IEEE Std 610.10-1994

IEEE Standard Glossary of Computer Hardware Terminology

Sponsor

Standards Coordinating Committee of the IEEE Computer Society

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Abstract: Terms pertaining to computer hardware are defined. Terms falling under the categories of computer architecture, computer storage, general hardware concepts, peripherals, and processors and components are included.
Keywords: computer, hardware, definition, glossary, terminology

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Introduction

(This introduction is not a part of IEEE Std 610.10-1994, IEEE Standard Glossary of Computer Hardware Terminology.)

As the computer field continues to expand, new terms are being generated and new meanings are being adopted for existing terms. The IEEE Computer Dictionary project (the 610 computer glossary series of documents) was undertaken to document this vocabulary. Its purpose is to identify terms currently in use in the computer field and to establish standard definitions for these terms. The dictionary is intended to serve as a useful reference for those in the computer field and for those who come into contact with computers, either through their work or in their everyday lives.

The completed dictionary will contain terms from each of the following areas: Computer Hardware, Software Engineering, Mathematics of Computing, Theory of Computation, Computer Applications, Artificial Intelligence, Data Management, Image Processing and Pattern Recognition, Modeling and Simulation, Computer Graphics, Computer Networking, Computer Languages, and Computer Security and Privacy. This glossary contains the terms related to Computer Hardware.

Every effort has been made to use definitions from established standards in this dictionary. When existing standards were found to be incomplete, unclear, or inconsistent with other entries in the dictionary, however, new, revised, or composite definitions have been developed.

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IEEE Standard Glossary of Computer Hardware Terminology

1. Overview

1.1 Scope

This glossary defines terms pertaining to computer hardware. It includes terms from the following areas:

- Computer storage
  - Storage media (nonspecific)
  - Storage media—card form
  - Storage media—optical
  - Storage media—paper form
  - Storage media—magnetic
  - Types of storage
  - General storage concepts
  - Storage functions
  - General memory concepts
  - Characters, words, bytes, and bits
  - Storage devices
  - Recording techniques
  - Virtual storage concepts

- Processors and components
  - General circuit concepts
  - Integrated circuits
  - Circuits elements
  - Types of circuits
  - Components—bus
  - Components—channels
  - Components—circuit boards
  - Components—registers
  - Components—processors
  - Components—uncategorized
  - Logic elements and concepts
  - Logic—operations
  - Mathematic elements
  - Timers, rates, clocks, and counters

- Peripherals
  - Display devices
  - Input devices
  - Keyboards and keys
  - Printers and plotters
  - Tape devices
  - Card readers
  - Fonts

- Computer architecture
  - Types of computers/machines
  - Types of systems/networks/environments
  - Computer architecture—types
  - Computer architecture—general
  - Instructions and addressing
  - Engines
  - Computer performance
  - Construction and packaging

- General hardware concepts
  - Analog computer concepts
  - Things that hardware can do
  - General terms—applications
  - General terms—electrical
  - Hardware errors
  - Languages
  - Hardware signalling
  - Standards and standard organizations

Some terms are the names of commercial products. Many times such products are developed by a particular group, then the product name is accepted as a generic description of all products performing similar functions. For this reason, this glossary does not, in most cases, attempt to identify the owner or developer of a product. The reader should exercise caution in drawing inferences concerning ownership, trademarks, and copyright of names.

Some technical terms that appear in the definitions are defined in other glossaries in the 610 series and are not included as entries here. For example, IEEE Std 610.12-1990, IEEE Glossary of Software Engineering Terminology, defines terms relating to computer programs, while IEEE Std 610.5-1990, IEEE Standard Glossary of Data Management Terminology, defines terminology relating to data management.

1.2 Glossary Structure

Entries in the glossary are arranged alphabetically. An entry may consist of a single word, such as "hardwired" or "processor," or a phrase, such as "print head." Phrases are given in their natural order, as in "printed circuit board," rather than in reversed order, "circuit board, printed."

Blanks and numerals precede all other characters in alphabetizing. Hyphens and slashes are treated as blanks.

The following distinction is made between acronyms and abbreviations: An acronym is a combination of the first one (or few) letters from two or more words in the term, put together to make a single term. An acronym does not have to be pronounceable. Generally, acronyms are capitalized. An abbreviation is a shortened version of a single word or anything that is not an acronym.

If a term has more than one definition, the definitions are numbered. The order of the definitions does not imply preference or frequency of use. In most cases, noun definitions are given first, followed by verb and adjective definitions as applicable. Examples and notes have been added to clarify selected definitions.

The following cross-references are used to show a term's relationship to other terms in the glossary:

- *Contrast with:* refers to a term with an opposite or substantially different meaning.
- *Syn:* refers to a synonymous term.
- *See also:* refers to a related term.
- *See:* refers to a preferred term or to a term where the desired definition can be found.

The word "deprecated" indicates a term or definition whose use is discouraged because such use is obsolete, misleading, or ambiguous.

2. References

In those cases in which a definition is directly quoted from an existing dictionary or glossary, the following references apply:

ANSI X3.138-1988, Information Systems—Information Resource Dictionary System (IRDS).[1]

IEEE Std 1084-1986 (W1993), IEEE Standard Glossary of Mathematics of Computing Terminology.[2]

IEEE Std 610.2-1987, IEEE Standard Glossary of Computer Applications Terminology (ANSI).[3]

IEEE Std 610.3-1989, IEEE Standard Glossary of Modeling and Simulation Terminology (ANSI).

IEEE Std 610.4-1990, IEEE Standard Glossary of Image Processing and Pattern Recognition Terminology (ANSI).

IEEE Std 610.5-1990, IEEE Standard Glossary of Data Management Terminology (ANSI).

IEEE Std 610.6-1991, IEEE Standard Glossary of Computer Graphics Terminology (ANSI).

IEEE Std 610.7-1995, IEEE Standard Glossary of Computer Networking (ANSI).

IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology (ANSI).

IEEE Std 610.13-1993, IEEE Standard Glossary of Computer Languages (ANSI).

NOTE—Numbers in brackets that follow a definition refer to the source document for the definition. A lowercase "a" after the number indicates that an editorial change was made in the definition for inclusion in this document.

[1]ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[2]IEEE Std 1084-1986 has been withdrawn; however, copies can be obtained from the IEEE Standards Department, IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

[3]IEEE publications are available from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

3. Terms and Definitions

3.1 absolute address. (1) An address that is permanently assigned to a device or storage location and that identifies the device or location without the need for translation or calculation. *Syn:* explicit address; machine address; specific address. *See also:* base address; relative address; relocatable address; symbolic address; virtual address. [IEEE Std 610.12-1990][4] (2) The actual complete address of a device or storage location. *Syn:* address reference.

3.2 absolute instruction. A computer instruction in which all addresses are absolute addresses. [IEEE Std 610.12-1990]

3.3 absolute-value circuit. A transducer or circuit employed in analog computers that produces an output signal equal in magnitude to the input signal but always of one polarity.

3.4 AC. Acronym for alternating current.

3.5 AC analog computer. An analog computer in which electrical signals are of the form of carrier signals where the absolute value of a mathematical variable is represented by the amplitude of the carrier and the sign of the mathematical variable is represented by the phase (0 or 180 degrees) of the carrier relative to the computer.

3.6 acceleration time. The part of access time that is required to bring a storage device, typically a tape or disk drive, to the speed at which data can be read or written. *Syn:* start time. *Contrast with:* deceleration time.

3.7 accelerator. A circuit or device that accelerates some unit in a computer, as in an accelerator board. *See also:* hardware accelerator.

3.8 accelerator board. A printed circuit board that replaces or augments the computer's main processor with a faster processor.

3.9 access. (1) The process of obtaining data from or placing data into a storage device. *Syn:* storage access. *Note:* Specific types of accesses and access modes, such as direct access and sequential access, are defined in IEEE Std 610.5-1990. Terminology relating to access protection will be defined in IEEE P610.9, Glossary of Security & Privacy Terminology.[5] [IEEE Std 610.5-1990a] (2) To obtain data from or place data into a storage device as in (1). [IEEE Std 610.5-1990]

3.10 access arm. In a magnetic disk device, an arm that supports and positions one or more magnetic heads. *See also:* voice-coil actuator.

3.11 access mechanism. A mechanism that is responsible for moving an access arm. *Syn:* actuator.

3.12 access time. The elapsed time required to read from or write to a storage device after the proper controls and address have been applied. *See also:* acceleration time; latency; mean access time; seek time; transfer time.

3.13 accounting machine. A device that reads data from external storage media, such as cards or tapes, and automatically produces accounting records or tabulation, usually on continuous forms.

3.14 accumulator. A register or storage location in which the result of an operation is formed.

3.15 accuracy. The degree of exactness of an approximation or measurement. *Note:* Accuracy denotes the absolute quality of computed results; precision refers to the amount of detail used in representing those results. *See also:* precision.

3.16 acoustic delay line. A delay line whose operation is based on the time of propagation of sound waves within a given medium. *Syn:* sonic delay line. *See also:* mercury storage.

3.17 acoustic memory. *See:* acoustic storage.

3.18 acoustic storage. A type of storage consisting of acoustic delay lines.

3.19 acoustic tablet. A data tablet on which the position of the sensor or stylus is determined by acoustic sensing techniques.

3.20 active storage. Storage that holds data that is being processed.

[4]The numbers in brackets refer to the source document for the definition. Information on these source documents can be found in clause 2. A lowercase "a" after the number indicates that an editorial change was made in the definition for inclusion in this document.

[5]This authorized standards project, IEEE P610.9, was not approved by the IEEE Standards Board at the time this went to press.

3.21 actual address. The real or designed address that is built into the computer by the manufacturer as a storage location or register.

3.22 actual instruction.* *See:* effective instruction. [IEEE Std 610.12-1990]

* Deprecated.

3.23 actual time. *See:* real time.

3.24 actuating signal. A particular input pulse in the control circuitry of a computer.

3.25 actuator. **(1)** A mechanism that moves an object in order to access a storage device. For example, the device that selects a laser disk in a jukebox, or an access arm in a magnetic disk drive. **(2)** In robotics, a motor or transducer that uses electrical, hydraulic, or pneumatic energy to effect motion in a robot.

3.26 A/D. Acronym for analog-to-digital, as in A/D converter.

3.27 ADC. Acronym for analog-to-digital converter.

3.28 add. *See:* adder; false add.

3.29 add-on board. *See:* expansion board.

3.30 add time. The elapsed time required to perform one addition operation, not including the time required to obtain the operands or to return the result to storage. *Contrast with:* multiply time; subtract time.

3.31 adder. A device whose output data is the arithmetic sum of the two or more quantities presented as input data. *See also:* adder-subtracter; full adder; half adder; parallel adder; quarter adder; serial adder; summer. *Contrast with:* subtracter.

3.32 adder-subtracter. A device that acts either as an adder or subtracter depending upon the control signal received. *Note:* The adder-subtracter may be constructed so as to yield the sum and the difference at the same time.

3.33 address. **(1)** A number, character or group of characters that identifies a given device or storage location. [IEEE Std 610.12-1990] **(2)** To refer to a device, data item, or storage location by an identifying number, character, or group of characters, known as its address, as in (1). *Syn:* address reference. [IEEE Std 610.12-1990a]

3.34 address bus. A bus used to carry an address from the processor to memory or to a peripheral device.

3.35 address field. Any of the fields of a computer instruction that contain addresses, information necessary to derive either other addresses, or values of operands. *See also:* operand field; operation field. *Syn:* address part. [IEEE Std 610.12-1990]

3.36 address format. **(1)** The number and arrangement of address fields in a computer instruction. *Note:* The expression "plus-one" is frequently used to indicate that one of the addresses specifies the location of the next instruction to be executed; for example in an three-plus-one address format, an instruction contains three addresses of operands for the present operation, plus one address representing the next instruction to be executed. Such an instruction is known as a "three-plus-one address instruction." *See also:* four-address instruction; instruction format; n-plus-one address instruction format; one-address instruction; three-address instruction; two-address instruction. [IEEE Std 610.12-1990a] **(2)** The number and arrangement of elements within an address, such as the elements needed to identify a particular channel, device, disk sector or record on a storage device. [IEEE Std 610.12-1990a]

3.37 address mark. **(1)** A mark on a disk that is used to identify the specific areas on the disk such as an index, or free storage. **(2)** *See:* index mark.

3.38 address modification. Any arithmetic, logic or syntactic operation performed on an address. [IEEE Std 610.12-1990]

3.39 address part. *See:* address field.

3.40 address reference. *See:* address.

3.41 address register. A register in which an address is stored. *Note:* An address register is generally used in an operand field of a processor instruction and contains a pointer to the address holding the data value to be used by the instruction. *See also:* base address register; instruction address register.

3.42 address space. **(1)** The range of addresses that a computer program can access. *Note:* In some systems, this may be the set of physical storage locations that a program can access, disjoint from other programs, together with the set of virtual addresses referring to those storage locations which may be accessible by other programs. **(2)** The number of memory locations

that a central processing unit can address. *See also:* virtual address space.

3.43 address stop. An address that, when it is encountered by a program, causes the program to halt execution. *See also:* breakpoint instruction; instruction address stop.

3.44 address trace. **(1)** To monitor references made to a particular address. **(2)** A list of addresses of previously executed instructions, in the order in which they were executed. *Note:* Generally used for debugging.

3.45 address track. A track that contains addresses that may be used to locate data on other tracks of the same data medium. *Note:* Usually refers to disk drives.

3.46 address translator. **(1)** A device that transforms the address of an instruction to the address in main storage at which it is to be loaded or relocated. **(2)** In virtual storage, a device that transforms the address of an item of data or instruction from its virtual address into its real address.

3.47 addressable memory. A region of memory that can be located by an address. *Syn:* addressed memory.

3.48 addressable register. A register with a fixed location and address.

3.49 addressed memory. *See:* addressable memory.

3.50 addressibility. The ability to locate an item in storage using an address.

3.51 addressing. The process of assigning or refering to an address.

3.52 addressing mode. A means of combining information in an instruction, in registers, or in memory to define the location of a datum; For example, direct addressing, immediate addressing; implied addressing; indirect addressing; indexed addressing; relative addressing; symbolic addressing; virtual addressing.

3.53 addressless instruction. *See:* zero-address instruction.

3.54 adjacent channel. A channel whose frequency band is adjacent to that of another channel, known as the reference channel.

3.55 AFIPS. Abbreviation for American Federation of Information Processing Societies.

3.56 air-floating head. *See:* floating head.

3.57 algebraic sum. The answer arrived at when adding two operands numerically. For example: 01102 + 01012 = 10112. *Contrast with:* logical sum.

3.58 all-purpose computer.* *See:* general-purpose computer.

* Deprecated.

3.59 allocated storage. Portions of storage that are assigned or reserved for active instructions or for data.

3.60 alphabetic word. **(1)** A word consisting solely of letters from the same alphabet; for example, the word "CIRCUS." **(2)** A word that consists of letters and associated special characters, but not digits; for example, the word "HEAVY-DUTY."

3.61 alphanumeric display device. *See:* character display device.

3.62 ALT. Abbreviation for alternate key.

3.63 alternate function key. A function key that, when used in conjunction with the alternate key, performs a different function or command than when it is used alone.

3.64 alternate key (ALT). A control key that controls the interpretation of other keys. That is, when used in conjunction with another key it causes a different interpretation of that key than when the key is used alone. *See also:* shift key.

3.65 alternate track. On a disk, a spare track that is used in place of a normal track in the event that the latter is damaged or inoperable. *Syn:* alternative track.

3.66 alternating current (AC). An electric current that reverses direction at regularly recurring intervals of time. *Contrast with:* direct current.

3.67 alternative track. *See:* alternate track.

3.68 ALU. Acronym for arithmetic and logic unit.

3.69 American Federation of Information Processing Societies (AFIPS). A national (American) association of computing and information-related organizations that represents the United States in the International Federation of Information Processing (IFIP) organization.

3.70 American National Standards Institute (ANSI). An organization that establishes and maintains standards for the information processing industry within the United States.

3.71 amp. **(1)** Abbreviation for ampere. **(2)** Abbreviation for amplifier.

3.72 amplifier (amp). **(1)** An apparatus or device used to increase the amplitude or the power of an input signal by means of energy drawn from an external source. **(2)** In an analog computer, a device that enables an input signal to control a source of power and thus is capable of delivering at its output an enlarged reproduction or analytical modification of the essential characteristics of the signal. *See also:* buffer amplifier; high-gain amplifier; operational amplifier; relay amplifier; servo amplifier; unloading amplifier.

3.73 amplitude selection. In an analog computer, a summation of one or more variables with a constant resulting in a sudden change in rate or level at the output of a computing element as the sum changes sign.

3.74 analog (analogue). Pertaining to data in the form of continuously variable physical quantities. *Contrast with:* digital. *See also:* analog computer. [IEEE Std 1084-1986]

3.75 analog adder. *Syn:* summer.

3.76 analog channel. A channel in which transmitted information can take any value between the defined limits of the channel. *Note:* The limits for an analog channel are usually the upper and lower frequencies which will pass through the channel.

3.77 analog computer. A computer that processes analog data. *Syn:* electronic analog computer. *See also:* AC analog computer; DC analog computer. *Contrast with:* digital computer; hybrid computer. [ANSI X3.138-1988]

3.78 analog divider. A divider whose output analog variable is proportional to the quotient of the input analog variables.

3.79 analog multiplier. A multiplier whose output analog variable is proportional to the product of two input analog variables. *Note:* This term may also be applied to a device that can perform more than one multiplication, such as a servo multiplier. *See also:* quarter-squares multiplier. *Contrast with:* analog divider.

3.80 analog plotter. A plotter that presents analog data in the form of a two-dimensional graphic representation. *Contrast with:* digital plotter; raster plotter.

3.81 analog-to-digital converter (ADC or A/D converter). A device that provides the means to obtain a digital number representation from a specific analog value. *Contrast with:* digital-to-analog converter.

3.82 analytical engine. A device from which modern digital computers are descended, invented in the mid 1800's by Charles Babbage, a British mathematician, to solve mathematical problems.

3.83 AND element. *See:* AND gate.

3.84 AND gate. A gate that performs the Boolean operation of conjunction. *Syn:* AND element.

3.85 AND-NOT.* *See:* exclusion.
* Deprecated.

3.86 AND-parallelism. Pertaining to the performance of multiple predicate operations concurrently; the successful completion of which results in a true response. *Contrast with:* OR-parallelism.

3.87 ANSI. Acronym for American National Standards Institute.

3.88 ANSI standard. A standard approved by ANSI (The American National Standards Institute). Examples of ANSI standards include programming languages (C, FORTRAN, or COBOL), media formats (Hollerith cards), and interface standards (SCSI interfaces, device drivers).

3.89 aperture. An opening in a data medium or device such as the opening in the an aperture card, or an opening in a multiaperture core.

3.90 aperture card. A punch card of standard dimensions into which microfilm frames may be inserted.

3.91 aperture core. *See:* multiaperture core.

3.92 arbitrary sequence computer. A computer in which each instruction explicitly specifies the location of the next instruction to be executed. *Contrast with:* consecutive sequence computer. *See also:* nonsequential computer.

3.93 architectural design. **(1)** The process of defining a collection of hardware and software components and

their interfaces to establish the framework for the development of a computer system. *See also:* functional design. [IEEE Std 610.12-1990] **(2)** The result of the process in (1). [IEEE Std 610.12-1990]

3.94 architecture. In computer hardware, the organizational structure and interrelationship between the parts of a computing system, including the arrangement, design and interconnection of components. *See also:* computer architecture; network architecture. *Note:* This term is sometimes taken to mean the "instruction set" of a computer, since the physical architecture of a computer is often very tightly coupled with the instruction set of a computer.

3.95 arithmetic and logic unit (ALU). A functional component of a computer system that performs arithmetic and logical operations. *Syn:* arithmetic-logic unit. *See also:* arithmetic unit; exponent arithmetic and logic unit; logic unit; register arithmetic and logic unit.

3.96 arithmetic element. *See:* arithmetic unit.

3.97 arithmetic instruction. An instruction in which the operation field specifies an arithmetical operation; for example, an add instruction or a multiply instruction. *Contrast with:* logic instruction.

3.98 arithmetic-logic unit. *See:* arithmetic and logic unit.

3.99 arithmetic register. A register that holds the operands or the results of operations such as arithmetic operations, logic operations, and shift operations.

3.100 arithmetic unit. A functional component of a computer system that performs arithmetic operations. *Note:* The term is also sometimes used for an arithmetic and logic unit. *Syn:* arithmetic element. *See also:* scalar unit; vector unit.

3.101 array processor. A processor capable of executing instructions in which the operands may be arrays rather than scalar data elements. *Syn:* vector processor. *Note:* Arrays and other data structures are defined in IEEE Std 610.5-1990.

3.102 ASR. Acronym for automatic send/receive.

3.103 associative memory. A type of memory whose locations are identified by their contents or by a part of their contents, rather than by their names or positions. *Syn:* content-addressable storage; search memory.

3.104 astable circuit. A circuit that alternates between its two unstable states.

3.105 asymmetric multiprocessor. A multiprocessor in which the processors are not assigned equal tasks. *Note:* Typically one processor is in charge of assigning tasks to processors and controlling I/O for them all. *Contrast with:* symmetric multiprocessor.

3.106 asynchronous circuit. A logic circuit in which the timing of the result is not related to a clock. *Contrast with:* synchronous circuit. *See also:* double rail logic.

3.107 asynchronous computer. A computer in which each event or operation is performed upon receipt of a signal generated by the completion of a previous event or operation, or upon availability of the system resources required by the event or operation. *Contrast with:* synchronous computer.

3.108 asynchronous operation. An operation that occurs without a regular or predictable time relationship to a specified event; for example, an interrupt.

3.109 attention key (ATTN). A control key that causes an attention or input-output interrupt signal to be generated, thereby causing the processing unit to cease processing. *See also:* escape key. *Syn:* break key; program attention key.

3.110 attenuation. (1) A decrease in the magnitude of current, voltage, or power of a transmitted signal due to loss through a communication medium. *See also:* equalization. **(2)** A decrease in the magnitude of current, voltage, or power of a signal during transmission from one point to another.

3.111 ATTN. Abbreviation for attention key.

3.112 audio response device. An output device capable of generating spoken language.

3.113 autochanger. *See:* jukebox.

3.114 automatic. Pertaining to a function, operation, process, or device that, under specified conditions, functions without intervention by a human operator. [IEEE Std 610.2-1989]

3.115 automatic carriage. A control mechanism for a typewriter or other output device that can automatically control the feeding, spacing, skipping and ejecting of paper and preprinted forms.

3.116 automatic check. A check that is built into a device in order to verify the accuracy of information transmitted, manipulated, or stored by that device. *Syn:* built-in check; hardware check. [IEEE Std 610.5-1990]

3.117 automatic component interconnection matrix. A hardware system for connecting inputs and outputs of parallel computing components according to a predetermined program. *Note:* This system, which may consist of a matrix of mechanical and/or electronic switches, replaces the manual program patch boards and patch cords on analog computers. *Syn:* autopatch.

3.118 automatic computer.* A computer that can perform a sequence of operations without intervention by a human operator.
* Deprecated.

3.119 automatic-feed punch. A card punch or keypunch into which cards are fed automatically. *Contrast with:* hand-feed punch.

3.120 automatic punch. *See:* card punch.

3.121 automatic send/receive (ASR). (1) A teletypewriter with a keyboard, printer, and paper tape punch/reader, allowing tape to be produced and edited off-line for automatic transmission. *Contrast with:* keyboard send-receive. **(2)** A keyboard/printer device that uses asynchronous set-serial connection to a computer.

3.122 autopatch. *See:* automatic component interconnection matrix.

3.123 auxiliary console. In a computer system with more than one console, an alternate console used primarily to supervise operations within the computer. *Contrast with:* master console.

