

SCELBI COMPUTER CONSULTING, INC.
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The SCELBI-8H and SCELBI-8HK Mini-Computers

The SCELBI-8H, and the kit version - the SCELBI-8HK, are low cost, medium speed, digital mini-computers constructed from a basic set of printed circuit cards. The technique of using a series of low cost printed circuit cards which can be connected together in modular fashion to form complete computer/processing/control systems provides dramatic cost savings when assembling systems; provides immense flexibility in tailoring systems to individual customer requirements; yields significant increases in over-all system reliability and mean-time-to-repair; and allows systems to be easily and economically expanded or altered as customer requirements change. In addition, the modularity of the SCELBI-8H computer offers educational and training advantages. Each P.C. card's function can be learned in a short time. The subsequent connection of individual cards into a computer system can be readily followed and understood. These concepts are important from an educational/training view-point and subsequently greatly increase the ability of users to fully utilize the capabilities of the computer as well as to be able to maintain and service their own systems. Much design effort was expended during development of the SCELBI-8H computer to provide a low cost, yet powerful mini-computer, that would serve the needs of electronic and computer enthusiast and students.

The SCELBI-8H mini-computer has been system designed to integrate with a line of low cost SCELBI peripheral interfaces and devices to form complete computer systems with low cost input/output capability. SCELBI peripheral interfaces currently available include: An oscilloscope display driver that turns an ordinary oscilloscope with a band-width of five megahertz or more into a complete Alpha-Numeric display device for a SCELBI-8H computer. There is a low cost ASCII Keyboard and interface available to serve as an input device to the SCELBI-8H. And, there is an economical interface that turns a low cost audio tape recorder (cassette unit) into a computer "Mag-tape" unit that will store and retrieve endless amounts of programs and/or data for the SCELBI-8H computer. The combined cost of the Oscilloscope Alpha-Numeric driver, the Keyboard with interface, and the interface for the audio cassette tape system cost about one third of what a Model 33 Teletype (RTM) sells for - but, if you can afford or already have a Model 33 TTY; SCELBI does have a very low cost interface for the Model 33 Teletype.

Naturally, SCELBI peripheral interfaces are also based on P.C. card modules, and are placed "on line" by simply connecting cables from selected I/O port connectors on the computer to similar connectors on the peripheral interfacing units. (Customers can also connect their own custom designed peripherals just as easily!)

The SCELBI-8H computer and peripheral interfaces are sold in modular form. A customer may start with a small system and add on units as desired. Systems can be purchased in a variety of forms with savings available to those who have the necessary skills to do certain construction arts on their own. For instance, customers may purchase just a computer card set (assembled or in kit form) and then provide their own chassis, card and I/O connectors, console switches, and power supply system. Or they may purchase complete assembled units, or kit versions that come complete with pre-punched chassis, all card and I/O connectors, console switches, and a power supply system. (NOTE: It is recommended that customers desiring to assemble kit versions (SCELBI-8HK units) have at least one year practical electronic assembly experience or formal training in electronics.) SCELBI-8HK kit units come complete with highly detailed assembly instructions and drawings and a qualified assembler can typically construct a complete computer with 1K of memory in less than 20 hours.

All SCELBI-8H and SCELBI-8HK computers are supplied with a comprehensive operating manual detailing operation of the computer, the instructions set, programming operations and methods, I/O operations, and basic information for designing custom input/output interfaces.

The SCELBI-8H mini-computer is a fully programmable machine having a basic instruction set of 48 instructions with variations of these fundamental operations allowing approximately 170 different instructions. The instruction set includes a strong complement of mathematical and boolean operations, register indexing operations, accumulator rotating capability, jumps, calls with subroutine nesting, and a large group of "True" and "False" conditional branching operations.

The machine has one full accumulator and six additional temporary registers capable of indexing operations as well as passing data between registers or registers and memory locations. Two of the six registers are special memory pointer registers. The CPU program counter is on a seven level push-down stack allowing subroutine nesting to seven levels.

The computer has an I/O instruction set which directs the flow of information from Input Ports to the Accumulator or from the Accumulator to Output Ports. The basic SCELBI-8H is standardly equipped to communicate with 8 Output ports and 6 Input ports. (Special systems can be tailored to greatly increase I/O capability.) All Input and Output ports are fully TTL (transistor-transistor-logic) compatible making interfacing to peripherals a simple matter.

