

SEVENTH EDITION

MODERN
DICTIONARY
of
ELECTRONICS


RUDOLF F. GRAF



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microcircuit module—An assembly of microcircuits or of microcircuits and discrete parts, designed to perform an electronic-circuit function or functions and constructed in such a manner that it is considered to be a single entity for the purposes of specification, testing, commerce, and maintenance.

microcircuit wafer—A microwafer carrying one or more circuit functions such as a flip-flop or gate. Integrated-circuit chips may be bonded to deposited conductors.

microcode—1. A computer-coding system that includes suboperations, such as multiplication and division, that ordinarily are inaccessible in programming. A list of very small program steps. 2. A set of control functions performed by the instruction decoding and execution logic of a computer that defines the instruction repertoire of that computer. Microcode is not generally accessible by the programmer. 3. Sequences of low-level steps, making up machine instructions, that are built into a microprocessor that directly control the interaction of the processor's computing elements—that is, machine instructions wired into the hardware that is being controlled. 4. Permanent basic subcommands, built into a computer, that are executed directly by the computer. Generally, these commands define the instruction set of a microprogrammable computer.

microcoding—In a computer, a system of coding that uses suboperations not ordinarily accessible in programming.

microcomponents—1. Those components smaller than existing components by several orders of magnitude. 2. An assembly of very small, interconnected discrete components—active or passive—that forms an electronic circuit. Interconnection of the various leads is by soldering or welding. Microcomponents use no substrates.

microcomputer—1. A general-purpose computer composed of standard LSI components built around a central processing unit (CPU). The CPU (or microprocessor) is program-controlled, featuring arithmetic and logical instructions and a general-purpose parallel I/O bus. The CPU is generally contained on a single chip. Generally intended for dedicated applications, the microcomputer also includes any number of ROMs and RAMs (for instruction and data storage) and, in some cases, one or more I/O devices. The simplest microcomputer consists of one CPU chip and one ROM. 2. A computer whose major sections—CPU, control, timing, and memory—are each contained on a single integrated-circuit chip, or, at most, a few chips. An LSI computer. 3. A computer that has a single or multichip LSI CPU, as distinguished from a minicomputer. 4. A class of computer having all major central processor functions contained on a single printed circuit board constituting a stand-alone module. 5. A computer whose central processing unit is a microprocessor. A microcomputer includes microprocessor, memory, and input/output controllers. 6. A device consisting of a central processor (usually a microprocessor, but sometimes a custom LSI chip set or a bit-slice processor) combined with a memory and input/output.

microcomputer development system—Abbreviated MDS. Also called expandable breadboarding system. 1. A key tool used in the development phase of microprocessor-based computers. It provides an efficient means of program coding, subprogram testing, and final testing for the completed program in a simulated operating condition without the use of the hardware that is contained in the final end product. The elements of the MDS combine to make up a complete microprocessor-based computer, which is composed of the central processing unit or microprocessor unit; a mass-storage memory section; either a floppy disk or tape cassette, complete

with associated drive and control circuits; a CRT terminal (video readout), a keyboard; and, as there is in most systems, a printer. In addition, an emulator module is part of the system and is used to test the operation of the developed system under defined conditions without the use of final hardware. 2. A system designed exclusively to aid in the development of microprocessor systems. Microcomputer development systems enable a designer to develop software and hardware as if many standard operating system utilities were present in his or her final design. These utilities, however, actually reside in the development system and therefore do not require costly additions to every shipped system. 3. Microcomputer equipped with the hardware and software facilities required for efficient program development and hardware debugging.

microcontroller—A complete microprocessor system on a chip. Includes on-chip the CPU, local RAM, local ROM or EPROM, clock and control circuits, and serial and parallel I/O ports that can be programmed for various control functions. *See also* chip sets.

microcrack—A thin crack in a substrate or chip device, or in thick-film trim-kerf walls, that can only be seen under magnification and which can contribute to latent failure phenomena.

microdensitometer—An instrument used in spectroscopy to measure lines in a spectrum by light transmission measurement.

microelectrode—An extremely small electrode. Some microelectrodes are small enough to contact a single biological cell.

microelectronic circuit—Discrete electrical components assembled and connected in extremely small and compact form.

microelectronic device—An alternate term for integrated circuit.

microelectronics—Also called microsystems electronics. 1. The entire body of electronic art that is connected with or applied to the realization of electronic systems from extremely small electronic parts. 2. *See* integrated circuit. 3. All techniques for the manufacture of extremely small electronic circuits, generally including all types of silicon integrated circuits, thin-film circuits, and thick-film circuits. 4. The physical realization of electronic circuits or systems from a number of extremely small circuit elements inseparably associated on or within a continuous body. Microelectronics has developed along two basic technologies: monolithic integrated circuits and hybrid integrated circuits. 5. The field that deals with techniques for producing miniature circuits, e.g., integrated circuits, thin-film techniques, and solid-state logic modules. 6. The art of electronic equipment design and construction that uses microminiaturization schemes.

microelement—A resistor, capacitor, or transistor, diode, inductor, transformer, or other electronic element or combination of elements mounted on a small ceramic wafer 0.01 inch (or 0.25 mm) thick and about 0.3 inch (0.75 mm) square. Individual microelements are stacked, interconnected, and potted to form micromodules.

microelement wafer—A microwafer carrying one or more components or a simple network. The network can consist, for example, of several thin-film resistors deposited directly on the wafer.

microfarad—One millionth of a farad. Letter symbol: μF .

microfarad meter—*See* capacitance meter.

microflash—An extremely short electronic flash, having a duration of about 1×10^{-6} second. Used in photographing rapidly moving subjects.

microflash lamp—A lamp that emits radiation pulses having a duration of approximately 1 microsecond.