3.124 auxiliary operation. Any operation that is performed by equipment that is not under continuous control of the central processing unit.

3.125 auxiliary storage. A type of secondary storage that is available to a processor only through input-output channels; for example, storage on magnetic tape or a disk drive. *See also:* paging device. *Contrast with:* main storage. *Syn:* peripheral storage.

3.126 available time. (1) The time during which a functional unit is on and is operating correctly or is ready to use. *See also:* makeup time. *Contrast with:* unavailable time. **(2)** In time-sharing computer systems, the time during which a system or system component is performing tasks for the user.

3.127 b. Abbreviation for bit.

3.128 B. Abbreviation for byte.

3.129 B-box. *See:* index register.

3.130 B-line. *See:* index register.

3.131 b-register.* *See:* index register.
* Deprecated.

3.132 backend. Pertaining to one part of a process which has two parts, the frontend and the backend; the frontend usually denotes what the user sees and the backend denotes some special process. *See also:* backend computer. *Contrast with:* frontend.

3.133 backend computer. A specialized computer that is attached to another computer, known as a frontend, or host, computer that handles the interface to the users while the backend computer performs functions such as database access, simulation, or vector processing. *Syn:* backend machine; backend processor. *Contrast with:* frontend computer. *See also:* bifunctional machine.

3.134 backend machine. *See:* backend computer.

3.135 backend processor. *See:* backend computer.

3.136 backplane. (1) The circuitry and mechanical elements used to connect the circuit boards within a computer system. *Note:* This circuitry is usually limited to terminating the bus signals, and sometimes generating central clocks or providing an arbiter. **(2)** The main circuit board of a computer into which other circuit boards are plugged. *Contrast with:* motherboard.

3.137 backward channel. A channel, associated with the forward channel, used for supervisory or error control signals, but with a direction of transmission opposite to that of the forward channel in which user information is being transferred. *Note:* In the case of simultaneous transfer of user information in both directions, this definition applies with respect to the data source under consideration. *Syn:* reverse channel.

3.138 backward read. To read data from a sequential storage medium in a reverse direction; for example, to read a magnetic tape from the end to the beginning.

3.139 badge reader. A reader capable of reading information on specially coded badges or cards.

3.140 balance check. In an analog computer, the computer-control state in which all amplifier summing junctions are connected to the computer zero reference level (usually signal ground) to permit zero balance of the operational amplifiers.

3.141 balanced. Pertaining to a relationship between two or more objects that are alike or symmetrical in some respect. *Contrast with:* unbalanced.

3.142 band. A group of tracks on a magnetic drum or a magnetic disk which are read or written as a group.

3.143 band printer. An element printer in which type slugs are carried on a flexible band.

3.144 bank. **(1)** One or more disk drives lined up in a row. **(2)** Any group of similar devices that are connected together for use as a single device. For example, a row of light-emitting diodes connected to form a display. **(3)** A contiguous section of addressable memory. For example, eight memory devices, each of which is 64 kB by 1; forming a 64 kB × 8 memory bank.

3.145 bar. *See:* type bar.

3.146 bar-code. An identification code consisting of a pattern of vertical bars whose width and spacing identifies the item marked. [IEEE Std 610.2-1989]

3.147 bar-code reader. *See:* bar-code scanner.

3.148 bar-code scanner. An optical scanner used to read a bar-code using reflected light. *Syn:* bar-code reader. *See also:* light pen.

3.149 bar printer. An element printer in which the members of the character set are carried on a type bar.

3.150 barrel shifter. A circuit which will shift a word a certain number of bits in either direction within a single clock cycle.

3.151 base address. **(1)** An address that is used as a reference point to which a relative address is added to determine the absolute address of a particular storage location to be accessed. *Syn:* constant address; presumptive address; reference address. [IEEE Std 610.12-1990a] **(2)** A given address from which an absolute address is derived by combination with a relative address.

3.152 base address register. A register used in an operand field of a processor instruction with a specified offset, the sum of which points to a data value within a data structure to be used by the instruction. *See also:* base register.

3.153 base font. The font that is used by a printer or other peripheral device when no font is specified. *Syn:* default font.

3.154 base register. *See:* base address register.

3.155 baud. A unit of signaling speed, expressed as the number of times per second the signal can change in the electrical state of the transmission line. *Note:* Depending on the encoding strategies, a signal event may represent a single bit or less than one bit. [IEEE Std 610.7-1995]

3.156 baud rate. The rate of signal transitions per unit time, usually expressed in baud. *Note:* Often confused with bit rate. *See also:* data signaling rate. [IEEE Std 610.7-1995]

3.157 beginning-of-file label (BOF). An internally-recorded label that identifies a file, marks its location, and contains information for use in file control. *Syn:* header label. *Contrast with:* end-of-file label.

3.158 beginning-of-tape marker (BOT). A marker on a magnetic tape used to indicate the beginning of the permissible recording area. *Note:* It might be a photo reflective strip, a unique data pattern, or a transparent section of tape. *Contrast with:* end-of-tape marker. *See also:* load point.

3.159 beginning-of-volume label (BOV). An internally-recorded label that identifies a volume and which indicates the beginning of the recording area on that volume. *Syn:* volume header; volume label. *Contrast with:* end-of-volume label.

3.160 bel. The fundamental unit in a logarithmic scale for expressing the ratio of two amounts of power. *Note 1:* The number of bels is equal to the $\log_{10}(P_1/P_2)$, where P_1 is the power level being considered and P_2 is an arbitrary reference level. *Note 2:* The decibel, a more commonly used unit, is equal to 0.1 bel.

3.161 belt printer. An element printer in which the type slugs are carried on a flexible belt.

3.162 benchmark. A standard against which measurements or comparisons can be made. *See also:* benchmark problem; benchmark program.

3.163 benchmark problem. **(1)** A problem used to evaluate the performance of hardware, software, or both. [ANSI X3.138-1988] **(2)** A problem used to evaluate the performance of several computer systems relative to one another, or relative to system specification.

3.164 benchmark program. A standard program that can be used to evaluate the performance of a computer system. *See also:* kernel benchmark program; local benchmark program; synthetic benchmark program.

3.165 bias. A systematic deviation of a value from a reference value. [IEEE Std 1084-1986]

3.166 biasing. A technique used in memory mapping whereby the translation from a logical address to a physical address is performed by simply adding a bias to the logical address to determine the physical address. *Syn:* relocation. *See also:* segmenting.

3.167 bidirectional bus (BIDI). A bus which provides a communication path in either direction between two or more devices; for example, between a central processor and peripheral devices.

3.168 bidirectional printer. A printer that can print in two directions, that is, left-to-right and right-to-left. *Syn:* reverse printer.

3.169 bifunctional machine. A computer that can perform either the host computer or backend computer functions.

3.170 bin. *See:* pocket.

3.171 binary card. A punch card that is to contain information in column binary or row binary form.

3.172 binary cell. A storage cell that can hold one binary digit. For example, a single-bit register.

3.173 binary digit (bit). **(1)** A unit of information that can be represented by either a zero or a one. *See also:* byte; word. [IEEE Std 610.12-1990] **(2)** An element of computer storage that can hold a unit of information as in (1). [IEEE Std 610.12-1990]

3.174 binary symmetric channel. A channel designed to convey messages consisting of binary characters and which has the property that the conditional probabilities of changing any one character to the other character are equal.

3.175 binder-hole card. A punch card that contains one or more holes used to bind the cards together.

3.176 bipolar. **(1)** Having two opposite states, such as positive and negative; For example, in computer logic, a value of true is represented by an electrical voltage polarity opposite to that representing a value of false. *Contrast with:* unipolar. **(2)** Pertaining to a semiconductor technology in which transistors are built from alternating layers of positively and negatively doped semiconductor material. *See also:* diode-transistor logic; emitter coupled logic; transistor-transistor logic.

3.177 bistable. Pertaining to a circuit or device that is capable of assuming one of two stable states. *See also:* monostable.

3.178 bit (b). Acronym for binary digit. *See also:* block; byte; clocking bit; overhead bit; start bit; stop bit; synchronization bit. [IEEE Std 1084-1986, IEEE Std 610.5-1990, IEEE Std 610.12-1990]

3.179 bit blitter circuit. A circuit that performs bit block transfer operations. *Syn:* blitter. *See also:* blt chip.

3.180 bit block transfer. **(1)** To move information, optionally with a masking step, from one storage location to another. *Note:* Used extensively in bit mapped displays. Often abbreviated as bit blt, bitblt, or just blt (pronounced "blit"). *See also:* bit blitter circuit. **(2)** The transfer or combination of the pixel values in rectangular regions of bit maps.

3.181 bit blt (bitblt). Abbreviation for bit block transfer.

3.182 bit density. *See:* recording density.

3.183 bit map. A data structure that stores information about entities in the form of a series of one-bit entries, each of which describes the state of the corresponding entity; for example, in graphics, a block of memory that stores a raster image in a device-specific format in which the characteristics of each pixel are determined by a set of bits. *See also:* bit-mapped; bit plane. [IEEE Std 610.6-1991a]

3.184 bit map font. A font defined in the form of a bit map that specifies the bit pattern which makes up each character. *Contrast with:* outline font; vector font. *Syn:* intrinsic font. *Contrast with:* derived font.

3.185 bit-mapped. Pertaining to a display screen on which a character or image is generated from a bit map in memory.

3.186 bit pad. *See:* data tablet.

3.187 bit parallel. Pertaining to a method for simultaneously processing all bits as a contiguous set of bits over separate wires, one wire for each bit.

3.188 bit pattern. The image created on the screen of a display device by the mapping of the bit map onto the screen.

3.189 bit plane. A portion of a bit map that stores one bit of every pixel of a raster image. *Note:* Several bit planes are combined to make the full image.

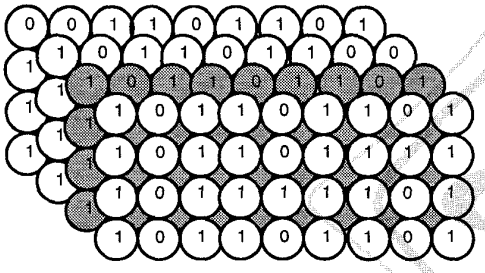


Figure 1—Bit plane

3.190 bit rate. The rate at which data are transmitted, expressed in bits per unit time. *Syn:* bit transfer rate. *See also:* baud rate. [IEEE Std 610.7-1995]

3.191 bit serial. Pertaining to a method of sequentially processing a contiguous set of bits one at a time over a single wire, according to a fixed sequence.

3.192 bit slice. Pertaining to a device consisting of an n-bit functional component, such as an arithmetic and logic unit (ALU), or a sequencer, which may be cascaded with one or more identical devices to expand the width of its function by multiples of n. *See also:* bit slice device; bit slice processor.

3.193 bit slice architecture. An architecture in which a section of the register and the arithmetic and logic unit in a computer is placed into one package. *See also:* bit slice processor.

3.194 bit slice device. A device that uses bit slice technology.

3.195 bit slice microprocessor.* *See:* bit slice device; bit slice processor.
* Deprecated.

3.196 bit slice processor. A processor that is built from multiple bit slices to any given word-size.

3.197 bit stream. A continuous stream of bits, transmitted over a channel with no separators between the character groups. [IEEE Std 610.7-1995]

3.198 bit transfer rate. *See:* bit rate.

3.199 blank medium. A data medium on which neither marks of reference, nor user data are recorded; For example, an unformatted floppy disk. *See also:* empty medium; virgin medium.

3.200 blitter. *See:* bit blitter circuit; bit block transfer.

3.201 block. **(1)** A group of contiguous storage locations, computer program statements, records, words, characters, or bits that are treated as a unit. *See also:* interblock gap. [IEEE Std 610.12-1990, IEEE Std 610.5-1990] **(2)** To form a group as in (1). **(3)** A circuit assemblage that functions as a unit. For example, a logic block within a sequential circuit.

3.202 block gap.* *See:* interblock gap. [IEEE Std 610.5-1990]
* Deprecated.

3.203 blt. *See:* bit block transfer.

3.204 blt chip. An integrated circuit whose purpose is to perform bit block transfer operations.

3.205 board. A generic term used as an abbreviation for circuit board.

3.206 BOF. Acronym for beginning-of-file label.

3.207 boolean vector machine. A special type of attractor neural network that uses binary values for its connectivity-states matrix.

3.208 boost. In an analog computer, to increase the power output capability of an operational amplifier by circuit modification in the output stage.

3.209 bore. The inside diameter of a spool of magnetic tape.

3.210 BOT. Acronym for beginning-of-tape marker.

3.211 bounds register. A register which holds an address specifying a storage boundary. *Note:* An access outside the boundary results in an error.

3.212 BOV. Acronym for beginning-of-volume label.

3.213 branch instruction. A computer instruction that changes the sequence in which computer instructs are performed. *Note:* A branch instruction generally specifies the next instruction in terms of a relative address based on the program counter. *Syn:* decision instruction. *See also:* conditional branch instruction; jump instruction.

3.214 breadboard. An experimental model of a circuit, usually roughly conceived, that can be used as a prototype for planning, design, and feasibility evaluation.

3.215 break key. *See:* attention key.

3.216 breakpoint halt. *See:* breakpoint instruction.

3.217 breakpoint instruction. **(1)** A computer instruction that causes program flow to be halted. *See also:* address stop. **(2)** A computer instruction that causes program flow to be redirected to a monitor or debugging program. *Syn:* breakpoint halt; dynamic stop.

3.218 bridge circuit. A circuit of elements that is arranged such that when an elecromotive force is present in one branch, the response of a detecting device in another branch can be zeroed by adjusing the electrical constants of the other branches. *See also:* bridge limiter.

3.219 bridge limiter. A bridge circuit that is used as a limiter circuit.

3.220 bubble memory. A type of nonvolatile storage that uses magnetic fields to create regions of magnetization; a pulsed field breaks the regions into isolated bubbles, free to move along the surface and the presence or absence of a bubble represents digital information. *Syn:* magnetic bubble memory.

3.221 bucket. A colloquial reference for an area of storage that may contain more than one record and that is referenced as a whole by some addressing technique. [IEEE Std 610.5-1990a]

3.222 buffer. A device or storage area used to store data temporarily to compensate for differences in rates of data flow, time or occurrence of events, or amounts of data that can be handled by the devices or processes involved in the transfer or use of the data. *Syn:* input buffer; input-output area; output buffer. [IEEE Std 610.5-1990, IEEE Std 610.12-1990]

3.223 buffer amplifier. An amplifier employed in analog computers that produces an output signal equal in magnitude to the input signal but always of one polarity. *Note:* This isolates a preceding circuit from the effects of the following circuit. *See also:* unloading amplifier.

3.224 buffer prefix. An area contained within a buffer that is used to store control information for the buffer.

3.225 buffer register. *See:* data buffer register; input buffer register.

3.226 buffer storage. **(1)** A type of storage that is used as temporary storage; to compensate for differences in data rate and data flow. *See also:* dynamic buffering. [IEEE Std 610.5-1990a] **(2)** A portion of main storage that is assigned to temporary storage as in (1).

3.227 buffered computer. A computer that can perform input-output and process operations simultaneously by using input and output buffers.

3.228 buffering. The process of using a buffer. *See also:* dynamic buffering.

3.229 bug. In computer hardware, a recurring physical problem that prevents a system or system component from working together properly.

3.230 built-in check. *See:* automatic check. [IEEE Std 610.5-1990]

3.231 built-in font. *See:* internal font.

3.232 bulk storage. *See:* mass storage.

3.233 burn in. The process of running a device for a period in order to identify early failures caused by "infant mortality." *Note:* This is not the same as programming, or "burning" electrically programmable read-only memory.

3.234 burning. *See:* electrically programmable; fusible link.

3.235 burst. **(1)** To read or write data in such a manner that does not require or permit an interruption to occur. **(2)** To separate the pages of a continuous form, often by means of a device called a burster. *See also:* decollate.

3.236 bus. One or more conductors that are used for the transmission of signals, data, or power. *See also:* address bus; bidirectional bus; control bus; data bus; data chain bus; memory bus; time-multiplexed bus.

3.237 bus-based architecture. A computer architecture in which the components such as processors, peripheral devices and memory are interconnected by one or more busses. *Contrast with:* non-bus architecture.

3.238 bus driver. **(1)** A device capable of providing sufficient current to drive all loads connected to a bus. *See also:* bus slave. **(2)** A device which controls access to a bus.

3.239 bus master. A device connected to a bus which controls all other devices connected to the same bus. *Note:* The bus master controls which slave devices may, and when they may, place data on the bus. *Contrast with:* bus slave.

3.240 bus mouse. A mouse that connects to the computer system using a bus, generally contained within a special expansion board. *Contrast with:* serial mouse.

3.241 bus slave. **(1)** A device which responds to signals on a bus. *Contrast with:* bus master. **(2)** A device connected to a bus which cannot put data onto the bus until given permission by the bus driver or bus master.

3.242 button device. *See:* choice device. [IEEE Std 610.6-1991]

3.243 byte. **(1)** A group of adjacent binary digits operated upon as a unit and is usually shorter than a computer word. *Note:* Although most people refer to a byte as having 8 bits used for data representation, hardware designers may add one or more parity bits to be used for error detection and correction. *See also:* doublet; gigabyte; gulp; kilobyte; megabyte; nibble; n-bit byte; octet; quintet; quartet; septet; sextet; triplet. [IEEE Std 610.12-1990a] **(2)** An element of computer storage that can hold a group of bits as in (1). *See also:* bit; word. [IEEE Std 610.12-1990]

3.244 cache. A small portion of high-speed memory used for temporary storage of frequently-used data, instuctions, or operands. *See also:* cache architecture; cache memory; caching; data cache; disk cache; high-speed buffer; instruction cache.

3.245 cache architecture. **(1)** A computer architecture that employs an extremely high-speed memory block, called a cache, in which data is stored. **(2)** The organization of cache memory; for example, direct mapped cache, two-way set associative cache.

3.246 cache hit. *See:* hit.

3.247 caching. The process of accessing a cache.

3.248 cage. *See:* card cage.

3.249 calculating punch. A calculator, with card reader and card punch, that reads data from a punch card, performs some arithmetic operations or logic operations on the data, and punches the results on the same or another punch card. *Syn:* multiplying punch.

3.250 calculator. A device that is suitable for performing logic and arithmetic digital operations, but that requires manual intervention to initiate each operation. *See also:* calculating punch.

3.251 capacitor. An element within a circuit consisting of two conductors, each with an extended surface exposed to that of the other, but separated by a layer of insulating material called the dielectric. *Note:* The dielectric is designed so the electric charge on one conductor is equal in value but opposite in polarity to that of the other conductor. *See also:* storage capacitor.

3.252 capacitor storage. A type of storage that uses the capacitive properties of certain materials.

3.253 capstan. A rotating shaft within a tape drive that pulls the tape across the read or write heads.

3.254 card. **(1)** A generic term used as an abbreviation for a circuit board. **(2)** An input medium made of paperboard, formed in a uniform size and shape such that it may be punched or marked and sensed electronically. *See also:* magnetic card; mark-sensing card; punch card.

3.255 card cage. A chassis in which a printed circuit board may be mounted.

3.256 card code. The set or combination of punched holes in a punch card that represent a character.

3.257 card column. A single vertical line of punch positions on a punch card. *Contrast with:* card row.

3.258 card deck. A group of punch cards.

3.259 card duplicator. *See:* card reproducing punch.

3.260 card feed. A mechanism that moves cards one at a time from the card hopper to the card path.

3.261 card hopper. The part of a card-processing device that holds the cards to be processed and makes them available to the card feed mechanism. *Contrast with:* card stacker. *Syn:* punched card holder.

3.262 card image. A representation of the hole patterns found in a punched card, for example, a matrix in which a one represents a punch and a zero represents the absence of a punch.

3.263 card path. In a card-processing device, a path along which cards are moved and guided. *See also:* card feed.

3.264 card-processing device. Any device that can read or write data to punch cards. *See also:* card punch; card reader; card reproducing punch.

3.265 card punch. An output device that produces a record of data as hole patterns in punch cards. *Syn:* automatic punch. *See also:* card-reproducing punch; keypunch.

3.266 card reader. An input device that reads or senses hole patterns in a punch card, transforming the data from hole patterns to electrical signals. *Syn:* punched card reader. *See also:* card hopper; card stacker; card track; paper tape reader.

3.267 card reproducer. *See:* card reproducing punch.

3.268 card reproducing punch. A card-processing device that prepares one punch card, copying all or part of the data from another punch card. *Syn:* card duplicator; card reproducer.

3.269 card row. A single horizontal line of punch positions on a punch card. *Contrast with:* card column.

3.270 card sorter. A sorting device that deposits punch cards in pockets selected according to the hole patterns in the cards.

3.271 card stacker. The part of a card-processing device that receives the cards after they have been processed. *Contrast with:* card hopper.

3.272 card-to-disk converter. An input device that converts data from punch cards to disk storage. *See also:* card-to-tape converter; key-to-disk converter.

3.273 card-to-tape converter. An input device that converts data from punch cards to magnetic or paper tape. *See also:* card-to-disk converter; key-to-tape converter.

3.274 card track. That part of a card-processing device that moves and guides the card along the card path.

3.275 carriage. The mechanism in a typewriter or other printing device that holds the paper and moves it past the printing position. *See also:* automatic carriage.

3.276 carriage control tape. **(1)** A tape that is used to control vertical tabulation of printing or display positions. **(2)** A tape that contains line feed and form feed control data for a printing device.

3.277 carriage restore key. *See:* carriage return key.

3.278 carriage return (CR). A command or signal sent to a printer to instruct it to move to the beginning of the writing line. *Note:* Often used in conjunction with a line feed to move to the beginning of the next writing line.

3.279 carriage return key. A control key on a keyboard that initiates a carriage return. *Syn:* carriage restore key. *Note:* Often used to terminate a command or to request its execution. *Syn:* enter key.

3.280 cartridge. A container holding some form of data medium such that the medium can be accessed without separating it from the container; for example, a magnetic tape cartridge or a font cartridge. *See also:* cassette.

3.281 cartridge font. A font that is stored on a font cartridge.

3.282 cassette. A container holding some form of data medium on reels which are driven at their axis at a variable speed which allows the tape to be accessed without separating it from the container. *See also:* cartridge; magnetic tape cassette.

3.283 cathode ray storage. A type of matrix storage in which a cathode ray beam is used to access data.

3.284 cathode ray tube (CRT). An evacuated glass tube in which a well-defined and controllable beam of electrons is focused onto a phosphor-coated display surface of the tube causing the phosphors to emit light. *Note:* A beam deflection system moves the beam as required to generate an image. *See also:* storage tube; Williams-tube storage. [IEEE Std 610.6-1991a]

3.285 CBEMA. Acronym for the Computer and Business Equipment Manufacturers Association.

3.286 CCD. Acronym for charge-coupled device.

3.287 CCITT. Acronym for Comité Consultatif International de Télégraphique et Téléphonique (French). *Note:* Also known in English as International Telegraph and Telephone Consultative Committee.

3.288 CCR. Acronym for condition code register.

3.289 CD. Acronym for compact disc.

3.290 CD-ROM. Acronym for compact disc read-only memory. *See:* CD-ROM storage.

3.291 CD-ROM storage. A read-only form of optical storage employing compact discs to store information.

3.292 cell. **(1)** A module used in assembling application-specific integrated circuits. *See also:* photocell. **(2)** The storage position of one unit of information, such as a character, a bit, or a word. *See also:* storage cell.

3.293 cell library. A collection of cells used to design and lay out application-specific integrated circuits in accordance with the functional requirements of particular end users

3.294 cell-organized raster display device. A raster display device on which an image is constructed by a collection of rectangular characters, each character represented by an n-by-m set of illuminated control indicators.

3.295 central computer.* *See:* host computer.
* Deprecated.