The basic SCELBI-8H mini-computer is supplied with provisions for operating with from 256 to 4,096 words of memory. Memory word size is eight bits. RAM MOS memory is supplied as standard but other memory elements (such as ROM) can be supplied on special request. For customers desiring large memory capability, special memory expansion accessories will allow memory expansion to 16K words. The machine is able to access up to 16K words in memory.

The computer has an operating speed that is dependent on the number of "states" an instruction requires to complete execution. One computer "state" requires 4 micro-seconds. Instructions require 3 to 11 "states" with a typical instruction requiring about 5 "states" or 20 millionths of a second for execution. Thus, in typical programmed operation the SCSELBI-8H mini-computer performs 40,000 to 50,000 operations per second, each operation being the complete parallel manipulation of an eight bit word. This speed is sufficient for a vast variety of computing applications. This moderate operating speed greatly reduces the cost of the machine while simultaneously increasing the reliability of the machine. In addition, the lack of extremely fast and critical timing pulses, makes it much easier for customers to design and successfully implement their own special interfaces using standard TTL integrated circuits and thus place various devices under the control of, or feed information to, a SCSELBI-8H mini-computer.

SCSELBI COMPUTER CONSULTING, INC., has a wide range of programs and software support for the SCSELBI-8H mini-computer and SCSELBI developed peripheral interfaces. Programs currently available include program loaders, memory dumps, and CRT display programs for the SCSELBI Keyboard and Oscilloscope Alpha-Numeric display interfaces. Similar programs are available for use with a Model 33 Teletype (RTM). There are also read and write control programs for the SCSELBI Audio cassette "mag-tape" interface. Editor and Assembler programs and a sophisticated calculator package for the SCSELBI-8H are currently under development. Also available is an Assembler program that assembles programs for the SCSELBI-8H on a Digital Equipment Corporation's PDP-8 (RTM) series computer.

A BASIC SCSELBI-8H MINI-COMPUTER SYSTEM

A basic SCSELBI-8H mini-computer consists of a set of 5 P.C. cards (described in detail below) which plug into P.C. card sockets. The sockets are inter-connected by wires and installed in a simple aluminum chassis. The chassis holds additional P.C. card sockets for expanding memory of the computer up to 4,096 words by simply plugging in additional memory cards. In addition the chassis has 11 switches along the front which serve as computer console switches. The rear apron of the chassis holds 14 I/O connectors and one power connector.

The entire SCSELBI-8H mini-computer measures approximately 10 inches in width, by 9.5 inches in height by 12 inches in depth. (NOTE: Customers may choose to provide their own chassis, P.C. card sockets, I/O connectors, and console switches.)

A separate power supply capable of delivering plus five volts (+5V) and minus nine volts (-9V) is required for the computer. Current requirements of the power supply depend on the amount of memory in a system and the number of peripheral units attached to the computer. SCSELBI can provide power supplies covering a wide range of current capabilities. (SCSELBI will provide schematics of suitable power supplies to customers

who desire to build their own.) Power requirements for two typical SCSELBI-8H systems are shown below:

Example #1: A SCSELBI-8H with 1K of RAM Memory, Oscilloscope Display Driver, Keyboard and Keyboard Interface, and Audio Cassette Tape Interface: Requires 3 Amps + 5 Volts and 1 Amp - 9 Volts.

Example #2: Same system as Example #1 except computer has 4K RAM Memory: Requires 6 Amps + 5 Volts and 3 Amps of - 9 Volts.

A SCSELBI-8H system is completed by the addition of peripheral units as desired which are simply plugged into appropriate I/O connectors on the mini-computer. Of course programs are then developed or purchased and "loaded" into the computer's memory to have the system perform the desired functions and/or operations.

THE BASIC SCSELBI-8H CARD SET

#1100 - CPU Card. This card is the primary module in a SCSELBI-8H mini-computer. This card contains a micro-processor "CPU-on-a-chip", a network of control and timing logic, and a master clock system. All computer operations emanate from and terminate at this card. This card provides signals that control and synchronize the overall operations of all other cards in a SCSELBI-8H system.

