65K memory limit of 8080 based microcomputers.

Using the new *IMSAI* Intelligent Memory Manager (IMM) and sixteen 65K RAM boards, you can now expand your microcomputer to 1 million bytes. The IMM provides read and write protection, memory configuration and interrupt vectoring to anywhere in the megabyte memory.

Smaller memory configurations can be handled as well.

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## IMSAI TCOS

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TCOS is an extension of our existing SCS-1 Self Contained System that contains a resident editor, resident assembler, and driver routines for both teletype and cassette as well as examine and deposit commands, break point commands and other useful debugging aides. It requires 4K bytes, residing at location A000, and requires an MIO board to run. The format of types that TCOS writes is TARBELL standard.

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### BASIC - E

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Basic - E is a compiled scientifically oriented extended disk basic. It has both sequential and random disk file access capability. A large number of mathematical functions are included. Also included are full string handling functions, strings up to 256 bytes, N-dimensional arrays, serialized storage management. Basic - E runs under CP/M (DOS - A).

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### CP/M (DOS A)

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CP/M is the most versatile floppy disk operating system available. It is supplied with an assembler, editor, debugger, extended disk BASIC (Basic - E), and a full set of utilities and drivers for *IMSAI* peripherals. Also included is an extensive test program, SHAKDOWN, used to pinpoint problems in the disk, disk interface, memories and system in general. SHAKDOWN substantially reduces the effort required to "bring up" an *IMSAI*. CP/M (DOS - A) has been field tested for 2 years and this a very solid system.