3.296 central processing unit (CPU). That unit of a computer system which fetches, decodes and executes programmed instructions and maintains the status of results as the program is executed. *Syn:* central processor. *See also:* processor; uniprocessor.

3.297 central processor. *See:* central processing unit.

3.298 chad. The bit of material resulting from punching a hole in a paper card or tape. *Syn:* chip.

3.299 chadless tape. Perforated tape that has been punched in such a way that chad is not formed.

3.300 chain printer. An element printer in which the type slugs are carried by the links of a revolving chain, called a print chain.

3.301 change recording. *See:* non-return-to-zero (change) recording.

3.302 channel. **(1)** A one-way path for transmission of signals between two or more points; for example, an output channel or a data channel. *See also:* circuit. *Syn:* line; link; path. [IEEE Std 610.7-1995] **(2)** The portion of a storage medium that is accessible to a given reading or writing station, such as a track, or a band. **(3)** A two-way communications path between the central processor and its peripheral devices. [IEEE Std 610.7-1995]

3.303 channel-attached terminal. A terminal that is connected directly to the computer by wires or cables. *Syn:* locally-attached terminal. *Contrast with:* link-attached terminal.

3.304 channel path. The routing, switching and line links between an input-output channel and some peripheral device. *Note:* There may be multiple channel paths between a channel and a device. [IEEE Std 610.7-1995]

3.305 channel router. A machine used to determine a path between two points. *Note:* Often used in the design and layout of integrated circuits and printed circuit boards.

3.306 character device. A printer or other peripheral device that receives data character by character.

3.307 character display device. A display device that provides a representation of data only in the form of characters. *Syn:* alphanumeric display device; readout device. *Contrast with:* graphic display device.

3.308 character font. A family or related set of graphic characters that are of the same style of type. For example, Courier Bold Oblique. [IEEE Std 610.12-1990a]

3.309 character generator. A device that forms character images on a display device or printer.

3.310 character printer. A printer that can print only character text. *Contrast with:* graphic printer.

3.311 character reader. A reader that can recognize hand-written or printed characters using character recognition. *See also:* magnetic ink character reader; optical character reader; page reader.

3.312 character-at-a-time printer. A printer that prints a single character at a time. *Syn:* serial printer. *Contrast with:* line printer; page printer.

3.313 character-based user interface. A user interface in which commands must be expressed in characters entered on a keyboard. *Syn:* text-based user interface. *Contrast with:* graphical user interface.

3.314 charactron. A CRT display device that incorporates a metallic foil into which characters are embossed. The electron beam is directed to the location of a desired character on the foil and its image focused onto the display surface.

3.315 charge-coupled device (CCD). A storage device in which individual semiconductor components are connected to each other so that the electrical charge at the output of one device provides the input to the next.

3.316 charge-storage tube. *See:* storage tube display device.

3.317 CHDL. Acronym for computer hardware description language. *See:* hardware description language.

3.318 check card. A punch card so formatted as to be suitable for use as a negotiable bank check; for example, a U.S. series E bond.

3.319 Chinese binary. *See:* column binary.

3.320 chip. **(1)** *See:* integrated circuit. **(2)** A small piece of silicon or other semiconductive material on which circuits can be placed. **(3)** *See:* chad

3.321 chip density. The number of transistors implemented on a single integrated circuit.

3.322 choice device. A logical input device used to make a selection from a set of predefined menu options in a graphics system. A typical physical device is a function keyboard or a set of function keys. *Syn:* button device. [IEEE Std 610.6-1991]

3.323 chopper. A mechanical, electrical, or electromechanical device that converts direct current into alternating current. *Note:* As applied to a direct-coupled operational amplifier, it is a modulator used to convert the direct current at the summing junctions to alternating current for amplification and reinsertion as a correcting voltage to reduce offset.

3.324 circuit. **(1)** An arrangement of interconnected components that has at least one input and one output terminal, and whose purpose is to produce at the output terminals a signal that is a function of the signal at the input terminals. *See also:* channel; element node; expansion board; telecommunication circuit. *Syn:* network; physical circuit. **(2)** An arrangement of interconnected electronic components that can perform specific functions upon application of proper voltages and signals. *See also:* integrated circuit; logic circuit.

3.325 circuit board. A flat piece of insulating material, often multi-layered, constituted of epoxy-glass or phenolic resin, on which electrical components are mounted and interconnected by etched copper foil so patterned as to form a circuit. *Note:* Sometimes referred to as a "board" or a "card." *See also:* printed circuit board.

3.326 circuit limiter. *See:* limiter circuit.

3.327 circulating register. A shift register in which data that are moved out of one end of the register are reentered into the other end, as in a closed loop.

3.328 circulating storage. Dynamic storage in the form of a closed loop. *Syn:* cyclic storage. *See also:* regenerative track.

3.329 CISC. Acronym for complex-instruction-set computer.

3.330 CIU. Acronym for computer interface unit.

3.331 clamping circuit. **(1)** A circuit used in analog computers to provide automatic hold and reset action electronically for the purpose of switching or supplying repetitive operation. **(2)** *See:* limiter circuit

3.332 clear. To replace a variable, register, or other storage location with a zero, blank, or null value. *See also:* initialize; reset. [IEEE Std 610.12-1990a]

3.333 clock. **(1)** A device that measures and indicates time. *See also:* master clock; real-time clock; time-of-day clock; timer; wall clock. **(2)** A device that generates periodic, accurately spaced signals used for such purposes as timing, regulation of the operations of a processor, or generation of interrupts. **(3)** To trigger a circuit to perform an operation, such as to accept data into a register.

3.334 clock pulse. *See:* clock signal.

3.335 clock register. *See:* timer.

3.336 clock signal. A periodic signal used for synchronizing events. *Syn:* clock pulse; timing pulse.

3.337 clock track. A track on which a pattern of signals, known as synchronization bits, is recorded to provide a timing reference. *Syn:* timing track. *See also:* clocking bits.

3.338 clocking bit. A bit containing an encoded signal, preceding the data within a data stream, or on a separate channel; used for establishing timing intervals. *See also:* clock track; synchronization bits. [IEEE Std 610.7-1995]

3.339 closed architecture. An architecture for which design parameters and specifications are not available to anyone except the manufacturer of the system. *Contrast with:* open architecture.

3.340 cluster. One or more contiguous sectors on a magnetic disk.

3.341 CMOS. Acronym for complementary metal-oxide semiconductor.

3.342 coarse-grain parallel architecture. Parallel architecture that uses between 2 and 16 processors. *Contrast with:* fine-grain parallel architecture; medium-grain parallel architecture.

3.343 coated card. *See:* edge-coated card.

3.344 code converter. A converter that changes the representation of data from one code to another. [IEEE Std 610.5-1990a]

3.345 coefficient potentiometer. A parameter potentiometer that is used to represent a coefficient.

3.346 collator. A device that compares and merges sets of punch cards or other documents into a sequence.

3.347 color display device. A display device that can display more than one color, in addition to the background color. *Contrast with:* monochrome display device. *See also:* red, green, blue (RGB) display device. [IEEE Std 610.6-1991a]

3.348 color printer. A printer that utilizes multi-colored ribbons, pens, or ink supplies, allowing it to print in more than one color.

3.349 column binary. Pertaining to the binary representation of data on punch cards in which the weights of punch positions are assigned along card columns, for example, each column in a 12-row card may be used to represent 12 consecutive bits. *Syn:* Chinese binary. *See also:* binary card. *Contrast with:* row binary.

3.350 COM printer. Acronym for computer output microfilm printer.

3.351 combinational. Pertaining to a logic whose output values at any given instant depend only upon the input values at that time. *Contrast with:* sequential.

3.352 combinational circuit. A logic circuit whose output values at any given instant depend only upon the input values at that time. *Syn:* combinatorial circuit. *Contrast with:* sequential circuit. *See also:* gate.

3.353 combinatorial circuit. *See:* combinational circuit.

3.354 combined head. *See:* read/write head.

3.355 Comité Consultatif International de Télégraphique et Téléphonique (CCITT). An international organization that studies and issues recommendations on issues related to communication technology. *Note:* Also known in English as International Telegraph and Telephone Consultative Committee.

3.356 command. **(1)** In hardware, a control signal. **(2)** An expression that can be input to a computer system to initiate an action or affect the execution of a computer program; for example, the "log on" command to initiate a computer session. [IEEE Std 610.12-1990] **(2)** Loosely, a mathematical or logic operator. **(3)** Loosely, a computer instruction.

3.357 command key. Any control key on a keyboard used to represent a particular machine command.

3.358 common storage. A portion of main storage that can be accessed by two or more modules in a software system. [IEEE Std 610.12-1990]

3.359 communication. The flow of information from one point, known as the source, to another, the receive.

3.360 communications computer. A computer that is specially designed to be an interface between another computer or terminal and a network, or to control data flow in a network. *See also:* concentrator; frontend computer; switching computer. [IEEE Std 610.7-1995]

3.361 compact disc (CD). An optical disk that is compact in size, generally 4 to 5 inches in diameter. *See also:* CD-ROM storage; laser disk.

3.362 compact disc read-only memory (CD-ROM). *See:* CD-ROM storage.

3.363 compact disc storage. *See:* CD-ROM storage.

3.364 compatible. Pertaining to a computer system or system component that is capable of handling data and programs intended for use with some other system or component. *See also:* downward compatible; upward compatible.

3.365 complementary metal-oxide semiconductor (CMOS). A semiconductor technology in which circuits are composed of paired NMOS and PMOS devices; characterized by extremely low power dissipation when not changing states.

3.366 complementer. A device whose output data are a representation of the complements of the numbers represented by its input data.

3.367 complex-instruction-set computer (CISC). A computer with a very expansive and robust instruction set, incorporating several types of addressing modes and varying length instruction words. *Note:* Such instructions are usually stored in microcode. *Contrast with:* reduced-instruction-set computer.

3.368 component. **(1)** One of the parts that make up a system. A component may be hardware or software and may be subdivided into other components. *Note:* The terms "module," "component," and "unit" are often used interchangeably or defined to be sub-elements of one another in different ways depending upon the context. The relationship of these terms is not yet standardized. [IEEE Std 610.12-1990] **(2)** Any part, assembly, or subdivision of a computer, such as a resistor, amplifier, power supply or rack.

3.369 computational bandwidth. The maximum number of operations per second a machine can perform.

3.370 compute-bound. Pertaining to programs that have an abundance of computations. *Contrast with:* input-output bound. *Syn:* process bound.

3.371 computer. A device that consists of one or more associated processing units and peripheral units, that is controlled by internally stored programs, and that can perform substantial computations, including numerous arithmetic operations, or logic operations, without human intervention during a run. *Note:* May be stand alone, or may consist of several interconnected units.

3.372 Computer and Business Equipment Manufacturers Association (CBEMA). The Secretariat for ANSI X3 series standards on information processing.

3.373 computer architecture. The organizational structure of a computer system, including the hardware and the software. *Contrast with:* computer network architecture.

3.374 computer channel. *See:* input-output channel.

3.375 computer-control state. In an analog computer, one of several distinct and selectable conditions of the control circuit. *See:* balance check; hold; operate; potentiometer set; reset; static test.

3.376 computer control unit. *See:* instruction control unit.

3.377 computer description language. *See:* hardware description language.

3.378 computer hardware description language (CHDL). *See:* hardware description language.

3.379 computer instruction. **(1)** A statement in a computer language; specifying an operation to be performed by a computer and the addresses or values of the associated operands; for example, MOVE A to B. *See also:* address field; machine instruction; microinstruction; nanoinstruction; operand field; operation field. [IEEE Std 610.12-1990a] **(2)** Loosely, any executable statement in a computer program. [IEEE Std 610.12-1990] **(3)** An instruction expressed in machine language.

3.380 computer instruction code. A code used to represent the instruction within an instruction set. *See also:* machine code.

3.381 computer instruction set. The collection of computer instructions possible on a given computer. *Syn:* machine instruction set.

3.382 computer interface unit (CIU). A device used to connect peripheral devices with a computer.

3.383 computer language. A language designed to enable humans to communicate with computers and computer systems. *Note:* IEEE Std 610.13-1993 defines specific computer languages. [IEEE Std 610.13-1993]

3.384 computer network. A structured connection of computer systems and peripheral devices that exchange data as necessary to perform the specific function of the network. *See also:* centralized computer network; decentralized computer network; distributed computer network. *Note:* Terminology relating to networks can be found in IEEE 610.7-1995. [IEEE Std 610.7-1995]

3.385 computer network architecture. The logical structure and the operating principles, including those concerning services, functions, and protocols, of a computer network. *Contrast with:* computer architecture. [IEEE Std 610.7-1995]

3.386 computer operation. **(1)** An operation which can be performed by a computer with a single instruction. **(2)** An operation performed by a functional unit within a computer. For example: an instruction fetch, or an addition. *Syn:* machine operation.

3.387 computer output microfilm (COM). The end result of a process that converts and records data from a computer directly to a microfilm. *Syn:* microfilm. [IEEE Std 610.12-1990a]

3.388 computer output microfilm printer (COM printer). A page printer that produces a microimage of each page on a photographic film.

3.389 computer program. A combination of computer instructions and data definitions that enable computer hardware to perform computational or control functions. [IEEE Std 610.5-1990, IEEE Std 610.12-1990]

3.390 computer resources. The computer equipment, programs, documentation, services, facilities, supplies, and personnel available for a given purpose. [IEEE Std 610.12-1990]

3.391 computer system. A system containing one or more computers, peripheral devices and associated software. *Syn:* computing system. [IEEE Std 610.12-1990a]

3.392 computer word. **(1)** A unit of storage, typically a set of bits, that is suitable for processing by a given computer; for example, two bytes. *Syn:* fullword; machine word. *See also:* double word; halfword. **(2)** *See:* word. [IEEE Std 610.12-1990]

3.393 computing system. *See:* computer system

3.394 concentrator. A communications computer that provides communications capability between many low speed asynchronous channels and one or more high-speed synchronous channels. *See also:* data concentrator; wiring concentrator.

3.395 condition code register (CCR). A flag register used to hold the status bits used to decide conditional branches. *Note:* These bits generally include: zero, negative, and overflow.

3.396 conditional branch instruction. A branch instruction that specifies conditions and, if those conditions are met, changes the program flow to a new location. *See also:* branch instruction; conditional jump instruction.

3.397 conditional control transfer instruction.* *See:* conditional jump instruction.
* Deprecated.

3.398 conditional jump instruction. A jump instruction that specifies conditions and, if those conditions are met, changes program flow to a new location. *See also:* conditional branch instruction. *Contrast with:* unconditional jump instruction.

3.399 conditional transfer instruction.* *See:* conditional jump instruction.
* Deprecated.

3.400 conducting material. A material, such as a metal, that has a very large number of free electrons that can easily be put into motion to create an electric current. *Contrast with:* insulating material; semiconducting material.

3.401 conductor. A device made from conducting material; For example, a metal wire.

3.402 configuration. **(1)** The arrangement of a computer system, network, or component as defined by the number, nature, and interconnections of its constituent parts. [IEEE Std 610.12-1990] **(2)** The physical and logical elements of an information processing system, the manner in which they are organized and connected, or both. *Note:* May refer to hardware configuration or software configuration. [IEEE Std 610.7-1995]

3.403 conjunction. The Boolean operation whose result has the value 1 if and only if each operand has the value 1. *See also:* AND gate. *Contrast with:* nonconjunction.

3.404 connect time. In time-sharing computer systems, the time that a terminal or user is connected and able to communicate with a computer. *See also:* CPU time.

3.405 connectionless service. A kind of delivery service offered by most hardware that treats each packet or datagram as a separate entity containing the source and destination address.

3.406 consecutive sequence computer. A type of computer in which instructions are executed in an implicitly defined sequence unless a jump instruction specifies the storage location of the next instruction to be executed. *Contrast with:* arbitrary sequence computer.

3.407 console. A functional unit used for communication between the computer operator and the computer. *Note:* May provide special-purpose keys, input devices, and display devices employed to operate and control the computer. *Syn:* console display; display console. *See also:* control panel.

3.408 console display. *See:* console.

3.409 constant address. *See:* base address.

3.410 constant-linear-bit recording. A method for recording information on a storage device whereby the rotational speed is kept constant, but the data rate (density) is varied with the track to ensure that data is stored with the same number of bits per inch in all tracks. *Contrast with:* constant-linear-velocity recording.

3.411 constant-linear-velocity recording. A method for recording information on a circular disk whereby the rotational speed is varied so that the speed of the storage medium past the recording head is constant for all tracks on the disk. *Note:* Since the outer-most tracks are longer than the inner-most tracks, this allows the device to store more information there. *Contrast with:* constant-linear-bit recording. *Syn:* group code recording.

3.412 content addressable storage. *See:* associative memory.

3.413 contiguous memory. An area of storage that occupies consecutive or adjacent address locations.

3.414 continuous feed. A mechanism enabling a printer to employ continuous form paper using friction feed or tractor feed. *Contrast with:* single-sheet feed.

3.415 continuous form. **(1)** A series of connected paper forms, each divided by a tear-off perforation, that feeds continuously through a printing device. *Syn:* fanfold paper; zip-zag fold paper; Z-fold paper. *Contrast with:* cut form. *See also:* burst. **(2)** Pertaining to a series of cards or paper as in (1). For example, continuous form cards or continuous form paper.

Figure 2—Continuous form

3.416 continuous-stream printer. A printer that can print processed data off-line in a continuous form.

3.417 control area. A storage area used to hold information necessary for the control of a task, function, or operation.

3.418 control ball. *See:* track ball.

3.419 control block. The circuitry within a computer that performs control functions such as decoding microinstructions and generating the internal control signals that perform requested operations.

3.420 control bus. A bus that carries signals that regulate system operations.

3.421 control card. A punch card containing input parameters for controlling the execution of a program or job.

3.422 control counter.* *See:* program counter.
* Deprecated.

3.423 control flow architecture. A computer architecture in which execution is controlled by the need for a particular result; that is, an instruction is executed only when its result is needed by another process. *Contrast with:* data flow architecture. *Syn:* Von Neumann architecture. *Contrast with:* Harvard class architecture.

3.424 control hole. *See:* designation hole.

3.425 control instruction register.* *See:* program counter.
* Deprecated.

3.426 control key (CTRL). Any key on a keyboard that is used to control a process. *Note:* The control key, usually labelled "CTRL" is said to represent a control character, and when used in conjunction with another key, such as "C", the combination is said to represent the control character "CONTROL C" or "^C". *Contrast with:* typing key. *See also:* alternate key; attention key;

command key; cursor control key; enter key; escape key; function key; shift key.

3.427 control panel. The part of a console that contains switches, pushbuttons and indicators.

3.428 control punch. *See:* designation hole.

3.429 control read-only memory (CROM). A type of read-only storage in the control block of some processors such that the ROM has been programmed to decode the control logic.

3.430 control register. **(1)** A register in a computer or peripheral device, the contents of which control the operations of the computer or peripheral. *See also:* device register. **(2)*** *See:* program counter.
* Deprecated.

3.431 control signal. Any signal that purposely affects the recording, processing, transmission or interpretation of data by a system element.

3.432 control store. In a microprogrammed computer, the computer memory in which microprograms reside. *See also:* microword. [IEEE Std 610.12-1990]

3.433 control tape. *See:* carriage control tape.

3.434 control terminal. *See:* master terminal.

3.435 control transfer instruction.* *See:* jump instruction.
* Deprecated.

3.436 control unit. A functional unit of a computer that interprets and executes the instructions of a program in a prescribed sequence. *See also:* instruction control unit; main control unit.

3.437 controller. **(1)** A functional unit in a computer system that controls one or more units of the peripheral equipment. *Syn:* peripheral control unit. *See also:* dual-channel controller; input-output controller. **(2)** In robotics, a processor that takes as input desired and measured position, velocity or other pertinent variables and whose output is a drive signal to a controlling motor or activator. **(3)** A device through which one can introduce commands to a control system.

3.438 convention. Any practice that is not formally standardized, but which is adopted by a group in a given situation. For example, programmers usually adopt the convention of indenting subordinate instructions in a routine so that the structure of the program is more easily visualized. *See also:* standard.

3.439 converter. A device capable of converting impulses from one mode to another, such as analog to digital, parallel to serial, or from one code to another. *See also:* code converter; digital-to-analog converter; power supply.

3.440 coprocessor. A processor used in conjunction with a central processing unit, designed to perform specific functions that may not be executed efficiently by the central processing unit, for example: a floating-point coprocessor.

3.441 core. *See:* magnetic core.

3.442 core memory.* *See:* magnetic core.
* Deprecated.

3.443 core storage. A type of storage in which the data medium consists of magnetic cores. *Contrast with:* semiconductor storage.

3.444 corrective maintenance. Maintenance that is performed specifically to overcome existing faults. *Contrast with:* preventive maintenance.

3.445 corrupt data error. **(1)** An error condition that results when hardware components fail or an external impulse enters into the system upsetting at least one data bit. **(2)** A condition that results from erratic hardware performance, characterized by introduction of a high degree of random errors in the data.

3.446 counter. **(1)** A device with a finite number of states each of which represents a number which, upon receipt of an appropriate signal, can be incremented or decremented by a given constant. *Note:* The device may be capable of being set to a particular state such as zero. *See also:* keystroke counter; line counter; modulo-n counter; reversible counter. **(2)** A register or storage location used to accumulate the number of occurrences of some event. *See also:* program counter.

3.447 CPU. Acronym for central processing unit.

3.448 CPU busy time. *See:* CPU time.

3.449 CPU time. In time-sharing computer systems, the time devoted by the central processing unit to the execution of instructions of a particular process, task, or user. *Syn:* CPU busy time. *See also:* connect time.

3.450 CPU timer. A feature of some computer systems that measures elapsed CPU time and that causes an interrupt when a previously specified amount of time has elapsed.

3.451 CR. Acronym for carriage return.

3.452 crash. **(1)** The sudden and complete failure of a computer system or component. *Note:* IEEE Std 610.12-1990 defines specific failure terminology. *See also:* disk crash; head crash; hard failure. [IEEE Std 610.12-1990] **(2)** To fail as in (1).

3.453 CROM. Acronym for control read-only memory.

3.454 cross bar switch. A relay-operated device that makes a connection between a line in a set of lines and a line in another set, where the two sets are arranged along adjacent sides of a matrix of contacts or switch points.

3.455 crowbar. A protective circuit in a power distribution circuit that rapidly shorts the output voltage to ground when an over-voltage or other error condition occurs.

3.456 CRT. Acronym for cathode ray tube. [IEEE Std 610.6-1991]

3.457 CRT display device. A display device that displays data onto a phosphor coated display screen using controlled electron beams within a CRT. *Note:* Raster display devices and random-scan display devices are two major categories of CRT display devices. *See also:* charactron; dark-trace tube display device; penetration CRT display device; raster display device; storage tube display device.

3.458 cryogenic storage. A type of storage that uses the superconductive and magnetic properties of certain materials at temperatures near absolute zero.

3.459 cryotron. A device that makes uses of the effects of extremely low temperatures on conductive materials such that small magnetic field changes can control large current changes.

3.460 CTRL. Acronym for control key.

3.461 cursor. **(1)** In computer graphics, a cross, flashing underscore, or other symbol that represents a position on a graphics display surface. [IEEE Std 610.6-1991] **(2)** A moveable icon or spot of light on the screen of a display device that indicates a particular object or character. [IEEE Std 610.2-1987a] **(3)** A moveable mark as in (1) that indicates the position on which the next operation will occur.

3.462 cursor control device. An input device used to control the position of the cursor on a display device. *Syn:* pointing device. *See also:* cursor control keypad; joystick; mouse; paddle. [IEEE Std 610.6-1991]

3.463 cursor control key. Any key on the keyboard that may be used to control a cursor function such as moving the cursor up or down a line. *See also:* carriage return key; home key.

3.464 cursor control keypad. A keypad comprising a set of cursor control keys such as in the following diagram of a standard inverted "T" cursor control keypad.