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microphotograph—A small picture of a large subject. The microfilming of a check or other document produces a microphotograph.

microprobe—An extremely sharp and small exploring tool head attached to a positioning handle. Used for testing microelectronic circuits by establishing ohmic contact.

microprocessor—Also called MPU (microprocessor unit). 1. A central processing unit (CPU) fabricated on one or more chips, containing the basic arithmetic, logic, and control elements of a computer that are required for processing data. 2. An integrated circuit that accepts coded instructions, executes the instructions received, and delivers signals that describe its internal status. The instructions may be entered or stored internally. Widely used as control devices for household appliances, business machines, toys, etc., as well as for microcomputers. 3. An electronic integrated circuit, typically a single-chip package, capable of receiving and executing coded instructions.

microprocessor development system—A combination of hardware and software that acts as a tool for micro system design and debugging from concept to final production release. It contains assembler, compiler, and editor programs to assist with the original program writing. It also can simulate the system, both at the concept stage and during the final integration. The larger memory available makes it practical to document programs, that is, to add remarks within the program that will be ignored by the microprocessor and that will indicate to a subsequent user the purposes of specific instructions. These remarks do not, of course, go into the final ROM. The development system is also able to transfer the debugged program that it is already using into PROM or EPROM.

microprocessor emulator—A software routine or device that imitates the functions of a specific microprocessor.

microprogram—1. A computer program written in the most basic instructions or subcommands that can be executed by the computer. Frequently, it is stored in a read-only memory. *See also* firmware. 2. A special-purpose program, stored in a fixed memory, that is initiated by a single instruction in a system's main program. For example, one instruction in the main program may initiate a stored microprogram of six or seven instructions needed to execute the single main program instruction. 3. In a computer, a subelement of a conventional program built up of a sequence of even smaller operations called microinstructions. Each microinstruction is further subdivided into a collection of microoperations carried out in one basic machine cycle. (For example, the computer program consists of a sequence of instructions that are carried out in a specific order. Each instruction consists of a routine of one or more steps. This sequence of computer machine cycles necessary to execute a single instruction is called a microprogram.) 4. A sequence of instructions held in the control store that determines what operations the processor performs for each command given to it by the main memory. 5. A type of program that directly controls the operation of each function element in a microprocessor. 6. Stored routines in CPU control memory that define machine instructions as a series of elemental steps to be executed by the processor's control section. 7. A special computer program that sequences the control unit of a processor. It implements sequential instruction fetch, plus decoding and execution, by providing the appropriate signals to the required gates. Most MPUs are internally microprogrammed and can be microprogrammed by the user. Bit-slices are user microprogrammable. 8. A machine-executable description of

the elementary steps that are executed in the course of what the software sees as an instruction.

microprogrammable computer—A computer in which the internal CPU control sequence for performing instructions is generated from a read-only memory (ROM). By changing the ROM contents, the instruction set can be changed (as contrasted with a fixed-instruction computer).

microprogramming—1. The setting up of basic suboperations for a computer to handle, after which the programmer combines them, and they are presented to the computer again in a higher-level program. For example, if a computer has only basic instructions for addition, subtraction, and multiplication, the instruction for division would be defined by microprogramming. 2. A method of operating the control part of a computer in which each instruction is broken into several small steps (microsteps) that form part of a microprogram. 3. A method of organizing a general-purpose computer to perform desired functions, using instructions stored in a control array.

microprogram store—*See* control store.

microradiometer—Also called a radio micrometer. A thermosensitive detector of radiant power. It consists of a thermopile supported on and connected directly to the moving coil of a galvanometer.

microsecond—One millionth of a second: 1×10^{-6} or 0.000001 second. Letter symbol: μ s.

Microsoft Windows—An operating environment for IBM PCs and compatibles that features icons, pull-down menus, desk accessories, and the ability to easily move text and graphics from one program to another via a clipboard. It can also operate more than one program at a time.

microstrip—Also called stripline. 1. A microwave transmission component in which a single conductor is supported above a ground plane. 2. Printed-wiring LC resonant circuits or transmission lines. Conductive patterns form inductors. Capacitance is developed between the inductive patterns and the ground plane. 3. (Microstripline) A transmission line consisting of a metallized strip and a solid ground plane metallization separated by a thin, solid dielectric. This transmission line configuration permits accurate fabrication of 50-ohm transmission line elements on a ceramic or printed circuit board substrate.

microsyn—A precise and sensitive pickoff device for converting angular displacement within a small range to an electrical signal.

microsystems electronics—*See* microelectronics.

microvolt—One millionth of a volt. Letter symbol: μ V.

microvoltmeter—A highly sensitive voltmeter that measures millionths of a volt.

microvolts per meter—The potential difference in microvolts developed between an antenna system and ground, divided by the distance in meters between the two points.

microvolts/meter/mile—One method of stating the field strength of a radiated field. Radiation from industrial heating equipment, for example, must be suppressed so that the radiated field strength does not exceed 10 microvolts per meter at a distance of 1 mile (1.609 km) from the source.

microwafer—A basic microcircuit building block generally made of beryllia, alumina, or glass. Terminations on the edges are usually of gold on top of chromium, with a heavy nickel overlay for welding.

microwatt—One millionth of a watt. Letter symbol: μ W.