#1101 - DBB and Output Card. This card contains memory address and state control latches and logic for selecting banks of memory words. In addition the card contains multiplexing logic for selecting Output ports. While the card is capable of selecting 16 different Output ports, in a standard SCSELBI-8H system only 8 Output ports are made available to I/O connectors on the standard chassis.

#1102 - Input Card. This card contains multiplexing logic which selects the input to the Central Processor Unit. The card allows the input to the CPU to arrive from the memory bank(s); the console switches (which are used to allow control of the computer by an operator); or any one of six different Input ports.

#1103 - RAM Memory Card. This card can be populated with RAM memory integrated circuits in groups of 256 words to a maximum of 1,024 eight bit words. These cards serve as the main memory bank(s) for a SCSELBI-8H mini-computer. The standard SCSELBI-8H chassis has P.C. card sockets to accept up to four of these cards allowing up to 4,096 words of main memory to reside on the basic chassis.

#1104 - Front Panel Card. This card has been specially designed to allow a SCELBI-8H user to monitor the operation of a SCELBI-8H mini-computer. The card contains an array of logic circuitry and long-lasting solid state light emitting diodes which allow the operator to display the contents of memory locations, internal CPU register contents, critical cycle states, and the general status of the CPU and I/O operations. The card also contains power supply voltage monitor indicators.

SCELBI QUALITY

Components used in SCELBI products are selected and screened to meet exacting SCELBI standards. Integrated circuits are tested (using SCELBI-8H mini-computers) before being supplied in kits. In addition all semiconductor components are subjected to tests prior to packaging in kits.

In the case of assembled products, as standard policy all units are operated continuously for at least 72 hours to ensure proper operation of all circuits.

Printed circuit cards used by SCELBI COMPUTER CONSULTING, INC. are made of high quality industrial grade glass epoxy (G10) material. Cards have two ounce copper lands on both sides and plated through holes are used to connect foil patterns through the card. The standard card size is 9 inches wide by 6.4 inches in height (including the connector fingers). The standard card plugs into a pair of 44 pin P.C. card sockets. Connector foil spacing is 0.156 inches center-to-center.

A few SCRLBI peripheral products use cards 4.5 inches wide by 6.4 inches in height. These cards mount in a single 44 pin P.C. socket.

SCELBI CUSTOMER SERVICE

SCELBI personnel are always available to assist customers during the hours of 9:00 A.M. to 5:00 P.M. Customers may drop us a line or call our service number: (203) 874-1573. (Sorry - no collect calls will be accepted!) Brief questions about equipment operation, assembly instructions, or minor service problems are handled as a free service. However, customers requiring in-depth consulting services, programming or design assistance etc., will be billed a modest fee based on staff time consumed. Realistic estimates of such fees can be made at the time of initial inquiry.

SCELBI COMPUTER CONSULTING, INC. is well equipped to handle special hardware and software development projects. Programming and special interface circuit design services are available at reasonable fees. SCELBI has special facilities that allow very rapid development, assembly and testing of programs for SCELBI-8H systems.

In addition, SCELBI maintains a staff of consultants with specialties in a variety of scientific fields including biological and chemical fields who are able to work with customers to develop special applications for SCELBI-8H systems in those fields.

SCELBI WARRANTY

SCELBI products are warranted for a period of 90 days from date of purchase. In the case of assembled units this warranty applies to all parts, materials and workmanship.

In the case of kits, the warranty applies only to components and materials when such parts and materials are assembled in the proper manner as detailed in SCELBI Assembly Manuals.

The warranty is voided in its entirety if the purchaser fails to follow SCELBI provided assembly, operations or maintenance instructions; physically abuses the equipment through neglect or mishandling; makes unauthorized modifications to any part of the equipment; or uses parts that have not been supplied by SCELBI COMPUTER CONSULTING, INC. In the event a judgement is necessary as to the validity of a warranty because of evidence of improper operation, neglect or abuse, parts substitution etc., the judgement of SCELBI personnel will be final.

Units covered by warranty will be repaired or replaced at the option of SCELBI COMPUTER CONSULTING, INC. free of charge when the customer returns defective units.

Units not covered by warranty (including kits that have been improperly assembled) will be repaired by SCELBI with charges for parts and labor when defective or nonoperative units are returned by the customer.