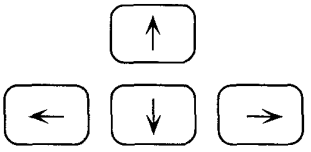


Figure 3—Cursor control keypad

3.465 cut form. A series of individual paper forms that feed into a printing device. *Contrast with:* continuous form.

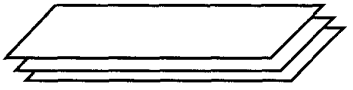


Figure 4—Cut form

3.466 cut-sheet feed. A mechanism enabling a printer to print on multiple sheets of paper. *See also:* single-sheet feed.

3.467 cycle. **(1)** In an AC voltage or current, exactly one complete set of positive and negative values. **(2)** Any set of operations that is repeated regularly in the same sequence. *See also:* cycle time; instruction cycle, machine cycle. *See also:* read cycle; read-write-modify cycle; write cycle. **(3)** To perform, or cause to perform, one set of operations as in (2). **(4)** An interval of space or time in which one set of operations as in (2) is completed.

3.468 cycle counter. *See:* index register.

3.469 cycle stealing. The process of suspending the operation of a central processing unit for one or more cycles to permit the occurrence of other operations, such

as transferring data from main storage in response to an output request from an input-output controller. [IEEE Std 610.12-1990a]

3.470 cycle time. The minimum amount of time between the start of successive read or write cycles of a storage device. *See also:* read cycle time; write cycle time.

3.471 cyclic storage. *See:* circulating storage.

3.472 cylinder. In an assembly of magnetic disks, the set of all tracks that can be accessed by all the magnetic heads at a given fixed position.

3.473 D flip-flop. A flip-flop that has one data input, one trigger, and an output which assumes the state of the data input when the trigger is received.

3.474 D/A. Acronym for digital-analog computer. *See:* digital-to-analog converter.

3.475 D/A converter. *See:* digital-to-analog converter.

3.476 d-to-a converter. *See:* digital-to-analog converter.

3.477 DAC. Acronym for digital-to-analog converter.

3.478 daisy wheel printer. A wheel printer in which the type slugs are mounted on a "daisy wheel," a central hub with numerous spring fingers each of which is embossed with one character.

3.479 dark trace tube display device. A CRT display device whose electron beam causes the display surface of the tube to darken rather than to brighten. For example, the image may be viewed by illumination from the rear as a reverse image against the otherwise transparent or translucent face of the tube.

3.480 DASD. Acronym for direct-access storage device.

3.481 data. A representation of facts, concepts, or instructions in a manner suitable for communication, interpretation, or processing by humans or by automatic means. *Note:* "Data" is plural for datum, but is often used as collective noun, as in "The data is in this file." IEEE Std 610.5-1990 defines terminology pertaining to data management. [IEEE Std 610.5-1990]

3.482 data access register. A register that is used for arithmetic associated with random-access of data.

3.483 data buffer register. A register in a central processing unit or peripheral device capable of receiving or transmitting data at different data transfer rates. *See also:* input buffer register.

3.484 data bus. A bus used to communicate data to and from a processing unit or a storage device. *Contrast with:* storage bus. *See also:* bidirectional bus.

3.485 data cache. An area of high-speed buffer storage, used to store data and operands. *Contrast with:* instruction cache.

3.486 data card. A punch card that contains data to be used by a computer program. *See also:* source data card.

3.487 data carrier. Material that serves as a data medium or to which a data medium is applied and that facilitates the transport of data; for example, a punch card, a magnetic disk or a plastic card with a magnetic surface that serves as the data medium. [IEEE Std 610.5-1990a]

3.488 data cell. *See:* storage cell.

3.489 data chain bus. A connection by which electrical signals are transmitted and/or received at multiple circuit elements.

3.490 data channel. *See:* input-output channel.

3.491 data collection station. *See:* data input station.

3.492 data converter. A device whose purpose it is to convert data from one representation to an equivalent representation. *See also:* code converters; protocol converters.

3.493 data entry device. An input device used to prepare data so that a computer can accept it. For example, a keyboard, or bar-code scanner.

3.494 data flow architecture. A computer architecture in which execution is controlled only by the data needed for that operation and not the order in which instructions are stored in memory. *Contrast with:* control flow architecture.

3.495 data input station. A workstation that is used primarily as an input device. *Syn:* data collection station; input workstation.

3.496 data medium. A material in or on which data are or may be represented. *See also:* data carrier; media; prerecorded data medium. [IEEE Std 610.5-1990a]

3.497 data processing system. A system, including computer systems and associated personnel, that performs input, processing, storage, output, and control functions to accomplish a sequence of operations on data. *See also:* information system. [IEEE Std 610.12-1990a]

3.498 data processor. *(1) A processor capable of performing operations on data. For example: a desk calculator or tabulating machine, or a computer. *(2) A person who operates a computer.
* Deprecated.

3.499 data signaling rate. The rate of data transmission, generally expressed as bits per second. *See also:* baud rate. [IEEE Std 610.7-1995]

3.500 data stream. (1) All data that is transmitted through an input-output channel in a single read or write operation. (2) A continuous stream of data elements being transmitted, or intended for transmission.

3.501 data striping RAID storage. A form of RAID storage, known as level 0, in which data is striped across the multiple drives by system block size. *Note:* No parity check is performed.

3.502 data tablet. A graphical input device, used as a locator, consisting of a flat surface with a sensing apparatus, such as a grid of wires, and a pointing device such as a mouse, puck, or stylus to indicate tablet locations. *Syn:* bit pad; writing tablet. *See also:* acoustic tablet; graphic tablet; locator. [IEEE Std 610.6-1991]

3.503 data-transfer interface. An interface that enables a connection between a computer and a peripheral unit such as a magnetic disk. *See:* enhanced small device interface; integrated drive electronics interface; small computer system interface; ST-506 interface.

3.504 database engine. A software engine that is specially designed for database applications; performs low-level database operations such as record creation, editing, and deletion. *See also:* relational engine.

3.505 datum. Singular form for data. [IEEE Std 610.5-1990]

3.506 daughter board. A printed circuit board that attaches to another, often the main system board, or motherboard, to provide additional functionality or performance. *Syn:* piggyback board.

3.507 dB. Abbreviation for decibel.

3.508 DC. (1) Pertaining to an electric current or voltage that is constant over the time interval of interest. (2) Acronym for direct current.

3.509 DC analog computer. An analog computer in which variables are represented by the instantaneous positive or negative values of voltages. *Contrast with:* AC analog computer.

3.510 DCA. Acronym for digital coefficient attenuator.

3.511 DCTL. Acronym for direct-coupled transistor logic.

3.512 DD. Acronym for double-density disk.

3.513 de facto standard. A standard that is developed informally when a single entity develops a product or technology and, through success and imitation, that product or technology becomes so widely used that deviation causes compatibility problems or limits marketability. One such example is the Hayes modem handshake protocol.

3.514 decay time. *See:* fall time.

3.515 deceleration time. The time that is required to slow a storage device, typically a tape or disk drive, to a stop after data has been read or written. *Syn:* stop time. *Contrast with:* acceleration time.

3.516 decibel (dB). (1) A unit of measurement for the relative strength of a signal parameter such as power or voltage. [IEEE Std 610.7-1995] (2) The standard unit for expressing transmission gain or loss and relative power levels. Decibels indicate the ratio of power input to power output: $dB = 10 \log_{10}(P_{out}/P_{in})$. *Note:* One decibel is 0.1 bel. [IEEE Std 610.7-1995a]

3.517 decision instruction. (1) *See:* branch instruction. (2)* *See:* discrimination instruction.
* Deprecated.

3.518 decoder. (1) A device that has a number of input lines such that any number may carry signals and a number of output lines such that no more than one at a time may carry a signal. *Note:* the combination of input signals serves as a code to indicate which output line

carries the signal. *Syn:* decoder matrix; many-to-one decoder. **(2)** A device that can decode data.

3.519 decoder matrix. *See:* decoder.

3.520 decollate. To separate the parts of a multipart form, often by means of a device called a decollator. *Syn:* deleave. *See also:* burst.

3.521 decoupled architecture. A computer architecture in which a program is divided into two or more instruction streams, and a number of processors cooperate in the execution of the task.

3.522 decrement. **(1)** The quantity by which a variable is decreased. [IEEE Std 1084-1986] **(2)** To decrease the value of a variable. [IEEE Std 1084-1986] **(3)** To decrease the value of a variable by one. *Contrast with:* increment. [IEEE Std 1084-1986]

3.523 dedicated computer. A special-purpose computer that can be used exclusively for one purpose, such as a dedicated word processing system or a numerical control system for machine tooling.

3.524 defacto standard. *See:* de facto standard.

3.525 default font. *See:* base font.

3.526 deferred address. *See:* indirect address.

3.527 degauss. To apply a variable, alternating current field for the purpose of demagnetizing magnetic media or devices. *See also:* delete.

3.528 degausser. A device that removes unwanted magnetization from objects; commonly used to demagnetize read/write heads, and to erase infromation from magnetic storage media.

3.529 delay. The amount of time by which a signal or event lags due to an external condition or event. *See also:* delay line; duration of unscheduled interrupt; propagation delay; rotational delay; time delay.

3.530 delay line. A line or circuit designed to introduce a desired delay in the transmission of a signal. *See also:* acoustic delay line; electric delay line; electromagnetic delay line; magnetic delay line. *Syn:* delay unit.

3.531 delay line storage. A storage technique in which data are stored by sending them through a circuit loop having a data capacity (measured in bits) equal to its propagation delay for one complete pass around the loop, measured in bit times past the read position. *Syn:* time delay register.

3.532 delay unit. *See:* delay line.

3.533 deleave. *See:* decollate.

3.534 delete. To remove data from a storage device or data medium. *See also:* read; write. *Syn:* erase. [IEEE Std 610.5-1990]

3.535 density. **(1)** On an integrated circuit, the number of logic gates per unit area of usable surface. *See also:* chip density; surface density. **(2)** *See:* recording density. **(3)** A measure of the number of characters per inch on an output medium such as paper.

3.536 derived font. A font that has been scaled, or modifed from a scalable font. *Contrast with:* bit map font.

3.537 designation hole. A hole that has been punched in a punch card to indicate the nature of the data on the card, or the functions that a machine is to perform. *Syn:* control hole; control punch.

3.538 desktop computer. A computer designed to be placed on a desk or table. [IEEE Std 610.2-1987a]

3.539 destination address. The address of a device or storage location to which data are to be transferred. *Contrast with:* source address. [IEEE Std 610.12-1990a]

3.540 destructive read. A read operation that deletes the data being read. *Contrast with:* nondestructive read.

3.541 device. A mechanism or piece of equipment designed to serve a purpose or perform a function. [IEEE Std 610.12-1990]

3.542 device driver. A software component that permits a system to control and communicate with a peripheral device. *See also:* disk driver; printer driver.

3.543 device register. **(1)** An addressable register used to store information describing the device. *See also:* control register. **(2)** An addressable register used to store status and control information, and data for transmission to or from a device. *Syn:* device status word.

3.544 device status word. *See:* device register.

3.545 diagonal microinstruction. A microinstruction capable of specifying a limited number of simultaneous operations needed to carry out a machine language

instruction. *Contrast with:* horizontal microinstruction; vertical microinstruction. [IEEE Std 610.12-1990]

3.546 diagonally integrated microprocessor. A microprocessor in which diagonal microinstructions can be performed. *Contrast with:* horizontally integrated microprocessor; vertically integrated microprocessor.

3.547 dicap storage. A type of storage that uses an array of diodes to control current directed to storage capacitors.

3.548 dice. Multiple pieces of silicon, each of which contains one or more circuits and is or will be packaged as a unit. *Note:* This is the plural form of die.

3.549 die. A single piece of silicon that contains one or more circuits and is packaged as a unit. *See also:* dice.

3.550 differential amplifier. An amplifier with two input circuits that amplifies the difference between the two input signals.

3.551 differential analyzer. An analog computer that uses interconnected integrators to solve differential equations.

3.552 differential gear. A mechanism used for addition and subtraction in an analog computer in which the angles of rotation of three shafts are related to each other such that the algebraic sum of the rotation of two shafts is equal to twice the rotation of the third.

3.553 differential phase shift keying (DPSK). A method for encoding a signal in which the value of a bit stream is encoded on the differences between the phase of adjacent signals; that is, if the signals are in phase, the bit is a one; if not, the bit is a zero.

3.554 differentiator. A circuit or device whose output signal is proportional to the derivative of its input signal with respect to one or more variables, usually time. For example, a resistor-capacitor circuit used to detect the edges of a pulse.

3.555 digit punch. A punch in one of the punch rows designated as 1 through 9 of a twelve-row punch card. *Contrast with:* zone punch.

3.556 digital. Pertaining to quantities in the form of discrete, integral values. *Contrast with:* analog. [IEEE Std 1084-1986]

3.557 digital-analog converter. *See:* digital-to-analog converter.

3.558 digital coefficient attenuator (DCA). A component that is used as a high-speed hybrid replacement for manual and servo potentiometers in analog computers. *Syn:* digital potentiometer. *See also:* digital-to-analog multiplier.

3.559 digital computer. **(1)** A computer that consists of one or more associated processing units and that is controlled by internally-stored programs. **(2)** A computer that utilizes digital circuitry to perform calculations and logical instructions, and to control sequencing of operations. *Contrast with:* analog computer; hybrid computer.

3.560 digital differential analyzer (DDA). A special-purpose digital computer consisting of many parallel computing elements, that performs integration by means of a suitable integration code on incremental quantities and that can be programmed for the solution of differential equations in a manner similar to an analog computer.

3.561 digital filter. A device that produces a predetermined digital output in response to a digital input. For example, a digital filter may use arithmetic or delays in order to obtain the desired transfer function.

3.562 digital logic. **(1)** Any logic used for digital integrated circuits and systems. **(2)** Circuitry that produces two or more distinct states, which can be used for logical operations.

3.563 digital optical disk. *See:* optical disk.

3.564 digital plotter. A plotter that presents digital data in the form of a two-dimensional graphic representation. *Contrast with:* analog plotter; raster plotter.

3.565 digital potentiometer. *See:* digital coefficient attenuator.

3.566 digital-to-analog converter. A converter that converts an input number sequence (digital) into a function of a continuous variable (analog). *Syn:* digital-analog converter; D/A converter; d-to-a converter. *Contrast with:* analog-to-digital converter. *See also:* digital-to-analog multiplier.

3.567 digitally controlled function generator. A hybrid component employed in analog computers to insert linear segment approximation values into a desired arbitrary function.

3.568 digitizer. A graphic input device that converts analog data, such as those derived from a drawing, into digital form. Examples include optical scanners and graphic tablets. *Syn:* quantizer. [IEEE Std 610.6-1991]

3.569 diode. A semiconducting device used to permit current flow in one direction and to inhibit current flow in the other direction. *Syn:* rectifier. *See also:* light-emitting diode display device.

3.570 diode array. An integrated circuit that contains two or more diodes.

3.571 diode-transistor logic (DTL). A family of bipolar integrated circuit logic formed by diodes, transistors, and resistors; characterized by medium speed, low power dissipation, high drive capability and low cost.

3.572 DIP. Acronym for dual in-line package.

3.573 DIP switch. One or more two-position switches housed in a dual in-line package (DIP); used on a circuit board to control certain functions or to specify particular operating characteristics.

3.574 dipole modulation. *See:* non-polarized return-to-zero recording.

3.575 direct access. *See:* access.

3.576 direct address. An address that explicitly specifies the location of an operand. *Contrast with:* indirect address. *Syn:* first-level address; one-level address. [IEEE Std 610.12-1990]

3.577 direct addressing. An addressing mode in which the address field of an instruction contains a direct address. *Contrast with:* indirect addressing.

3.578 direct current (DC). An electric current that flows in one direction. *Contrast with:* alternating current.

3.579 direct instruction. A computer instruction that contains the direct addresses of its operands. *Contrast with:* indirect instruction. [IEEE Std 610.12-1990]

3.580 direct memory access (DMA). A method for transferring data between an external device and memory without interrupting program flow or requiring CPU intervention. *Note:* The interface device takes control of the memory and transfers the data. *See also:* direct memory transfer; programmed input-output.

3.581 direct memory control (DMC). *See:* direct memory transfer.

3.582 direct memory transfer (DMT). A method for transferring data between an external device and memory without interrupting program flow. *Note:* The CPU microcode flow is changed to a routine which transfers the data. *Syn:* direct memory control. *See also:* direct memory access; programmed input-output.

3.583 direct reference address. A virtual address that is not modified by indirect addressing. *Note:* It can be modified by indexing.

3.584 direct-access storage device (DASD). An auxiliary storage device that can provide direct access to the data stored on the device. *See also:* immediate access storage.

3.585 direct-coupled transistor logic (DCTL). A family of circuit logic in which only transistors and resistors are used, with transistors directly connected to each other.

3.586 direct-view storage tube (DVST). *See:* storage tube display device.

3.587 disc. An alternative spelling of the word disk. *Note:* This is more common in British usage. *See also:* compact disc.

3.588 discrimination instruction. One of a class of instructions that comprises branch instructions and conditional instructions.

3.589 disjunction. The Boolean operation whose result has the value 0 if and only if each operand has the value 0. *Syn:* inclusive-OR operation; logical add; OR operation. *See also:* inclusive-OR gate. *Contrast with:* non-disjunction.

3.590 disk (disc). A generic term for any storage medium in the form of circular, flat recording surface. *Note:* Also known as a platter. *See also:* diskette; magnetic disk; magneto-optical disk; optical disk. *Syn:* platter.

3.591 disk array. Multiple disks arranged in such a manner as to increase storage capacity or to provide redundant data for disaster recovery. *See also:* RAID storage.

3.592 disk cache. A cache consisting of random-access memory, used by a disk driver as intermediate storage

between a rotating disk and main storage. *Note:* The disk cache minimizes access to the rotating disk by storing recently-used data or adjacent data in the random-access memory.

3.593 disk cartridge. An assembly of one or more magnetic disks that is removable from the disk drive, but which cannot be separated from its associated container. *See also:* removable storage. *Contrast with:* disk pack.

3.594 disk crash. The sudden and complete failure of a disk drive. *See also:* head crash.

3.595 disk drive. An electromechanical device that reads from and writes to disks. *See also:* disk pack; disk storage device; full-height disk drive; half-height disk drive; head-per-track disk drive; magnetic disk drive; WORM drive. *Contrast with:* tape drive.

3.596 disk driver. A device driver that supports a specific class of disk drives.

3.597 disk duplexing. *See:* double storage.

3.598 disk file. A file, typically containing data, residing on a magnetic or optical disk.

3.599 disk mirroring. *See:* double storage.

3.600 disk pack. An assembly of one or more magnetic disks that is removable from the disk drive together with its container, however the disks must be separated from the container when they are in use. *Contrast with:* disk cartridge. *See also:* volume.

3.601 disk storage device. *See:* disk drive.

3.602 diskette. A magnetic disk enclosed in a protective container. *Note:* Diskette is sometimes considered a synonym for "disk." *See also:* disk; double-sided diskette; floppy diskette.

3.603 diskless workstation. A workstation with no storage capacity, intended to be used in conjunction with another workstation networked in such a way that the two workstations can share the storage.

3.604 display. **(1)** A visual presentation of graphics or other data such as text. *See also:* display device. [IEEE Std 610.6-1991a] **(2)** To visually present graphics or other data. [IEEE Std 610.6-1991] **(3)*** *See:* display device.

* Deprecated.

3.605 display buffer. A storage device or area of memory that contains the graphics display commands and coordinate data used to create images on a display device. *See also:* image memory. [IEEE Std 610.6-1991]

3.606 display console. *See:* console.

3.607 display controller. *See:* display generator.

3.608 display device. An output device that gives a visual representation of data. *Note:* The representation is usually temporary, however arrangements may be made for producing a hard copy of the representation. *Syn:* display monitor; display screen; display station; display unit. *See also:* display surface; monitor.

3.609 display generator. A processing unit that will produce the corresponding image on the display device when presented with a display instruction. *Syn:* display controller.

3.610 display head. A head within a display device that employs the signals obtained from the various function generators to control the display of information on the display device.

3.611 display image. That portion of an image that is displayed on a graphic display device. [IEEE Std 610.6-1991a]

3.612 display line. The writing line on a display device. *See also:* display position.

3.613 display monitor. *See:* display device

3.614 display panel. **(1)** A set of indicators on the front of a device or component, used to indicate its status. **(2)** A special display area on a processing unit that is used to show the contents of the display register and is activated by a display switch.

3.615 display position. One character position on a display line.

3.616 display register. A register with corresponding indicators on the display panel, used to display the contents of the register selected by the display switch.

3.617 display screen. **(1)** The surface of a display device on which the visual representation of data is displayed. For example, the phosphor-coated portion of a CRT display device. **(2)** *See:* display device.

3.618 display station. A generic term for a terminal or a console.

3.619 display storage tube. *See:* storage tube.

3.620 display surface. The surface of an output device such as a display device or plotting unit. *See also:* display screen. [IEEE Std 610.6-1991]

3.621 display switch. A switch used to select the register that is to be shown on the display panel.

3.622 display tube.* *See:* display device.
* Deprecated.

3.623 display unit. *See:* display device.

3.624 distributed architecture. A computer architecture characterized by its suitability for distributed processing.

3.625 distributed system. A computer system in which several interconnected computers share the computing tasks assigned to the system. [IEEE Std 610.2-1987]

3.626 divider. A device capable of dividing one variable into another. *See also:* analog divider. *Contrast with:* multiplier.

3.627 DMA. Acronym for direct memory access.

3.628 DMC. Acronym for direct memory control. *See:* direct memory transfer.

3.629 DMT. Acronym for direct memory transfer.

3.630 do-nothing instruction. *See:* dummy instruction.

3.631 document reader. A device that can be used to sense and interpret information contained on documents such as punch cards or paper. For example, a card reader, or scanner.

3.632 dot matrix printer. An impact printer in which each character is represented by a pattern of dots selected from a matrix of available dot positions. *Contrast with:* formed character printer. *Syn:* dot printer; matrix printer; wire printer.

3.633 dot printer. *See:* dot matrix printer.

3.634 double address. *See:* indirect address.

3.635 double-address instruction. *See:* two-address instruction.

3.636 double-density (DD) disk. A floppy disk that is capable of storing information at twice the density of a single-sided disk. *See also:* high-density disks; single-density disk.

3.637 double-length register. Two registers that function as a single register that may be used for storing the product of multiplication, storing the partial quotient in division, or for accessing the left-hand or the right-hand portions in character string manipulation. *Syn:* double register. *See also:* n-tuple length register; quadruple-length register; triple-length register.

3.638 double-pulse recording. A variation of phase-modulation recording resulting in unmagnetized regions on each side of the magnetized regions.

3.639 double-rail logic. A family of circuit logic in which each logic variable is represented by two electrical lines which together can take on three meaningful states: zero, one, and undecided. *Syn:* dual-rail logic, two-rail logic.

3.640 double register. *See:* double-length register.

3.641 double-sided (DS) disk. A floppy disk that utilizes both of its sides for information storage. *Contrast with:* single-sided disk. *Syn:* flippy.

3.642 double storage. A method for storing and recovering information from storage in which duplicate copies of the data are stored in physically independent memory units; if one unit fails, the data can be retrieved from the second. *Syn:* disk duplexing; disk mirroring.

3.643 double word. A sequence of contiguous bits or characters that comprise two computer words and that may be addressed as a unit. [ANSI X3.138-1988]

3.644 doublet. A byte composed of two bits. *Syn:* two-bit byte. [ANSI X3.138-1988]

3.645 down. A colloquial expression used in reference to a system or a system component that is not functioning. *Contrast with:* up.

3.646 down time. The period during which a device cannot be operated due to a fault within itself or within the environment. *Contrast with:* up time. *See also:* environmental loss time; inoperable time; unavailable time. *Syn:* fault-time.

3.647 downloadable font. A font that must be downloaded from a computer to a printer each time the font is to be used. *Contrast with:* on-line font. *Syn:* soft font.

3.648 downward compatible. Pertaining to hardware or software that is compatible with an earlier or less complex version of itself. For example, if an early version of a program can handle files from a later version, the later version is said to be "downward compatible." *Contrast with:* upward compatible.

3.649 DPSK. Acronym for differential phase shift keying.

3.650 draft quality. Pertaining to printed output that is readable but not of extremely high quality. *Note:* May be used for internal communication and rough drafts. *Contrast with:* letter quality; near-letter quality.

3.651 DRAM. Acronym for dynamic random access memory.

3.652 drift. The unwanted change of the value of an output signal of a device over a specified period of time when the values of all input signals of the device are kept constant. *See also:* zero drift. [ANSI X3.138-1988]

3.653 drift stabilization. In an analog computer, any automatic method used to minimize the drift of an amplifier.

3.654 drive. *See:* tape drive, disk drive.

3.655 driver. A program, circuit or device used to power or control other programs, circuits or devices. *See also:* bus driver; device driver; relay driver.

3.656 drop-in. In the storage and retrieval of data from a magnetic storage device, an error revealed by the reading of a binary character not previously recorded. *Note:* Usually caused by defects or the present of particles in the magnetic surface layer.

3.657 drop-out. In the storage and retrieval of data from a magnetic storage device, an error due to the failure to read a binary character. *Note:* Usually caused by defects or the presence of particles in the magnetic surface layer.

3.658 drum. *See:* magnetic drum.

3.659 drum plotter. A plotter that draws an image on a display surface mounted on a rotating drum.

3.660 drum printer. An element printer in which a full set of type slugs, placed on a rotating print drum, is made available for each printing position. *See also:* cylinder printer.

3.661 DS. Acronym for double-sided disk.

3.662 DS/DD. Abbreviation for a double-sided, double-density disk.

3.663 DS/HD. Abbreviation for a double-sided, high-density disk.

3.664 DSK. Acronym for the Dvorak Simplified Keyboard. *See:* Dvorak keyboard.

3.665 DTL. Acronym for diode-transistor logic.

3.666 dual-channel controller. A controller that enables reading from and writing to a device to occur simultaneously.

3.667 dual in-line package (DIP). A common type of integrated circuit package in which the circuit leads or pins extend symmetrically outward and downward from opposite sides of the rectangular package body.

3.668 dual-pitch printer. A printer that can print two or more type sizes by using different character spacing.

3.669 dual-rail logic. See double-rail logic.

3.670 DUI. Acronym for duration of unscheduled interrupt.

3.671 dumb terminal. A terminal that can only send and receive information; that is, one that is lacking in local processing capability and built-in logic. *Contrast with:* intelligent terminal.

3.672 dummy. **(1)** Pertaining to a nonfunctional item used to satisfy some format or logic requirement or to fulfill prescribed conditions. *See also:* dummy address; dummy instruction. [IEEE Std 610.5-1990] **(2)** Pertaining to an item such as a character, data item or statement that has the appearance of a specified item, but not the capacity to function as such. *Syn:* placeholder.

3.673 dummy address. A nonfunctional address used for illustration or instruction purposes.

3.674 dummy instruction. **(1)** An item of data, in the form of an instruction, that requires modification before being executed. *Syn:* do-nothing instruction; no-op

instruction; waste instruction. **(2)** An item of data, in the form of an instruction, that is inserted into a sequence of instructions, but that is not intended to be executed.

3.675 duplexing. *See:* double storage.

3.676 duration of unscheduled interrupt (DUI). The length of the delay caused by an unscheduled or unexpected interrupt.

3.677 Dvorak keyboard. A keyboard layout in which the letters of the alphabet are arranged according to their frequency of use. *Note:* First patented in 1932 by Dr. August Dvorak. *Syn:* Dvorak simplified keyboard. *See also:* QWERTY keyboard.

3.678 Dvorak simplified keyboard (DSK). *See:* Dvorak keyboard.

3.679 DVST. Acronym for direct-view storage tube. [IEEE Std 610.6-1991]

3.680 dynamic buffering. Buffering in which buffer storage is allocated in the sizes and at the times as required by an application.

3.681 dynamic memory. *See:* dynamic storage.

3.682 dynamic random-access memory (DRAM). A dynamic form of random-access memory that uses, as its memory elements, capacitors that are built into the integrated circuit. *Note:* Since the capacitors lose their charge, this type of storage requires periodic refreshing. *Contrast with:* static random-access storage.

3.683 dynamic stop. *See:* breakpoint instruction.

3.684 dynamic storage. **(1)** A type of storage in which data is stored and retrieved from a moving data medium. *See also:* hold time. **(2)** A type of storage that requires periodic refreshment for retention of data. *Syn:* dynamic memory. *Contrast with:* static storage. *See also:* dynamic random-access memory.

3.685 dynamically programmable logic gate. A gate in a field programmable gate array, the function of which can be changed while it is in the circuit. *Note:* This is a function that is available in some RAM-based field programmable gate arrays.

3.686 dynamicizer. *See:* serializer.

3.687 E-unit. Abbreviation for execution unit.

3.688 EAM. Acronym for electrical accounting machine.

3.689 EAPROM. Acronym for electrically alterable programmable read-only memory.

3.690 ECL. Acronym for emitter-coupled logic.

3.691 ECSA. Acronym for Exchange Carriers' Standards Association.

3.692 edge-coated card. A punch card that has been strengthened by treating one or more of its edges with a special coating.

3.693 edge-notched card. A punch card into which notches representing data are punched around the edges. *See also:* edge-punched card.

3.694 edge-punched card. **(1)** A punch card that is punched with hole patterns in tracks along the edges. *Syn:* verge-punched card. **(2)*** edge-notched card.
* Deprecated.

3.695 edge sensitive. Pertaining to a circuit that responds to a transition, usually in one direction, of an input signal; for example, responding to the rising edge of a signal. *Contrast with:* level sensitive.

3.696 EEPROM, E2PROM, or E2PROM.** Acronym for electrically erasable programmable read-only memory.

3.697 effective address. An address that results from performing any required indexing, indirect addressing, or other address modification on a specified address. *Note:* if the specified address requires no modification, it is also the effective address. [IEEE Std 610.12-1990]

3.698 effective instruction. A computer instruction that results from performing any required indexing, indirect addressing, or other modification on the addresses in a specified computer instruction as well as any modification to the instruction itself. *Note:* If the specified instruction requires no modification, it is also the effective instruction. *See also:* presumptive instruction. [IEEE Std 610.12-1990a]

3.699 EIA. Acronym for Electronics Industry Association.

3.700 EIA-232-D. *See:* RS-232-C

3.701 EIA-422-A. *See:* RS-422-A

3.702 EIA-423-A. *See:* RS-423-A

3.703 EIA-530. An EIA standard which uses the 25-pin connector commonly associated with EIA-232-D. Note. Represents high-speed electrical characteristics of EIA-422-A and 423-A.

3.704 eight-bit byte. *See:* octet.

3.705 eject. **(1)** To remove, either manually or under software control, a storage medium, from the storage device; for example, to eject a diskette from a disk drive. **(2)** To advance a printer to the top of the next page to be printed. *Note:* This is commonly called a "form feed."

3.706 electric delay line. *See:* electromagnetic delay line.

3.707 electrical accounting machine (EAM). A machine that is predominantly electromechanical in nature. Examples include keypunches, mechanical sorters, collators, and tabulators.

3.708 electrically alterable read-only memory (EAROM). A type of read-only memory that can be erased electrically. *See also:* electrically erasable programmable read-only memory.

3.709 electrically erasable programmable read-only memory (EEPROM). A type of read-only memory that can be erased and reprogrammed by electronic methods.

3.710 electrically programmable. Pertaining to any memory in which binary digits may be entered electrically using a special programming device. This process is often referred to as "burning."

3.711 electrochromeric display device. A display device that uses materials that change from transparent to opaque under the control of an electric field. For example, a liquid crystal display device.

3.712 electromagnetic delay line. A delay line whose operation is based on the time of propagation of electromagnetic waves through distributed or lumped capacitance and inductance. *Syn:* electric delay line.

3.713 electron gun. A device in a cathode ray tube that emits a stream of electrons directed by the deflection system toward the phosphor-coated screen, thereby causing the phosphor to emit light. See also flood gun. [IEEE Std 610.6-1991]

3.714 electronic analog computer. *See:* analog computer.

3.715 electronic pen. A pick device that detects a display element or segment by sensing electronic pulses.

3.716 Electronics Industry Association (EIA). An organization that establishes and maintains standards for the electronics industry in the United States.

3.717 electrosensitive printer. A nonimpact printer in which images are generated on specially coated paper by an electric stylus.

3.718 electrostatic plotter. A raster plotter in which images are drawn by attracting toner particles to a static charge on the surface of a photoconductor, then transferring the image to a sheet of paper.

3.719 electrostatic printer. A nonimpact printer in which images are generated by attracting toner particles to a static charge on the surface of a photoconductor, then transferring the image to a sheet of paper. *Syn:* optical printer.

3.720 electrostatic storage. A type of storage that uses electrically charged areas on a dielectric surface layer. *See also:* Williams-tube storage.

3.721 element. A component of a circuit, such as a resistor or capacitor.

3.722 element printer. An impact printer that generates characters using interchangeable print elements such as daisy wheels or thimbles, each of which contains a full character set. *See also:* bar printer; band printer; chain printer; cylinder printer; drum printer; stick printer; wheel printer.

3.723 eleven punch. A zone punch in punch row eleven (second from the top) in a twelve-row punch card. *Syn:* X punch. *See also:* twelve punch; zero punch.

3.724 EM. Acronym for end-of-medium character.

3.725 embedded computer system. A computer system that is part of a larger system and which performs some of the requirements of that system; for example, a computer system used in an aircraft or rapid transit system. [IEEE Std 610.12-1990a]

3.726 emitter-coupled logic (ECL). A family of nonsaturated, very high speed, bipolar logic devices that are

commonly used in high performance processors, which dissipate relatively large amounts of power.

3.727 empty medium. A data medium that contains only marks of reference and no user data; For example, a formatted floppy disk. *See also:* blank medium; virgin medium.

3.728 end-of-file label (EOF). An internally-recorded label that indicates the end of a file and that may contain information for use in file control. *Syn:* trailer label. *Contrast with:* beginning-of-file label.

3.729 end-of-medium character (EM). A control character that is used to identify the physical end of the data medium, the end of the used portion of the medium, or the end of the wanted portion of the data recorded on the medium.

3.730 end-of-tape marker (EOT). A marker on a magnetic tape used to indicate the end of the permissible recording area. *Note:* It might be a photoreflective strip, a unique data pattern, or a transparent section of tape. *Contrast with:* beginning-of-tape marker.

3.731 end-of-volume label (EOV). An internally-recorded label that indicates the end of the recording area contained in a volume. *Contrast with:* beginning-of-volume label.

3.732 end mark. A mark that indicates the end of a word or another unit of data.

3.733 engine. A dedicated processor, architecture, or system component that is used for a single and special purpose; for example, an inferencing co-processor (inferencing engine), floating-point processor, a print engine in a laser printer, or a database engine (software engine).

3.734 enhanced small device interface (ESDI). A data-transfer interface characterized by improved seek times and greater throughput than its predecessor, the ST-506 interface.

3.735 enter key. **(1)** A control key that signals the end of input to a computer. **(2)** *See:* carriage return key.

3.736 environment. **(1)** A general term relating to everything that supports a system or the performance of a function. **(2)** The conditions that affect the performance of a system or function.

3.737 environmental loss time. The part of down-time that is due to a fault in the computer environment. *Syn:* external loss time.

3.738 EOF. Acronym for end-of-file label.

3.739 EOT. Acronym for end-of-tape marker.

3.740 EOV. Acronym for end-of-volume label.

3.741 EPROM. Acronym for erasable programmable read-only memory.

3.742 equality. *See:* equivalence.

3.743 equipment. A general term relating to devices and functional units that are part of an electrical installation. *See also:* computer equipment; intermediate equipment.

3.744 equivalence. The dyadic Boolean operation whose result has the Boolean value 1 if and only if the operands have the same Boolean value. *Syn:* equality. *See also:* IF-AND-ONLY-IF gate. *Contrast with:* non-equivalence.

3.745 erasable programmable read-only memory (EPROM). A type of programmable read-only memory that can be erased and reprogrammed using ultraviolet light. *Syn:* erasable read-only memory; reprogrammable read-only memory. *See also:* electrically erasable read-only memory; PROM programmer.

3.746 erasable read-only-memory (EROM). *See:* erasable programmable read-only memory.

3.747 erasable storage. A type of storage whose contents can be erased or modified. *Note:* This is generally applied only to nonvolatile storage. *Contrast with:* permanent storage.

3.748 erase. *See:* delete.

3.749 erase head. Any magnetic head used to erase information from magnetic storage media.

3.750 EROM. Acronym for erasable read-only memory. *See:* erasable programmable read-only memory.

3.751 ESC. Abbreviation for escape key.

3.752 escape key (ESC). **(1)** A special key on a keyboard that is used to represent the escape character. **(2)** A command key that is used to terminate a process or

transfer from one mode of operation to another. *See also:* attention key.

3.753 escapement. The relative movement by one increment between the printing medium and the printing position.

3.754 ESDI. Acronym for enhanced small device interface.

3.755 etched circuit. *See:* printed circuit.

3.756 evaluation stack. In a stack-based processor, a memory structure in which operands are stored before and after computations.

3.757 Exchange Carriers' Standards Association (ECSA). The Secretariat for ANSI T1-series of standards, relating to telephony.

3.758 exclusion. The dyadic Boolean operation whose result has the Boolean value 1 if and only if the first operand has the Boolean value 1 and the second has the Boolean value 0. *See also:* NOT-IF-THEN gate.

3.759 exclusive-NOR element. *See:* exclusive-NOR gate.

3.760 exclusive-NOR gate. A gate that performs the Boolean operation of equivalence. *Syn:* exclusive-NOR element.

3.761 exclusive-OR element. *See:* exclusive-OR gate.

3.762 exclusive-OR gate. A gate that performs the Boolean operation of nonequivalence. *Syn:* exclusive-OR element.

3.763 excursion. *See:* reference excursion.

3.764 executable instruction. **(1)** An instruction that is in the instruction set for a given computer and can be executed in its current form. **(2)** A word or words containing the complete machine code for a computer operation.

3.765 execution unit (E-unit). In a pipelined machine, the portion of the computer that actually performs the operation specified by an instruction.

3.766 expansion board. A circuit board that can be installed in an expansion slot in a computer; often used to increase the memory capabilities of the computing system. *Syn:* add-on board.

3.767 expansion slot. An area within a computer that is reserved for an expansion board.

3.768 explicit address. *See:* absolute address.

3.769 exponent arithmetic and logic unit. A special-purpose arithmetic and logic unit for handling exponent calculations or floating-point operands.

3.770 external device. **(1)** A unit of processing equipment in a computer system external to the central processing unit. **(2)** In a personal computer, a device that is not physically contained within the main cabinet. *Note:* Examples include external disk drives and external modems.

3.771 external label. A label, usually not machine-readable, that is attached to a data medium container; for example, a paper sticker attached to the outside of a reel of magnetic tape. *Contrast with:* internal label.

3.772 external loss time. *See:* environmental loss time.

3.773 extract instruction. An instruction that creates a new data item from parts of one or more other data items.

3.774 facsimile terminal. A terminal used in facsimile transmission. [IEEE Std 610.2-1987]

3.775 fail-safe circuit. A circuit in which the occurrence of a failure causes a specified set of outputs of the circuit to assume predetermined values.

3.776 fail-safe sequential circuit. A sequential circuit designed so that a failure in the internal logic causes the output to assume either a predetermined one or zero state.

3.777 fall time. **(1)** The time required for a voltage or current pulse to decrease from 90% to 10% of its maximum value. *Syn:* decay time. *Contrast with:* rise time. **(2)** In digital logic, the time required to transition from a high state to a low state.

3.778 false add. To form a partial sum, that is, to add without recognizing a carry.

3.779 fan fold paper. *See:* continuous form.

3.780 fault. A defect in a hardware device or component; for example, a short circuit or broken wire. *Syn:* physical defect. [IEEE Std 610.12-1990]

3.781 fault time. *See:* down time.

3.782 fault tolerant. Pertaining to a system or component that is able to continue normal operation despite the presence of faults. [IEEE Std 610.12-1990]

3.783 fault-tolerant sequential circuit. A sequential circuit designed so that a predetermined set of failures in internal state logic or output logic cause no error in the circuit output.

3.784 FCC. Acronym for Federal Communications Commission.

3.785 Federal Communications Commission (FCC). A Washington, D.C. regulatory board appointed by the President under the Communications Act of 1934 to regulate all telecommunications systems in the United States.

3.786 feed. **(1)** To supply the material to be operated upon to a machine. *See:* continuous feed; cut-sheet feed; friction feed; single-sheet feed; tractor feed. **(2)** A device capable of feeding as in (1). *See:* automatic-feed punch; card feed; paper feed; hand-feed punch. **(3)** A command or signal sent to a printer to instruct it to perform a feed operation as in (1). *See also:* form feed; line feed.

3.787 feed hole. A hole punched in a data medium to enable it to be positioned or fed into a machine. *Syn:* sprocket hole.

3.788 feed pitch. The distance between corresponding points of adjacent feed holes along the feed track. [ANSI X3.138-1988]

3.789 feed punch. *See:* automatic-feed punch.

3.790 feed track. A track of a data medium that contains the feed holes. *Syn:* sprocket track.

3.791 feedback. **(1)** A signal that is derived from the output of a circuit and applied to one or more inputs of the same circuit. **(2)** Pertaining to components or subcircuits that transform a portion of the output of a circuit into a form suitable for application to input of the same circuit. *See also:* servomechanism.

3.792 feedback limiter. A limiter circuit that limits the amount of positive or negative signal in an operational amplifier.

3.793 ferrite. An iron compound frequently used in the construction of magnetic cores components.

3.794 fetch. **(1)** That portion of an instruction cycle in which the next instruction is loaded from memory into the processor. **(2)** To obtain a data item from a storage location.

3.795 fetch cycle. That portion of an instruction cycle during which a fetch takes place.

3.796 fiberoptics. A technology that uses light as a digital information carrier. [IEEE Std 610.7-1995]

3.797 field. **(1)** A region near an electric charge, a source of electromagnetic radiation, or a magnet in which components or materials may be affected. **(2)** A portion of a computer instruction. *See also:* address field; operand field; operations field. **(3)** A portion of a data item such as the zone field of zoned decimal data.

3.798 field mark. A mark that identifies the beginning or the end of a field.

3.799 field programmable gate array (FPGA). A device containing many circuits whose interconnections and functions are programmable by the user. *Note:* Generally larger than a field programmable logic array. *See also:* dynamically programmable logic gate.

3.800 field programmable logic array (FPLA). A logic array integrated circuit which can be programmed after manufacture, typically at the time of installation. *Note:* The programming is typically done by passing a high current through fusible links on the integrated circuit. *See also:* field programmable gate array; programmable logic array.

3.801 fifth generation. A period during the evolution of electronic computer in which very large scale integration is employed, along with approaches to computing that include artificial intelligence, knowledge engineering, and distributed processing. *Note:* Introduced in mid-1980's, this generation of computers has not yet reached maturity. *See also:* first generation; fourth generation; second generation; third generation.

3.802 file gap. An area between two consecutive files used to indicate the end of the file. *Note:* Frequently used for other purposes such as to indicate the end or beginning of some other group of data.

3.803 file mark. A mark that identifies the end of a file.

3.804 file-protection ring. *See:* write ring.

3.805 film storage. *See:* magnetic thin film storage.

3.806 filter. **(1)** A circuit that eliminates certain portions of a signal, by frequency, voltage, or some other parameter. **(2)** A mathematical model which performs the same function on a sampled version of the signal. *Syn:* mask.

3.807 fine-grain parallel architecture. Parallel architecture that uses between 1 K and 256 K processors. *Contrast with:* coarse-grain parallel architecture; medium-grain parallel architecture.

3.808 firmware. The combination of a hardware device and computer instructions and data that reside as read-only software on that device. [IEEE Std 610.12-1990]

Notes
1—This term is sometimes used to refer only to the hardware device or only to the computer instructions or data, but these meanings are deprecated.

2—The confusion surrounding this term has led some to suggest that it be avoided altogether.

3.809 first generation. A period during the evolution of electronic computers in which computers were designed around vacuum tubes. *Note:* Introduced in 1949, first generation computers were thought to have been the state of the art from 1951 to 1959, when the transistor was developed. *See also:* fifth generation; fourth generation; second generation; third generation.

3.810 first-level address. *See:* direct address.

3.811 five-bit byte. *See:* quintet.

3.812 fixed-cycle operation. An operation that is completed in a specified number of regularly timed execution cycles. [ANSI X3.138-1988]

3.813 fixed disk. A magnetic disk that is permanently mounted within a disk drive. *See also:* hard disk. *Contrast with:* removable disk. *Syn:* nonremovable disk.

3.814 fixed head. A magnetic head that is in a fixed position, and which can access data only within a particular disk track. *Contrast with:* floating head. *See also:* head-per-track disk drive.

3.815 fixed-instruction computer. A computer in which the instruction set cannot be changed. *Contrast with:* user-programmable computer.

3.816 fixed-point register. A register used to manipulate fixed-point data.

3.817 fixed-program read-only storage. A form of read-only storage in which the data content of each storage cell is determined during manufacture and is thereafter unalterable.

3.818 fixed storage. *See:* read-only storage.

3.819 flag. A variable that is set to a prescribed state, often "true" or "false," based on the results of a process or the occurrence of a specified condition. *Syn:* switch indicator. [IEEE Std 610.12-1990]

3.820 flag register. **(1)** A register used to hold one or more bit indicators called flags, for example: a register holding the negative, zero, and overflow bits. *See also:* condition code register. **(2)** A register used to hold a flag.

3.821 flat pack. An integrated circuit package that has leads extending from the package in the same plane as the package so that leads can be spot welded to terminals on a substrate or soldered to a printed circuit board.

3.822 flat-panel display device. A display device whose physical depth (front-to-back) is relatively small. For example, a plasma panel or a liquid-crystal diode display device.

3.823 flatbed plotter. A plotter that draws an image on a display surface mounted on a flat surface.

3.824 flexible disk. *See:* floppy disk.

3.825 flip-flop. A circuit or device capable of assuming either of two stable states, and which can be made to switch states by applying the proper signal or combination of signals to its inputs. *See also:* D flip-flop; J-K flip-flop; latch; R-S flip-flop; trigger circuit.

3.826 flippy. **(1)** *See:* double-sided disk. **(2)*** *See:* floppy disk.
* Deprecated.

3.827 floating head. A magnetic head that is suspended on a layer of air at a small distance away from the surface of the recording medium and which can move from track to track. *Contrast with:* fixed head. *See also:* head positioner. *Syn:* air-floating head; flying head; moveable head.

3.828 floating-point register. A register used to manipulate floating point data.

3.829 flood gun. A unit within a cathode ray tube that emits a stream of electrons that uniformly covers the entire screen; used to maintain the energy level of phosphors previously energized by the electron gun. [IEEE Std 610.6-1991]

3.830 floppy disk. A magnetic disk made of flexible plastic material that is coated with magnetic material and encased in a protective plastic cover. *Note:* Although the name implies that the disk itself is flexible, this term is also used to refer to magnetic disks with rigid plastic covers. *Syn:* flexible disk; floppy diskette. *See also:* double-density disk; double-sided disk; high-density disk; microfloppy disk; minifloppy disk; single-sided disk. *Contrast with:* hard disk.

3.831 floppy diskette. *See:* floppy disk.

3.832 flush. **(1)** To empty one or more storage locations of their contents; for example, to clear the contents of a buffer after saving its contents on disk. **(2)** To ensure that a buffer has been written to the permanent storage location.

3.833 flying head. *See:* floating head.

3.834 FN. Acronym for function key.

3.835 font. A family or related set of characters and symbols of a particular style of type face; for example, 10-point Times Roman. *See also:* bit map font; character font; downloadable font; optical font; outline font.

3.836 font cartridge. A removable storage medium that is used with an output device such as a printer to store on-line fonts. *Note:* By changing the font cartridge, the user can access new fonts. *See also:* cartridge font; font disk.

3.837 font disk. A disk that is used to store one or more fonts. *See also:* font cartridge.

3.838 footprint. The physical space that a device occupies on a desk or other work surface. *Syn:* real estate.

3.839 form. A medium, sometimes preprinted, on which information is to be printed or plotted. *See also:* continuous form; form feed; index hole; printed card form.

3.840 form feed. **(1)** A command or signal sent to a printer to instruct it to eject the current page and go to the top of the next page. **(2)** *See:* tractor feed.

3.841 form feed character. A format effector character that instructs a device to move to the top of the next page or screen.

3.842 format. **(1)** The structure or appearance of an object such as a storage medium, file, field, or page of text. **(2)** To establish or change the structure or appearance of an object as in (1). *See:* high-level format; low-level format.

3.843 formed character printer. A printer in which each character is a fully formed entity on a slug, drum, mask or other medium. *Contrast with:* dot matrix printer.

3.844 forward channel. A channel used to transmit data in which the direction of transmission coincides with that in which information is being transferred. *Contrast with:* backward channel.

3.845 four-address instruction. An instruction containing four addresses. *See also:* address format. *Syn:* quadruple-address instruction.

3.846 four-bit byte. *See:* quartet.

3.847 four-plus-one address format. *See:* address format.

3.848 four-quadrant multiplier. A multiplier in which the multiplication operation is unrestricted as to the sign of both of the input variables. *Contrast with:* one-quadrant multiplier; two-quadrant multiplier.

3.849 fourth generation. A period during the evolution of electronic computers in which large scale integration is employed, enabling thousands of circuits to be incorporated on one chip, known as an integrated circuit. *Note:* Appearing in the mid-1970's, this generation is thought to be the state of the art at this time. *See also:* fifth generation; first generation; second generation; third generation.

3.850 FPGA. Acronym for field programmable gate array.

3.851 FPLA. Acronym for field programmable logic array.

3.852 frame grabber. An input device for digitizing, transferring and storing video frames, such as TV signals, in a computer. *See also:* frame store.

3.853 frame store. **(1)** Storage used for data to be sent to a display device. **(2)** Storage used to store data received from a frame grabber.

3.854 frequency-derived channel. A channel obtained from multiplexing a channel by frequency-division. [IEEE Std 610.7-1995]

3.855 friction feed. A method for feeding paper into a printer in which friction is used to hold the paper in place. *Contrast with:* tractor feed. *See also:* continuous feed; single-sheet feed.

3.856 frontend. Pertaining to one part of a process which has two parts, the frontend and the backend; the frontend usually denotes what the user sees and the backend denotes some special process. *See also:* frontend computer. *Contrast with:* backend.

3.857 frontend computer. A computer that interfaces between a group of terminals, communication links, and a host computer; performs communications, error checking, code conversion and other special purpose functions. *Syn:* frontend processor. *Contrast with:* backend computer. *See also:* communications computer.

3.858 frontend processor. *See:* frontend computer.

3.859 full adder. An adder that accepts three inputs (two operands and a carry digit), producing a sum and a carry as outputs according to the table below. *See also:* full subtracter. *Contrast with:* half adder; quarter adder. *Syn:* three-input adder.

input #1	0	0	1	1	0	0	1	1
input #2	0	1	0	1	0	1	0	1
input carry	0	0	0	0	1	1	1	1
output sum	0	1	1	0	1	0	0	1
output carry	0	0	0	1	0	1	1	1

Figure 5—Full adder

3.860 full-height disk drive. A disk drive that requires the whole height of the front panel of a standard computer cabinet bay. *Note:* Approximately 3.5 in, a full-height disk drive is twice the size of a half-height disk drive.

3.861 full-page display device. A display device that can display the contents of a full 8.5 x 11 in page at one time.

3.862 full scale. In an analog computer, the nominal maximum value of a computer variable or the nominal maximum value at the output of a computing element. *Note:* Sometimes used to indicate the entire computing voltage range, for example, 20 V is full scale for a computer whose voltages ranges from +10 V to -10 V.

3.863 full subtracter. A subtracter that accepts three inputs (two operands and a borrow digit), producing a difference and a borrow as outputs according to the table below. *Contrast with:* half subtracter. *See also:* full adder.

input #1	0	0	1	1	0	0	1	1
input #2	0	1	0	1	0	1	0	1
input carry	0	0	0	0	1	1	1	1
output differences	0	1	1	0	1	0	0	1
output borrow	0	1	0	0	1	1	0	1

Figure 6—Full subtracter

3.864 fullword. *See:* computer word.

3.865 function field. *See:* operation field.

3.866 function generator. A device whose output analog variable is equal to some function of its input variables. *See also:* digitally controlled function generator.

3.867 function key (FN). A control key used to initiate a desired functional operation. *Note:* A function key is distinguished from other control keys in that the functional operation can usually be programmed or defined dynamically. *Syn:* keyboard function key; user-definable key. *See also:* alternate function key; command key; control key.

3.868 function potentiometer. A potentiometer employed in analog computers in which the voltage at the moveable contact of the potentiometer follows a prescribed functional relationship to the displacement of the contact.

3.869 function switch. In an analog computer, a manually operated switch used as a computing element. For example, a switch may be used to modify a circuit or to add or delete an input function or constant.

3.870 functional address instruction. An instruction whose format contains no operation field because the operation is implicitly specified by its address fields.

3.871 functional design. **(1)** The process of defining the working relationships among the components of a system. *See also:* architectural design. [IEEE Std 610.12-1990] **(2)** The result of the process in (1). [IEEE Std 610.12-1990]

3.872 functional unit. An entity of hardware, software, or both, capable of accomplishing a specified purpose.

3.873 fusible link. A programmable integrated circuit in which circuits form bit patterns by being "blasted" open (that is, by use of a heavy destructive current) or by being left closed. *Note:* This "blasting" is also called "burning" a PROM.

3.874 gain. In a circuit or device, the ratio between the input and output signals.

3.875 gain integrator. In an analog computer, a device which provides the ratio of the input to the corresponding time rate of change of the output, for each input.

3.876 gang punch. To punch identical hole patterns into each punch card of a card deck. [ANSI X3.138-1988]

3.877 gap. *See:* file gap; head gap; interblock gap; interrecord gap.

3.878 gap width. The dimension of the air gap in a read/write head, measured along the radius of the disk. [ANSI X3.138-1988]

3.879 gas-discharge display device. *See:* plasma display device.

3.880 gas panel. *See:* plasma panel.

3.881 gas plasma display device (GASP). *See:* plasma display device.

3.882 GASP. Acronym for gas plasma display device. *See:* plasma display device.

3.883 gate. A combinational circuit that performs an elementary logic operation. *Note:* Usually involves at least one input and one output. *Syn:* logic element; logic gate.

3.884 gather write. A write operation in which information from nonadjacent storage areas is placed into a single physical record. *Contrast with:* scatter read.

3.885 GB. Abbreviation for gigabyte.

3.886 GCR. Acronym for group code recording. *See:* constant-linear-velocity recording.

3.887 general-purpose computer. A computer that is designed to solve a wide variety of problems. *Contrast with:* special-purpose computer.

3.888 general-purpose register. A register, usually explicitly addressable, within a set of registers, that can be used for different purposes, for example, as an accumulator, as an index register, or as a special handler of data. *Syn:* general register. [ANSI X3.138-1988]

3.889 general register. *See:* general-purpose register.

3.890 geometry engine. A hardware accelerator in some workstations that performs scaling, clipping, and other graphical translations between the display list and the display bit map.

3.891 gig. Colloqual reference for gigabyte.

3.892 gigabyte (gig, GB). This term may mean either a) 1 000 000 000 bytes or b) 2^{30} bytes. *See also:* kilobyte; megabyte.

Notes

1—The user of these terms shall specify the applicable usage. If the usage is 2^{10} or 1024 bytes, or multiples thereof, then note 2 below shall also be included with the definition.

2—As used in this document, the terms kilobyte (kB) means 2^{10} or 1024 bytes, megabyte (MB) means 1024 kilobytes, and gigabyte (GB) means 1024 megabytes.

3.893 glue logic. A family of circuit logic consisting of various gates and simple logic elements, each of which serve as an interface between various parts of a computer such as processors, memory units and input-output devices.

3.894 gooey. Colloquial pronunciation for GUI, graphical user interface.

3.895 granularity. Pertaining to the size of the standard meaningful unit with respect to a particular mode of operation; for example, in reference to computer processes, this term could be used to describe screen resolution, levels of manipulation of data, or the amount of time given to a background printing process.

3.896 graphic. A symbol produced by a process such as handwriting, drawing, or printing. [IEEE Std 610.2-1987]

3.897 graphic display device. A display device that can display graphical output. *Note:* Graphic display devices can display characters but they are in the form of graphic images. *Contrast with:* character display device.

3.898 graphic input device. An input device employed in the entry of graphic images. Examples include a joystick, a mouse, or a track ball. *See also:* data tablet; digitizer. [IEEE Std 610.6-1991a]

3.899 graphic printer. A printer that can display both text and graphical output. *Contrast with:* character printer.

3.900 graphic tablet. A data tablet or digitizer that can be used with a stylus to trace existing graphic images, or for entering new images.

3.901 graphic user terminal. A terminal used to display and manipulate both alphanumeric symbols as well as graphic images.

3.902 graphical user interface (GUI). A user interface that is graphical in nature; that is, the user can enter commands by using a mouse, icons and windows. *Note:* Sometimes pronounced "gooey." *Contrast with:* character-based user interface.

3.903 graphical user interface font. *See:* screen font.

3.904 graphics adapter. An expansion board that enhances the computer's ability to control the display device; for example, a graphics adapter that allows color output, or non-interlacing. *Syn:* video board.

3.905 gray scale display device. A monochrome display device that can display multiple shades of a single color in addition to the background color.

3.906 group code recording (GCR). *See:* constant-linear-velocity recording.

3.907 ground loop. A circuit in an analog computer when two or more points in the electrical system, that are nominally at ground potential, are connected by a conducting path such that either or both points are not at the same ground potential.

3.908 group mark. A mark that identifies the beginning or the end of a set of data; for example, a mark at the beginning of a block.

3.909 guard frequency. A reserved area within a range of frequencies that separates two channels in a carrier system or frequency-derived channel.

3.910 guide edge. *See:* reference edge.

3.911 gulp. Slang for a group of bytes.

3.912 half adder. An adder that accepts two inputs, producing a sum and a carry as outputs according to the table below. *See also:* half subtracter. *Contrast with:* full adder; quarter adder. *Syn:* two-input adder.

input #1	0	0	1	1
input #2	0	1	0	1
output sum	0	1	1	0
output carry	0	0	0	1

Figure 7—Half adder

3.913 half-height disk drive. A disk drive that uses the same width, but approximately one-half the front panel height as a standard disk drive, known as a full-height disk drive.

3.914 half subtracter. A subtracter that accepts two inputs, producing a sum and a borrow digit as output according to the table below. *See also:* half adder. *Contrast with:* full subtracter.

input #1	0	0	1	1
input #2	0	1	0	1
output sum	0	1	1	0
output carry	0	1	0	0

Figure 8—Half subtracter

3.915 halfword. A contiguous sequence of bits or characters that comprises half of a computer word and which is capable of being addressed as a unit.

3.916 halt instruction. *See:* pause instruction.

3.917 hand-feed punch. A card punch into which cards are manually entered and removed one at a time. *Contrast with:* automatic-feed punch. *Syn:* hand punch.

3.918 hand-held computer. A portable computer small enough to be held and operated while holding it in one hand.

3.919 hand punch. *See:* hand-feed punch.

3.920 handling zone. The portion of a disk or other storage medium that may be touched by the gripping mechanism or actuator. *Contrast with:* recording area.

3.921 handshaking. The exchange of predetermined signals or control measures between two systems or system components upon initial exchanges. *Note:* When the connection is established, the two components acknowledge each other. [IEEE Std 610.7-1995]

3.922 hard disk. A magnetic disk that consists of a rigid platter. *Note:* This term also is used as a synonym for fixed disk. *See also:* Winchester disk. *Contrast with:* floppy disk.

3.923 hard error. **(1)** An error caused by a hardware failure or by accessing incompatible hardware. **(2)** A storage error in which the data that is retrieved is wrong and the storage cell will no longer hold the data written to it. *Contrast with:* soft error; transient error.

3.924 hard failure. A cessation of some system or system component from which there is no possible recovery.

3.925 hard limiting. A type of limiting characterized by very little variation in the output within the range where the output is subject to limiting. *Contrast with:* soft limiting.

3.926 hard-sector. Pertaining to a magnetic disk that is segmented by physical, non-alterable means such as a hole, known as an index hole, in the disk. *Contrast with:* soft-sector.

3.927 hardened computer. A computer that is physically designed to function reliably in harsh environments such as extremes of temperature, shock and vibration, humidity or radiation. *Note:* Often required for space and military applications. *See also:* hostile environment computer.

3.928 hardware. Physical equipment used to process, store, or transmit computer programs or data. [IEEE Std 610.12-1990]

3.929 hardware accelerator. **(1)** A circuit which performs operations normally done in software much faster than they can be done in software. **(2)** A circuit that performs hardware operations much faster than the original hardware. For example: an 80386 based accelerator for an 80286 based machine.

3.930 hardware check. *See:* automatic check. [IEEE Std 610.5-1990]

3.931 hardware description language (HDL). A general-purpose computer language designed to serve as an interface to the design, documentation, and validation of computer hardware. *See also:* hardware design language. *Syn:* computer hardware description language.

3.932 hardware design language (HDL). A design language with special constructs and, sometimes verification protocols, used to develop, analyze, and document, a hardware design or computer architecture. *See also:* hardware description language. [IEEE Std 610.12-1990a]

3.933 hardware language. *See:* hardware description language; hardware design language; machine language.

3.934 hardwired. Pertaining to a circuit or device whose characteristics are permanently determined by the interconnections between components. *Contrast with:* programmable.

3.935 hardwired logic. A group of logic circuits permanently interconnected to perform a specific function.

3.936 Harvard class architecture. A computer architecture with separate paths to main storage for instructions and data, allowing for a high memory bandwidth. *Contrast with:* Von Neumann class architecture.

3.937 hazard-free logic. A group of logic circuits that are not subject to failures due to logic failure conditions.

3.938 HD. Acronym for high-density disk.

3.939 HDA. Acronym for head/disk assembly.

3.940 HDL. **(1)** Acronym for hardware description language. **(2)** Acronym for hardware design langauge.

3.941 HDLC. Acronym for high-level data link control.

3.942 head. **(1)** A device that reads, writes, or erases data on a storage medium. For example, a small electromagnet (magnetic head) used to read, write, or erase data on a magnetic drum or magnetic tape, or a device such as a laser that reads and writes data on an optical storage medium. *See also:* magnetic head; read head;

read/write head; write head. **(2)** A device within an output device, such as a printer or display device, that controls the creation of images on the device. *See also:* display head; plotting head; print head; scan head.

3.943 head crash. The sudden and complete failure of a disk drive caused by a physical collision between the read/write head and the surface of the recording medium. *Note:* Usually results in destruction of the head and part or all of the data on the medium. *See also:* disk crash.

3.944 head/disk assembly (HDA). In a magnetic disk device, an assembly that includes the magnetic disk, magnetic head, and an access mechanism.

3.945 head gap. The distance between a read/write head and the surface of a recording medium.

3.946 head loading zone. The relative distance that a read/write head travels with respect to a rotating storage device in order to achieve the proper clearance between the head and the surface of the medium.

3.947 head-per-track disk drive. A disk drive in which one fixed head is located over each track on the drive.

3.948 head positioner. A component within a storage device that positions a floating head over a specific track on the storage medium.

3.949 head switching. (1) The use of two read/write heads, one to read from the medium and one to write on another medium. **(2)** The process of switching from one head to another, either on the same or on different storage media.

3.950 header card. A punch card that contains information identifying data in the cards that follow. *Contrast with:* trailer card.

3.951 header label. *See:* beginning-of-file label.

3.952 hierarchical random-access memory (HRAM). A type of storage that consists of several layers of varying-speed storage in which information is stored in the fastest available storage.

3.953 high-availability computer. A computer designed with various fault tolerant systems that enables it to function when one or more of its components fail. *Note:* A computer is so designated due to its high percentage of user availability.

3.954 high-density (HD) disk. A floppy disk that is capable of storing information at a higher density than that of the same size double-density disk.

3.955 high-gain DC amplifier. In an analog computer, an amplifier that is capable of amplification substantially greater than that required for a specified operation throughout a frequency band extending from zero to some maximum. *See also:* operational amplifier. [1]

3.956 high-level data link control (HDLC). A standard protocol defined by ISO for bit-oriented, frame-delimited data communications.

3.957 high-level format. To prepare a disk or a partition of a disk to be used by a particular operating system. *Note:* In most instances, this includes scanning the surface of the disk for defective areas. *Syn:* logical format. *Contrast with:* low-level format.

3.958 high-speed buffer. A cache or a set of logically partitioned blocks that provides significantly faster access to instructions and data than provided by main storage.

3.959 high-speed metal-oxide semiconductor (HMOS). *See:* n-channel metal-oxide semiconductor.

3.960 high-speed printer (HSP). A printer that operates at a very high speed.

3.961 hit. (1) A comparison of two items of data that satisfies specified conditions; for example, when comparing "X" with the string "ACDFXYN", a hit would be encountered in the fifth character position. **(2)** In disk caching, a condition where the target data is located within the cache storage, eliminating the need to reference secondary storage. *See also:* hit probability; hit ratio. *Syn:* cache hit.

3.962 hit probability. The probability that a cache storage contains the target data. *Note:* generally expressed in percent.

3.963 hit ratio. The proportion of cache hits to all accesses.

3.964 hold. (1) An untimed delay in a computer program, terminated by an operator or an interlock operation. **(2)** In an analog computer, the computer control state in which the problem solution is stopped and held at its last values, usually by automatic disconnect of integrator input signals.

3.965 hold time. **(1)** The amount of time information may be retained in dynamic storage before needing to be refreshed or the information lost. *Syn:* output hold time. **(2)** The elapsed time during which a program is on hold. **(3)** The amount of time during which data presented to a flip-flop must be maintained after the clock transition in order for the data to be accurately stored.

3.966 hole. In a semiconductor, a conceptual unit of charge opposite to that of an electron. *Note:* A hole occurs when an electron is lost from an atom, and "moves" when an electron is lost from an adjacent atom.

3.967 hole pattern. A punching configuration or an array of holes that represent a single character in a data medium such as paper tape, or punch cards.

3.968 Hollerith card. *See:* punch card.

3.969 home address. The information written on every track of a magnetic disk, identifying the relative track number of that track.

3.970 home computer. A personal computer designed to be used in the home. [IEEE Std 610.2-1987]

3.971 home key. **(1)** A cursor control key that moves the cursor to the starting point of the screen, usually the upper left-hand corner. **(2)** A cursor control key that moves the cursor to the starting point of a file.

3.972 hopper. *See:* card hopper.

3.973 horizontal feed. Pertaining to the motion of a punch card along a card feed path with the long edge first. *Contrast with:* vertical feed.

3.974 horizontal microinstruction. A microinstruction that specifies a set of simultaneous operations needed to carry out a given machine language instruction. *Contrast with:* diagonal microinstruction; vertical microinstruction. [IEEE Std 610.12-1990a]

3.975 horizontal tabulation. **(1)** On an impact printer or a typewriter, movement of the imprint position a predetermined number of character spaces along the writing line. **(2)** On a display device, movement of the cursor a predetermined number of display positions along a display line. *Contrast with:* vertical tabulation

3.976 horizontally integrated microprocessor. A microprocessor in which horizontal microinstructions can be performed. *Contrast with:* vertically integrated microprocessor.

3.977 host. *See:* host computer.

3.978 host computer. **(1)** The primary or controlling computer in a multiple computer installation. *Syn:* host; host machine. *See also:* bifunctional machine. **(2)** A computer used to prepare computer programs for use on another computer or on another computer system; For example, a computer used to compile, link, or test programs to be used on another system. *Syn:* host processor. [IEEE Std 610.7-1995]

3.979 host interface. The interface between a communications network and a host computer. [IEEE Std 610.7-1995]

3.980 host machine. *See:* host computer.

3.981 host processor. **(1)** A processor that controls all or part of a user application network. **(2)** *See:* host computer.

3.982 hostile environment computer. A computer designed for use in an environment not conducive to safe operation, such as one with many dust particles in the air; precautions must be taken to ensure that dust particles do not enter the disk drives or settle on the heads. *See also:* hardened computer.

3.983 HRAM. Acronym for hierarchical random-access memory.

3.984 HSP. Acronym for high-speed printer.

3.985 hub. *See:* spool.

3.986 human interface. *See:* user interface.

3.987 hybrid circuit. **(1)** A circuit, usually in the form of a module or substrate, that is made up of discrete components and integrated circuits. *Contrast with:* monolithic integrated circuit. **(2)** A circuit that uses a combination of digital and analog components, modes of operation, or techniques.

3.988 hybrid computer. A computer consisting of both a DC analog computer and a digital computer that can process both analog and digital data.

3.989 hypercube architecture. A computer architecture in which processors are arranged as nodes in multiple dimensions with direct channel communication among neighboring nodes. *Note:* An n-dimensional hypercube has 2^n nodes.

3.990 hypermedia. The integration of text, graphics, sound, or video into an associative, user-controllable system of information storage and retrieval; for example, a hypermedia presentation on exercise might include dynamic links to additional topics such as health, anatomy, and sporting events. *Note:* If the information is primarily presented in text form, the product is known as hypertext. *See also:* multimedia.

3.991 hypertape drive. A high-speed tape drive that uses tape cartridges that can be automatically loaded.

3.992 hypertext. *See:* hypermedia.

3.993 I/O. Abbreviation for input-output.

3.994 I/O channel. *See:* input-output channel.

3.995 I/O circuit. *See:* input-output circuit.

3.996 I/O controller. *See:* input-output controller.

3.997 I/O port. *See:* input-output port.

3.998 I/O processor. *See:* input-output processor.

3.999 I-series. A series of ISDN standards reccommended by CCITT.

3.1000 I-unit. Abbreviation for instruction fetch unit.

3.1001 IC. (1) Acronym for instruction counter. *See:* program counter. (2) Acronym for integrated circuit.

3.1002 IDA. Acronym for independent disk array.

3.1003 IDE. Acronym for integrated device electronics.

3.1004 identity. The Boolean operation whose result has the value 1 if and only if all the operands have the same value. *Note:* An identity operation on two operands is called an equivalence operation. *Contrast with:* nonidentity. *See also:* identity gate.

3.1005 identity element. *See:* identity gate.

3.1006 identity gate. A gate that performs the Boolean operation of an identity operation. *Syn:* identity element.

3.1007 idle time. That part of up time during which a functional unit is not performing useful operations. *Contrast with:* operating time.

3.1008 IEEE. Acronym for Institute of Electrical and Electronic Engineers

3.1009 IF-A-THEN-NOT-B gate. *See:* NAND gate.

3.1010 IF-AND-ONLY-IF element. *See:* IF-AND-ONLY-IF gate.

3.1011 IF-AND-ONLY-IF gate. A gate that performs the Boolean operation of equivalence. *Syn:* IF-AND-ONLY-IF element.

3.1012 IF-THEN element. *See:* IF-THEN gate.

3.1013 IF-THEN gate. A gate that performs the Boolean operation of implication. *Syn:* IF-THEN element.

3.1014 IFIP. Acronym for International Federation of Information Processing.

3.1015 IIL. Acronym for integrated injection logic.

3.1016 image. (1) In image processing, a two-dimensional representation of a scene. [IEEE Std 610.4-1990] (2) In graphics, a displayed or drawn representation. [IEEE Std 610.6-1991]

3.1017 image memory. A discrete portion of memory used to hold a representation of an image. *Note:* Sometimes known as a display buffer, or a bit map. *See also:* video RAM.

3.1018 immediate access storage. A type of storage whose access time is extremely small, relative to those of alternative types of storage. *Syn:* instantaneous storage.

3.1019 immediate address. An instruction address in which the address field is the operand itself. *Syn:* zero-level address.

3.1020 immediate addressing. An addressing mode in which instructions contain the operand itself and not the address of the operand.

3.1021 immediate data. Data or operands that are contained in the address field of a computer instruction. [IEEE Std 610.12-1990a]

3.1022 immediate instruction. A computer instruction whose address fields contain immediate data, or the values of the operands rather than the operands' addresses. [IEEE Std 610.12-1990a]

3.1023 impact printer. A printer in which printing results from mechanical impacts with the paper. *See also:* dot matrix printer; element printer; formed-character printer; on-the-fly printer. *Contrast with:* nonimpact printer.

3.1024 implementation architecture. The logic structure of a computer system that describes how the functions described by the architecture are carried out.

3.1025 implication. The dyadic Boolean operation whose result yields the value 0 if and only if the first operand has the value 1 and the second has the value 0. *See also:* IF-THEN gate.

3.1026 implicit address instruction. *See:* zero-address instruction.

3.1027 implied addressing. An addressing mode in which the operation field of an instruction implicitly addresses operands. *See also:* repetitive addressing. [ANSI X3.138-1988]

3.1028 incidental time. *See:* miscellaneous time.

3.1029 inclusive NOR gate. *See:* NOR gate.

3.1030 inclusive OR gate. *See:* OR gate.

3.1031 increment. **(1)** The quantity by which a variable is increased. [IEEE Std 1084-1986] **(2)** To increase the value of a variable. [IEEE Std 1084-1986] **(3)** To increase the value of a variable by one. [IEEE Std 1084-1986] *Contrast with:* decrement.

3.1032 increment size. The minimum distance between two points or parallel lines of a display surface. *See also:* plotter step size. [IEEE Std 610.6-1991]

3.1033 incremental computer. A special-purpose computer that is designed to process changes in the variables as well as the absolute value of the variables themselves.

3.1034 incremental integrator. In an analog computer, a digital integrator so modified that the output signal is maximum negative, zero, or maximum positive when the value of the input is negative, zero, or positive. [ANSI X3.138-1988]

3.1035 incremental tape drive. A tape drive capable of handling one character at a time, creating interrecord gaps only when explicitly directed.

3.1036 independent disk array (IDA). A form of RAID storage, known as levels 4 and 5, in which the individual drives within the array may be accessed. *Note:* With level 4, all data drives use a common parity drive and with level 5, parity is performed across all drives.

3.1037 index hole. A hole found in hard-sectored media, such as magnetic disks, or paper tape, in which the hole indicates the start of the first sector, the first record, or the top of the form. *Contrast with:* index mark.

3.1038 index mark. A mark found on soft-sectored media, such as magnetic disks, in which a magnetic indicator is placed on the disk to indicate the beginning of each track within the sector. *Syn:* address mark.

3.1039 index register. A register whose contents can be used to modify an operand address during the execution of computer instructions; it can also be used as a counter. *Note:* may be used to control the execution of a loop, to control the use of an array, for table lookup or as a pointer. *Syn:* B-box; B-line; cycle counter.

3.1040 index word. In indexed addressing, a word containing an index modifier that is applied to the address field of a computer instruction.

3.1041 indexed access. *See:* access.

3.1042 indexed address. An address that must be added to the contents of an index register to obtain the address of the storage location to be accessed. *Syn:* variable address. [IEEE Std 610.12-1990]

3.1043 indexed addressing. An addressing mode in which an index register or index word is used to permit automatic modification of the referred address without altering the instruction. *Note:* Particularly useful when programming repetitive instruction sequences on many sets of data.

3.1044 indirect address. An address that specifies a storage location containing either a direct address or another indirect address. *Syn:* deferred address; double address; multilevel address; second-level address. *Contrast with:* direct address.

3.1045 indirect addressing. An addressing mode in which the address field of an instruction contains an indirect address. *See also:* n-level address. *Contrast with:* direct addressing.

3.1046 indirect instruction. A computer instruction that contains indirect addresses for its operands. *Contrast with:* direct instruction. [IEEE Std 610.12-1990]

3.1047 infant mortality. *See:* burn in.

3.1048 inference engine. A software engine within an expert system that draws conclusions from rules and situational facts. *See also:* parallel inference machine.

3.1049 information processing system. *See:* information system.

3.1050 information system. **(1)** A data processing system integrated with such other processes as office automation and data communication. *See also:* data processing system. *Syn:* information processing system. **(2)** A mechanism used for acquiring, filing, storing, and retrieving an organized body of knowledge. [IEEE Std 610.5-1990]

3.1051 initialize. To set a variable, register, or other storage location to a starting value. *See also:* clear; reset. [IEEE Std 610.12-1990]

3.1052 ink jet printer. A nonimpact printer in which the characters are formed by projecting a jet of ink droplets onto paper. [ANSI X3.138-1988]

3.1053 inner storage. *See:* internal storage.

3.1054 inoperable time. The part of down-time in which all environmental conditions are satisfied, during which a device would not yield correct results if it were operated.

3.1055 input. Pertaining to a device, process, or channel involved in the reception of data.

3.1056 input area. An area of storage reserved for input data. *Syn:* input block.

3.1057 input block. *See:* input area.

3.1058 input buffer. *See:* buffer.

3.1059 input buffer register. A data buffer register that accepts data from an input unit such as a magnetic tape drive or magnetic disk and which then transfers this data to internal storage.

3.1060 input channel. A channel employed only for data input; for example, to impress a state on a device or logic element; or to transfer data from an external storage unit to an internal storage unit. *See also:* input-output channel; output channel.

3.1061 input device. A device used to enter data into a computer system. *Note:* Commonly used input devices include light pens and keyboards. *Syn:* input unit. *Contrast with:* output device. *See also:* cursor control device; graphic input device; input-output device; pick device; string device.

3.1062 input limiter. A limiter circuit employing biased diodes in the amplifier input channel, that operates by limiting current entering the summing junction.

3.1063 input media. Media that are employed as input; for example, punched cards; magnetic disks. *Contrast with:* output media.

3.1064 input/output. *See:* input-output.

3.1065 input-output (I/O). Pertaining to input, output, or both.

3.1066 input-output area. *See:* buffer.

3.1067 input-output bound (io bound). Pertaining to any process that performs input-output operations which take a long time relative to the time of CPU operations performed. *Contrast with:* compute bound.

3.1068 input-output channel. A channel that handles the transfer of data between internal storage and peripheral equipment. *Syn:* computer channel; data channel. *See also:* input channel; output channel; input-output controller; selector channel. [IEEE Std 610.7-1995]

3.1069 input-output circuit. A circuit which connects a computer to another device.

3.1070 input-output control electronics. The electronics required to interface an input-output device to a central processing unit.

3.1071 input-output controller (IOC). A controller that controls one or more input-output channels. *See also:* input-output channel; selector channel. *Syn:* peripheral controller. [IEEE Std 610.7-1995]

3.1072 input-output device. A device through which data may be entered into a computer system, received from the system, or both. *Syn:* input-output unit. *See also:* input device; output device.

3.1073 input-output port. A port that is configured or programmed to provide a data path between the central processing unit and its peripheral devices.

3.1074 input-output processor (IOP). A processor dedicated to controlling input and output transfers.

3.1075 input-output unit. *See:* input-output device.

3.1076 input station. *See:* data input station.

3.1077 input terminal. **(1)** A terminal used to accept input. **(2)** Any point in a system or communication network at which data can enter the system.
Contrast with: output terminal.

3.1078 input unit. *See:* input device.

3.1079 input workstation. *See:* data input station.

3.1080 instantaneous storage. *See:* immediate access storage.

3.1081 Institute of Electrical and Electronic Engineers (IEEE). An international organization that is accredited to develop standards for ANSI.

3.1082 instruction. A statement or expression consisting of an operation and its operands (if any), which can be interpreted by a computer in order to perform some function or operation. *See also:* computer instruction; macroinstruction; microinstruction.

3.1083 instruction address. **(1)** The address of an instruction. **(2)** The address that must be used to fetch an instruction. [ANSI X3.138-1988]

3.1084 instruction address register. **(1)** *See:* program counter. **(2)** An address register used to hold the address of an instruction. *Syn:* instruction pointer register; program register. *See also:* P register.

3.1085 instruction address stop. An instruction address that, when it is fetched, causes execution to stop. *See also:* address stop.

3.1086 instruction cache. A cache that stores instructions for fast access by the processor. *Contrast with:* data cache.

3.1087 instruction code. *See:* computer instruction code.

3.1088 instruction control unit. In a processor, the part that retrieves instructions in proper sequence, interprets each instruction, and applies the proper signals to the arithmetic and logic unit and other parts in accordance with this interpretation. *Syn:* computer control unit.

3.1089 instruction counter (IC).* *See:* program counter.
* Deprecated.

3.1090 instruction cycle. The process of fetching a computer instruction from memory and executing it. *See also:* instruction time. [IEEE Std 610.12-1990]

3.1091 instruction decoder. **(1)** The portion of the computer that determines which functions of the execution unit and the operand handler must be performed to execute the instruction. *Note:* Often implemented as part of the instruction fetch unit. **(2)** A functional component that analyzes the operation to be performed, as indicated in an instruction. *See also:* instruction processor.

3.1092 instruction fetch unit (I-unit). The portion of a computer that reads the next instruction word from memory and converts the commands to the internal format used by the instruction decoder.

3.1093 instruction format. The number and arrangement of the fields (operand, operation, and address) in a computer instruction. *See also:* address format.

3.1094 instruction pointer register. *See:* instruction address register.

3.1095 instruction processor. A functional component that carries out the action indicated by the instruction decoder, resulting in a possible change of machine or data state; for example, instruction decision and execution.

3.1096 instruction register. A register that is used to hold an instruction for interpretation. [ANSI X3.138-1988]

3.1097 instruction set. The complete set of instructions recognized by a given computer or provided by a given programming language. *See also:* computer instruction set. *Note:* In computer hardware, this term is considered to be synonymous with a computer's architecture. [IEEE Std 610.12-1990a]

3.1098 instruction time. **(1)** The time it takes to perform one instruction cycle. **(2)** The time it takes a com-

puter to fetch an instruction from memory and execute it. [IEEE Std 610.12-1990]

3.1099 instruction word. A word that represents an instruction. *See also:* very long instruction word. [ANSI X3.138-1988]

3.1100 insulating material. A material that cannot conduct electricity under normal conditions. *Contrast with:* conducting material; semiconducting material.

3.1101 insulator. A device made of a material in which electrons or ions cannot be moved easily, hence preventing the flow of electric current.

3.1102 integrated circuit (IC). **(1)** A combination of connected circuit elements (such as transistors, diodes, resistors, and capacitors) inseparably associated on or within a continuous substrate. *Syn:* chip. *See also:* program. **(2)** A solid-state circuit consisting of interconnected active and passive semiconductor devices diffused into a single silicon chip. *Syn:* chip; microcircuit. *See also:* monolithic integrated circuit; very-high-speed integrated circuit.

3.1103 integrated device electronics (IDE). A data-transfer interface in which the control electronics for the disk drive are physically located on the drive itself rather than on an expansion board or drive adapter. *Syn:* integrated drive electronics.

3.1104 integrated drive electronics. *See:* integrated device electronics.

3.1105 integrated injection logic (IIL). A family of circuit logic in which the logic state is defined by current flow rather than by voltage level.

3.1106 integrated microprocessor. One or more large scale integration devices so interconnected as to provide all of the functions of a central processing unit within a single LSI circuit. *See also:* diagonally integrated microprocessor; horizontally integrated microprocessor; vertically integrated microprocessor. *Note:* This use of the term is deprecated; typically "microprocessor" is used.

3.1107 integrating amplifier. In an analog computer, an operational amplifier that produces an output signal equal to the time integral of a weighted sum of the input signals.

3.1108 integrating motor. In an analog computer, a motor designed to give a constant ratio of output shaft rotational speed to input signal. *Note:* The angle of rotation of the shaft with respect to a datum is thus proportional to the time integral of the applied signal.

3.1109 integrator. A functional unit whose output analog variable is the integral of an input analog variable with respect to time, or a variable other than time. *See also:* incremental integrator; storage integrator. [ANSI X3.138-1988]

3.1110 intelligent terminal. A terminal that can send and receive information as well as perform some processing, such as making decisions or performing calculations, independent of the computer. *Contrast with:* dumb terminal. *Syn:* programmable terminal. *See also:* smart terminal.

3.1111 interactive. Pertaining to a system or mode of operation in which each user entry causes a response from the system. [IEEE Std 610.2-1987]

3.1112 interblock gap. An area between two consecutive blocks. *Syn:* record gap. [IEEE Std 610.5-1990]

3.1113 interface. **(1)** A shared boundary between two objects such as devices, systems, or networks, across which information is passed. *See also:* data-transfer interface; user interface. [IEEE Std 610.12-1990a] **(2)** Hardware or software that provides a point of communciation between two or more processes, persons, or other physical entities. [IEEE Std 610.7-1995]

3.1114 interface error. An error condition caused by hardware incompatibility, software incompatibility or other incompabilities between any two items of equipment.

3.1115 interlace. **(1)** To arrange, access, select, or display in an alternating fashion. **(2)** To refresh a display device using two passes of the writing beam to complete the full display; the first pass draws every other line and the second fills in those skipped.

3.1116 interlaced. Pertaining to a display device in which every other line of pixels is refreshed on each pass. *Contrast with:* non-interlaced.

3.1117 interleave. To arrange parts of one sequence of things or events so that they alternate with parts of one or more other sequences of the same nature such that each sequence retains its identity; For example, to assign successive addresses to physically separated storage locations in such a way as to reduce access time.

3.1118 interleaved memory. A type of memory in which two or more separate arrays are used to fill alternate accesses in such a way as to speed the average access time of the memory. For example, the odd addresses are all in one memory array and the even addresses are in a second.

3.1119 interleaving. The process of alternating two or more operations or functions through the overlapped use of a computer facility. *See also:* interleaved memory.

3.1120 interlock. To prevent one device from interfering with another. For example, to lock the switches to prevent manual movement of the switches while a program is executing.

3.1121 internal font. A font that is permanently loaded in a printer's memory. *Syn:* built-in font; permanent font.

3.1122 internal label. A label contained within a data medium, used to mark something such as the beginning or end of a file. *Contrast with:* external label. *See also:* beginning-of-file label; beginning-of-volume label; end-of-file label; end-of-volume label.

3.1123 internal memory. *See:* internal storage.

3.1124 internal storage. Storage that is accessible by a processor without the use of input-output channels. *Note:* Includes main storage, and may include other kinds of storage such as cache memory and special-purpose registers. *Syn:* inner memory; internal memory; processor storage.

3.1125 International Federation of Information Processing (IFIP). An international organization of societies that serves information-processing professionals. *See also:* AFIPS.

3.1126 International Organization for Standards (ISO). An international organization that establishes and maintains standards for many different industries.

3.1127 International Telegraph and Telephone Consultative Committee. An international organization that studies and issues recommendations on issues related to communication technology. *Note:* Also know as CCITT, acronym for Comité Consultatif International de Télégraphique et Téléphonique (French).

3.1128 interpreted card. A punch card whose information content is made readable to the human eye by being printed across the top portion of the card.

3.1129 interpreter. A device that prints on a punch card the characters corresponding to hole patterns punched in the card. *Note:* The result is called an "interpreted card." *See also:* transfer interpreter.

3.1130 interrecord gap. The space between two consecutive records on a data medium. [ANSI X3.138-1988]

3.1131 interrupt. The suspension of a process to handle an event external to the process. [IEEE Std 610.12-1990]

3.1132 interrupt register. A special-purpose register that holds data necessary for handling interrupts. [ANSI X3.138-1988]

3.1133 interrupt vector. A value provided by an input-output device, used to distinguish between different input-output functions which can generate the same interrupt. *Note:* A table of interrupt vectors is often provided to allow a processor to look up the address of a service routine.

3.1134 interstage punching. A mode of card punching such that either the odd- or even-numbered card columns are used.

3.1135 interval timer. A timer, sometimes programmable, which generates a periodic interrupt to a processor, used as a time reference.

3.1136 intrinsic font. *See:* bit map font.

3.1137 inverter. A circuit or device whose output analog variable is equal in magnitude to its input analog variable, but is of opposite sign or polarity.

3.1138 IOC. Acronym for input-output controller.

3.1139 IOP. Acronym for input-output processor.

3.1140 ISO. Acronym for International Organization for Standardization.

3.1141 jam. A mis-feed in the feed mechanism of a printer or card reader.

3.1142 job-oriented terminal. A terminal that is designed for a particular application, for example, a terminal used for airline checking or for point of sale.

3.1143 joy stick.* *See:* joystick.

* Deprecated.

3.1144 joystick. A cursor control device consisting of a lever having at least two degrees of freedom and that can be used as a locator.

3.1145 jukebox. A storage device that holds multiple disks and which has one or more disk drives that can mount the disks in the disk drive as they are needed. *Syn:* autochanger.

3.1146 jump instruction. **(1)** A computer instruction that specifies a jump. *See also:* conditional jump instruction. *Contrast with:* unconditional jump instruction. **(2)** An instruction that changes the sequence in which computer instructions are performed. *Note:* A jump instruction generally specifies the next instruction in terms of a real address. *See also:* branch instruction.

3.1147 junction circuit. A circuit that connects two other circuits.

3.1148 kB. Abbreviation for kilobyte.

3.1149 kernel benchmark program. A benchmark program consisting of portions of actual computer programs such that the portion chosen is believed to be responsible for most of the execution time.

3.1150 key. **(1)** A manually activated mechanism on a keyboard, used for entering a character or command into a computer system. *See also:* control key; typing key. **(2)** To press a lever or button.

3.1151 key-to-disk converter. An input device that converts data from a keyboard to disk storage. *Syn:* keyboard-to disk. *See also:* card-to-disk converter; key-to-tape converter.

3.1152 key-to-tape converter. An input device that converts data from a keyboard to magnetic tape. *See also:* card-to-tape converter; key-to-disk converter.

3.1153 keyboard. An input device consisting of a systematic arrangement or layout of keys, used to encode data. *See also:* Dvorak keyboard; keypad; live keyboard; membrane keyboard; numeric keyboard; QWERTY keyboard.

3.1154 keyboard punch. *See:* keypunch.

3.1155 keyboard scanner. A unit within a keyboard that detects the depression of a key and generates an encoded signal indicating the identity of that key.

3.1156 keyboard send/receive (KSR). A teletypewriter unit with keyboard and printer. *Contrast with:* automatic send/receive.

3.1157 keyboard-to-disk. *See:* key-to-disk converter.

3.1158 keypad. A small group of keys that are set up for convenience and greater flexibility such that they are grouped together physically on a keyboard. For example, a numeric keypad or a cursor control keypad.

3.1159 keypunch. A keyboard-activated card punch that punches holes in a card, according to input received from the keyboard. *Syn:* keyboard punch. *See also:* numeric keypunch.

3.1160 keypunching. The process of using a card punch to generate punch cards.

3.1161 keystroke. The action of pressing one of the keys on a keyboard.

3.1162 keystroke counter. A counter that records the number of key depressions made on a given unit within some period of time.

3.1163 kilobyte (kB). This term may mean either a) 1000 bytes or b) 2^{10} or 1024 bytes. *See also:* gigabyte; megabyte.

Notes

1—The user of these terms shall specify the applicable usage. If the usage is 2^{10} or 1024 bytes, or multiples thereof, then note 2 below shall also be included with the definition.

2—As used in this document, the terms kilobyte (kB) means 2^{10} or 1024 bytes, megabyte (MB) means 1024 kilobytes, and gigabyte (GB) means 1024 megabytes.

3.1164 KSR. Acronym for keyboard send/receive.

3.1165 laced card. A punch card punched accidentally or intentionally with holes in excess of the hole patterns required by the character set in use.

3.1166 landscape orientation. A page orientation of a display surface having greater width than height. *Note:* Derived from pictures of landscapes, which are normally horizontal in format. *Contrast with:* portrait orientation.

3.1167 language standard. A standard that describes the characteristics of a language used to describe a requirements specification, a design, or test data. *See also:* standard language. [IEEE Std 610.12-1990]

3.1168 laptop computer. A portable computer designed for use on one's lap. [IEEE Std 610.2-1987]

3.1169 large scale integration (LSI). **(1)** Pertaining to an integrated circuit containing between 500 and 2×104 transistors in its design. *Contrast with:* medium scale integration; small scale integration; ultra large scale integration; very large scale integration. **(2)** Pertaining to an integrated circuit containing between 100 and 5000 elements.

3.1170 laser. **(1)** A device that can generate a laser beam. *Note:* "laser" is an acronym for light amplification by stimulated emissions of radiation. **(2)** Loosely, pertaining to a device that uses a laser beam, as in a laser printer.

3.1171 laser beam. An extremely narrow, coherent beam of electromagnetic energy in the form of light.

3.1172 laser beam printer. *See:* laser printer.

3.1173 laser disk. An optical disk, typically 12 inches in diameter. *See also:* compact disc.

3.1174 laser printer. A nonimpact, xerographic printer that uses a laser beam to create a latent image which is then made visible by a toner and transferred and fixed on paper. *Syn:* laser beam printer.

3.1175 latch. **(1)** A circuit that can be used to hold data in a ready position until required; usually controlled by another circuit. *See also:* latching; transparent latch. **(2)** A circuit consisting of one or more latches as in (1) that is used to store digital data. *See also:* register.

3.1176 latching. The process of holding data in a circuit until other circuits are ready to change the latch circuit.

3.1177 latency. **(1)** *See:* propagation delay. **(2)** *See:* rotational delay.

3.1178 LCD. **(1)** Acronym for liquid crystal display. **(2)** Acronym for liquid crystal device.

3.1179 leader. The blank section of magnetic tape at the beginning of a reel. *Contrast with:* trailer.

3.1180 leading edge. The end of a perforated tape that first enters a perforated-tape reader. [ANSI X3.138-1988]

3.1181 LED. **(1)** Acronym for light-emitting diode. *See:* light-emitting diode display device. **(2)** Acronym for light-emitting display.

3.1182 letter-quality (LQ). Pertaining to printed output that is suitable for high quality correspondence. *Note:* This term implies that "letter quality" output matches that of a standard typewriter. *See also:* draft quality; near-letter quality.

3.1183 level sensitive. Pertaining to a circuit that can be held in one state as long as an input signal maintains a certain value. *See also:* transparent latch. *Contrast with:* edge sensitive.

3.1184 light-emitting diode (LED) display device. A display device in which a single light-emitting diode is used for each segment of a character to be displayed. *Note:* Usually used in small control panels and displays such as clocks and appliances.

3.1185 light-emitting display (LED).* *See:* light-emitting diode display device.
* Deprecated.

3.1186 light pen. **(1)** A light-sensitive pick device, resembling a fountain pen, that detects light that emanates from a CRT beam when the end of the pen is held against the CRT device. *Note:* Often used as a locator. *Syn:* optical wand; selector pen. *See also:* electronic pen; sonic pen. **(2)** An input device that reads bar-codes by transmitting a beam of light onto the code and that receives and interprets the reflections from the bar-code. *See also:* bar-code scanner.

3.1187 light-sensitive. Pertaining to an input device that can detect energy in the form of light. *See also:* light pen; touch-sensitive.

3.1188 limiter. A device that is used to prevent an analog variable from exceeding specified limits. *See also:* limiter circuit; feedback limit.

3.1189 limiter circuit. A circuit that limits the amplitude of a signal so that interfering noise can be kept to a minimum, or to protect components from excessive stress. *See also:* bridge limiter; feedback limiter; input limiter. *Syn:* circuit limiter; clamping circuit.

3.1190 limiting. The process of preventing a data value or variable from exceeding a specified limit. *See also:* hard limiting; limiter; soft limiting.

3.1191 line. (1) A circuit connecting two or more devices. [IEEE Std 610.7-1995] (2) *See:* channel. (3) A wire or set of wires over which a current is propagated. (4) A sequence of characters.

3.1192 line counter. A counter that records the number of lines processed or listed by some unit within some timer period.

3.1193 line feed. A command or signal sent to a printer to instruct it to move to the next writing line. *Note:* Often used in conjunction with a carriage return to move to the beginning of the next writing line.

3.1194 line printer. A printer that prints a line of characters as a unit. *Contrast with:* character-at-a-time printer; page printer. [ANSI X3.138-1988]

3.1195 line speed. The maximum acceptable rate at which signals may be transmitted over a given channel.

3.1196 link. A channel or a point-to-point line. [IEEE Std 610.7-1995]

3.1197 link-attached terminal. A terminal that is connected to the computer by telecommunication lines or by a data link. *Contrast with:* channel-attached terminal.

3.1198 liquid crystal device (LCD). A display device in which light is directed through a liquid crystal, a device possessing many of the optical properties of solid crystals but one whose molecular order is not as firmly fixed. *Note:* The liquid crystal becomes opaque when it is energized by electrodes attached to its glass casing, enabling it to be employed in forming characters or graphic representations. *See also:* liquid crystal display.

3.1199 liquid crystal display (LCD). A display made of material whose reflectance or transmittance changes when an electric field is applied to it. *See also:* liquid crystal device.

3.1200 liquid crystal display device.* *See:* liquid crystal device.
* Deprecated.

3.1201 live keyboard. A keybord that lets users interact with the system while a program is running, allowing the examination or modification of program variables.

3.1202 load. (1) In computer operations, the amount of scheduled work to be performed on a computer system. *See also:* line load. [IEEE Std 610.7-1995] (2) To enter data or programs into storage or working registers. *See also:* mount.(3) In electronics, the amount of current drawn by a device. *Note:* This determines the "drive strength" of the circuit. *See also:* loading. [IEEE Std 610.7-1995]

3.1203 load point. The position on a magnetic tape that is indicated by the beginning-of-tape marker.

3.1204 load-store computer. *See:* reduced-instruction-set computer.

3.1205 loading. To add reactance in a circuit in order to minimize amplitude distortion. [IEEE Std 610.7-1995]

3.1206 local benchmark program. A benchmark program that is specific to a particular site, application or environment.

3.1207 local terminal. A terminal that is directly connected and relatively close to the computer with which it communicates. *Contrast with:* remote terminal.

3.1208 locally-attached terminal. *See:* channel-attached terminal.

3.1209 location. Any place in which data may be stored. *See also:* protected location; storage location.

3.1210 locator. An input device that can provide the coordinates of a cursor within some context or coordinate system. For example, a mouse, or a data tablet. *See also:* joystick; puck; track ball. [IEEE Std 610.6-1991]

3.1211 logger. (1) A functional unit that records events and physical conditions, usually with respect to time, along with the time of the occurrence. [ANSI X3.138-1988] (2) A device that enables a user to login to a computer system and to logout.

3.1212 logic. *See:* digital logic; diode-transistor logic; direct-coupled transistor logic; double-rail logic; emitter-coupled logic; glue logic; integrated injection logic.

3.1213 logic circuit. A circuit that is designed to perform one or more logic operations or to represent logic functions. *See also:* asynchronous circuit; combinational circuit; hard-wired logic; hazard-free logic; power-fail circuit; sequential circuit; voter.

3.1214 logic element. *See:* gate.

3.1215 logic gate. *See:* gate

3.1216 logic instruction. (1) An instruction in which the operation field specifies a logic operation; for example, a conditional branch instruction. *Contrast with:* arithmetic instruction. (2) An instruction that specifies an operation defined in symbolic logic, such as NOT, OR, AND.

3.1217 logic operation. An operation that follows the rules of symbolic logic. *Syn:* logical operation. [ANSI X3.138-1988]

3.1218 logic-seeking printer. A printer that is able to detect and skip over blank spaces, resulting in faster printing.

3.1219 logic unit. A part of a computer that performs logic operations and related operations. *See also:* arithmetic and logic unit. [ANSI X3.138-1988]

3.1220 logical add. *See:* disjunction.

3.1221 logical format. *See:* high-level format.

3.1222 logical operation. *See:* logic operation.

3.1223 logical product.* *See:* conjunction.
* Deprecated.

3.1224 logical sum. (1) The answer arrived at when adding two operands using the logical OR operation. For example: 0110 + 0101 = 0111 (all numbers binary). *Contrast with:* algebraic sum. (2)* *See:* disjunction.
* Deprecated.

3.1225 logical terminal. A terminal addressable by its logical function rather than its physical address.

3.1226 login. The process of establishing communication with and verifying the authority to use a network or computer. *Contrast with:* log off. *Syn:* logon; sign-on. *See also:* remote login. [IEEE Std 610.7-1995]

3.1227 logoff. The process of terminating communication with a network or computer. *Contrast with:* login. *Syn:* logout; sign-off. [IEEE Std 610.7-1995]

3.1228 logon. *See:* login. [IEEE Std 610.7-1995]

3.1229 logout. *See:* logoff. [IEEE Std 610.7-1995]

3.1230 long packet. A packet with a length of over 1518 bytes. *Syn:* over-sized packet. *Contrast with:* short packet. [IEEE Std 610.7-1995]

3.1231 longitudinal magnetic recording. A type of magnetic recording in which magnetic polarities representing data are aligned along the length of the recording track. *Contrast with:* perpendicular magnetic recording.

3.1232 low-level format. To format a blank storage medium in order to establish tracks and sectors on the medium. *Syn:* physical format. *Contrast with:* high-level format

3.1233 lower curtate. The adjacent card rows at the bottom of a punch card.

3.1234 LQ. Acronym for letter-quality.

3.1235 LSI. Acronym for large scale integration.

3.1236 machine. A generic term for a device such as a processor or computer.

3.1237 machine address. *See:* absolute address.

3.1238 machine code. Computer instructions and data definitions expressed in a form that can be recognized by the processing unit of a computer. *See also:* computer instruction code. [IEEE Std 610.12-1990]

3.1239 machine cycle. The time required for a processor to perform one internal operation, excluding those which may be accomplished in parallel. *Syn:* microcycle.

3.1240 machine instruction. An instruction in the machine language of a particular processing unit of a computer. *See also:* computer instruction; machine code.

3.1241 machine instruction set. *See:* computer instruction set.

3.1242 machine language. A programming language that is directly executed by the ALU portion of the processor in a computer. *Syn:* hardware language. [IEEE Std 610.12-1990a]

3.1243 machine operation. *See:* computer operation.

3.1244 machine-readable. (1) Pertaining to a medium that can record information and convey it to a machine or sensing device. *Syn:* machine-sensible. (2) Pertaining to information that can be read and processed by a machine.

3.1245 machine-readable medium. A data medium that can be used to convey data.

3.1246 machine-sensible. *See:* machine-readable.

3.1247 machine word. *See:* computer word.

3.1248 macroinstruction. A source code instruction that is replaced by a predefined sequence of source instructions, usually in the same language as the rest of the program and usually during assembly or compilation. [IEEE Std 610.12-1990]

3.1249 mag card. A colloquial reference to magnetic card.

3.1250 mag tape. A colloquial reference to magnetic tape.

3.1251 magnetic. Pertaining to any form of storage medium in which patterns of magnetization are used to store or represent information; for example, magnetic storage, or a magnetic delay line.

3.1252 magnetic bubble memory. *See:* bubble memory.

3.1253 magnetic card. A card with a magnetic surface that can be used for data storage.

3.1254 magnetic cell. A storage cell in which patterns of magnetization are used to represent information. *Syn:* static magnetic cell.

3.1255 magnetic character. A character that is formed on paper using a special magnetic ink.

3.1256 magnetic core. A tiny doughnut-shaped piece of magnetic material used for its non-linear properties to store data in main storage. *Syn:* memory core.

3.1257 magnetic delay line. A delay line whose operation is based on the time of propagation of magnetic waves.

3.1258 magnetic disk. A disk made of plastic or metal that is coated with a magnetizable surface on one or both sides, on which information can be stored. *See also:* diskette; floppy disk; hard disk; magneto-optical disk; platter. *Contrast with:* optical disk.

3.1259 magnetic disk drive. A disk drive that can access a magnetic disk.

3.1260 magnetic drum. A cylinder whose entire surface is coated with a magnetic material on which information can be stored in tracks running the circumference of the cylinder.

3.1261 magnetic head. A head that can read, write, or erase on a magnetic storage medium. *See also:* access arm; cylinder; erase head; fixed head; floating head.

3.1262 magnetic ink. Special ink that can be read by a magnetic scanner, such as is used on bank checks. *See also:* magnetic character.

3.1263 magnetic ink character reader (MICR). A character reader that recognizes characters using magnetic ink character recognition. *Contrast with:* optical character reader. *Note:* Terminology related to character recognition is defined in IEEE Std 610.2-1987.

3.1264 magnetic ink character recognition (MICR). The automatic recognition of magnetic ink characters. [IEEE Std 610.2-1987]

3.1265 magnetic ink scanner. A scanner that can read magnetic ink characters.

3.1266 magnetic recording. A method for storing data by selectively magnetizing portions of a magnetizable material. *See also:* longitudinal magnetic recording; non-return-to-reference recording; perpendicular magnetic recording; phase-modulation recording; return-to-reference recording.

3.1267 magnetic storage. Any storage medium that stores data using magnetic properties such as magnetic cores, disks, or tapes.
Contrast with: semiconductor storage.

3.1268 magnetic tape. A storage medium made of a flexible plastic ribbon that is coated with magnetic material (such as an iron oxide compound) on which information can be stored.

3.1269 magnetic tape cartridge. A cartridge holding magnetic tape, on which information can be stored.

3.1270 magnetic tape cassette. A cassette holding magnetic tape on which information can be stored. *See also:* magnetic tape cartridge; streaming tape cassette.

3.1271 magnetic tape drive. *See:* tape drive.

3.1272 magnetic tape reader. A reader capable of reading information on magnetic tape.

3.1273 magnetic tape storage. A type of sequential access storage in which information is stored by magnetic recording on the surface of a magnetic tape.

3.1274 magnetic thin film. A layer of magnetic material, usually less than one micron thick, applied to a carrier or base for use as storage cells.

3.1275 magnetic thin film storage. A type of magnetic storage in which information is stored by magnetic recording on a magnetic thin film.

3.1276 magneto-optical disk. A disk that uses optical methods, such as a laser, to record information on a magnetic storage medium. *Syn:* optically assisted magnetic storage. *See also:* magnetic disk; optical disk.

3.1277 magnetographic printer. A nonimpact printer that creates, by means of magnetic heads operating on a metallic drum, a latent image which is made visible by a toner and transferred and fixed on paper. [ANSI X3.138-1988]

3.1278 main console. *See:* master console.

3.1279 main control unit. In a processor with more than one instruction control unit, that unit to which, for a given interval of time, the other units are subordinated.

3.1280 main memory. *See:* main storage.

3.1281 main storage. That part of internal storage into which instructions and other data must be loaded for subsequent execution or processing. *Syn:* main memory; primary storage. *Contrast with:* auxiliary storage. *See also:* common storage; random-access memory; real storage.

3.1282 mainframe. The cabinet that houses the central processor and main storage of a computer system. *Note:* This term is sometimes used as an abbreviation for mainframe computer.

3.1283 mainframe computer (mainframe). A computer employing one or more mainframes. *Note:* The distinction between a microcomputer, minicomputer, and mainframe is not yet standardized, however, in 1991 a typical mainframe is IBM's 3090, a typical minicomputer is Digital's VAX, and a typical microcomputer is IBM's PS/2.

3.1284 maintenance panel. A part of a unit of equipment used to display information or provide access to test points for maintenance.

3.1285 majority circuit. A circuit with multiple inputs whose output is related to the state of the majority of its inputs. *Note:* Majority circuits are typically used in fault tolerant computers. *See also:* majority gate; voting computer.

3.1286 majority element. *See:* majority gate.

3.1287 majority gate. A gate that performs a majority operation. *Syn:* majority element.

3.1288 majority operation. A threshold operation in which each of the operands may take only the values 0 and 1; it takes the value 1 if an only if the number of operands having the value 1 is greater than the number of operands that have the value 0. *See also:* majority gate. [ANSI X3.138-1988]

3.1289 makeup time. That part of available time needed for reruns due to faults or mistakes in operations.

3.1290 many-to-one decoder. *See:* decoder.

3.1291 MAP. Acronym for memory allocation and protection.

3.1292 map. *See:* memory map.

3.1293 MAR. Acronym for memory address register.

3.1294 mark. A symbol or symbols that indicate the beginning or the end of a field, of a word, or of a data item in a file, record, or block. *Syn:* marker. *See also:* address mark; beginning-of-tape marker; end-of-tape marker; end mark; field mark; file mark; group mark; index mark; word mark.

3.1295 mark-sensing card. A card that can be marked with a special electrographic pencil, then read directly into a computer.

3.1296 marker. *See:* mark.

3.1297 mask. *See:* filter.

3.1298 mass storage. An area of storage, or a storage device, having a very large storage capacity. *Note:* Sometimes referred to as secondary storage in order to differentiate from main storage. *Syn:* bulk storage.

3.1299 master clock. A clock to which other clocks are synchronized.

3.1300 master console. In a computer system with more than one console, the primary console that is used to control the computer. *Syn:* main console. *Contrast with:* auxiliary console. *See also:* remote console.

3.1301 master terminal. A dedicated terminal that is reserved for the operator of the system or other authorized persons that are privileged to initiate conversations, and to control system-wide processes and operations. *Syn:* control terminal; operator console.

3.1302 matrix-addressed storage display device. A raster display device that does not require refresh. For example, a plasma panel.

3.1303 matrix printer. *See:* dot-matrix printer

3.1304 matrix storage. A type of storage whose elements are arranged in such a manner that access to any location requires the use of two or more coordinates; for example, cathode ray storage.

3.1305 MB. Abbreviation for megabyte.

3.1306 MDA. Acronym for mirrored disk array.

3.1307 MDR. Acronym for memory data register. *See:* memory buffer register.

3.1308 mean access time. The average access time identified with the normal operation of a device.

3.1309 mean time between failure (MTBF). For a stated period in the life of a device, the mean value of the lengths of time between consecutive failures under stated conditions. *Note:* Used to measure equipment reliability - the higher the MTBF, the more reliable the equipment.

3.1310 mean time to diagnosis (MTTD). The average length of time taken to isolate and diagnose the failure of a system or system component.

3.1311 mean time to fix (MTTF). *See:* mean time to repair.

3.1312 mean time to repair (MTTR). For a stated period in the life of a device, the average time required for corrective maintenance to be performed. *Note:* Used to measure the complexity and modularity of equipment—the higher the MTTR, the more complex the equipment. *Syn:* mean time to fix (MTTF)

3.1313 mechanical mouse. A mouse whose motion-sensing component is mechanical in nature such as a control ball or a pair of wheels. *Contrast with:* optical mouse.

3.1314 media. **(1)** A means of communication. *See also:* hypermedia. **(2)** Material on which information can be stored or transported. *See also:* input media; output media. *Note:* Media is the plural form of medium.

3.1315 medium. The singular form of the term media.

3.1316 medium-grain parallel architecture. Parallel architecture that uses between 32 and 1024 processors. *Contrast with:* coarse-grain parallel architecture; fine-grain parallel architecture.

3.1317 medium scale integration (MSI). **(1)** Pertaining to an integrated circuit containing between 100 and 500 transistors in its design. *Contrast with:* large scale integration; small scale integration; ultra large scale integration; very large scale integration. **(2)** Pertaining to an integrated circuit containing between 10 and 100 elements.

3.1318 meg. Colloquial reference for megabyte.

3.1319 megabyte (meg, MB). This term may mean either a) 1 000 000 bytes or b) 2^{20} bytes. *See also:* gigabyte; kilobyte.

Notes
1—The user of these terms shall specify the applicable usage. If the usage is 2^{10} or 1024 bytes, or multiples thereof, then note 2 below shall also be included with the definition.

2—As used in this document, the terms kilobyte (kB) means 2^{10} or 1024 bytes, megabyte (MB) means 1024 kilobytes, and gigabyte (GB) means 1024 megabytes.

3.1320 megacycle. One million cycles.

3.1321 membrane keyboard. A type of keyboard in which the keys are not raised, rather it is composed of a semi-flexible plastic sheet with a conductive surface below. *Syn:* pressure-sensitive keyboard.

3.1322 memory. All of the addressable storage in a processing unit and other internal storage that is used to execute instructions. *See also:* main storage.

3.1323 memory address. An address of a particular storage location in memory.

3.1324 memory address register (MAR). A register containing the address of the memory location to be accessed.

3.1325 memory allocation and protection (MAP). (1) To allocate physical sections of memory into logical partitions with read/write protection provided within each partition. **(2)** Pertaining to the hardware components that perform the allocation as in (1).

3.1326 memory array. A matrix of memory locations arranged in a rectangular geometric pattern on an integrated circuit.

3.1327 memory bank. (1) *See:* bank. **(2)*** *See:* main memory.
* Deprecated.

3.1328 memory board. A circuit board that provides random-access memory to a system.

3.1329 memory buffer register. A register in which a word is stored as it is read from memory or as it is written to memory. *Syn:* memory data register.

3.1330 memory bus. A bus connecting memory to the devices which can access it, including the processor and peripheral devices.

3.1331 memory core. *See:* magnetic core.

3.1332 memory cycle. A single complete access (read or write) of memory.

3.1333 memory data register (MDR). *See:* memory buffer register.

3.1334 memory map. A list of all the current addresses in a computer. *Note:* This may indicate what is currently allocated, who is using it and where it is located. *Syn:* memory map list.

3.1335 memory map list. *See:* memory map.

3.1336 memory mapping. (1) The manner in which an address is translated into a physical address of a storage location. *See also:* biasing; paging; segmenting. **(2)** The process of translating addresses as in (1).

3.1337 mercury storage. A type of storage that utilizes the acoustic wave propagation properties of mercury to store data. *See also:* acoustic delay line.

3.1338 metal-oxide semiconductor (MOS). A semiconductor technology using field-effect transistors in which the metal gate electrode is isolated from the channel by an oxide film. *Contrast with:* bipolar. *See also:* complementary MOS.

3.1339 MICR. (1) Acronym for magnetic ink character recognition. **(2)** Acronym for magnetic ink character reader.

3.1340 micro. Abbreviation for microcomputer.

3.1341 microarchitecture. The architecture of a microprogrammed computer. [IEEE Std 610.12-1990a]

3.1342 microcircuit. *See:* integrated circuit.

3.1343 microcode. A collection of microinstructions comprising part of, or all of a microprogram. [IEEE Std 610.12-1990a]

3.1344 microcomputer (micro). A computer that contains at least one microprocessor as its main computing element. *Note:* The distinction between a microcomputer, minicomputer, and mainframe is not yet standardized, however, in 1991 a typical mainframe is IBM's 3090, a typical minicomputer is Digital's VAX, and a typical microcomputer is IBM's PS/2.

3.1345 microcycle. *See:* machine cycle.

3.1346 microfilm. (1) A high resolution film for recording microimages. [IEEE Std 610.2-1987] **(2)** To record microimages on film. *Syn:* computer output microfilm. [IEEE Std 610.2-1987]

3.1347 microfloppy disk. A floppy disk that is 3.5 inches wide. *Contrast with:* minifloppy disk.

3.1348 microimage. An image that is too small to be read by the human eye without magnification. [IEEE Std 610.2-1987]

3.1349 microinstruction. In microprogramming, an instruction that specifies one or more of the basic operations needed to carry out a machine language instruction. Types include diagonal microinstruction, horizontal microinstruction, and vertical microinstruction. *See also:* microcode; microprogram; nanoinstruction. [IEEE Std 610.12-1990]

3.1350 microprocessor. An integrated circuit that contains the logic elements for manipulating data and for making decisions. *See also:* microcomputer; processor.

3.1351 microprogram. A sequence of instructions, called microinstructions, specifying the basic operations needed to carry out a machine language instruction. *See also:* control store; microcode. [IEEE Std 610.12-1990]

3.1352 microprogrammable computer. A microprogrammed computer in which microprograms can be created or altered by the user. *Contrast with:* fixed-instruction computer. [IEEE Std 610.12-1990]

3.1353 microprogrammed computer. A computer in which machine language instructions are implemented by microprograms rather than hard-wired logic. *See also:* microarchitecture; microprogrammable computer. [IEEE Std 610.12-1990a]

3.1354 microprogramming. The process of designing and implementing the control logic of a computer by identifying the basic operations needed to carry out each machine language instruction and then representing these operations in appropriate sequence in a special memory, called a control store. [IEEE Std 610.12-1990a]

3.1355 microword. An addressable element in the control store of a microprogrammed computer. [IEEE Std 610.12-1990]

3.1356 midrange computer. *See:* minicomputer.

3.1357 MIMD. Acronym for multiple instruction, multiple data.

3.1358 mini. Abbreviation for minicomputer.

3.1359 minicartridge. *See:* quarter-inch cartridge.

3.1360 minicomputer (mini). A computer of smaller size relative to a mainframe, but generally larger and more powerful than a microcomputer. *Note:* The distinction between a microcomputer, minicomputer, and mainframe is not yet standardized, however, in 1991 a typical mainframe is IBM's 3090, a typical minicomputer is Digital's VAX, and a typical microcomputer is IBM's PS/2. *Syn:* midrange computer.

3.1361 minifloppy disk. A floppy disk that is 5.25 inches wide. *Contrast with:* microfloppy disk.

3.1362 mirrored disk array (MDA). A form of RAID storage, known as level 1, in which each block of data is duplicated on a mirror drive.

3.1363 mirroring. *See:* double storage.

3.1364 miscellaneous time. The part of up time that is not rerun time, system production time, or system test time, but is time typically used for demonstrations or operator training. *Syn:* incidental time.

3.1365 MISD. Acronym for multiple instruction, single data.

3.1366 module. A packaged functional hardware unit designed for use with other components. [ANSI X3.138-1988]

3.1367 modulo-n counter. A counter in which the state represented reverts to zero after reaching a maximum value of n-1.

3.1368 monitor. **(1)** A device that observes and records selected activities with a computer system for analysis. **(2)** A software tool or hardware device that operates concurrently with a system or component and supervises, records, analyzes, or verifies the operation of the system or component. [IEEE Std 610.12-1990] **(3)** A generic term refering to any kind of display device.

3.1369 monochrome display device. A display device that can display only one color, or shades of that color, in addition to the background color. *Contrast with:* color display device. *See also:* gray scale display device. [IEEE Std 610.6-1991a]

3.1370 monolithic integrated circuit. An integrated circuit formed in a single piece of the substrate material. *Contrast with:* hybrid circuit.

3.1371 monoprocessor architecture. *See:* single processor architecture.

3.1372 monostable. Pertaining to a circuit or device that is capable of assuming one of two states, one of which is stable. *Syn:* one-shot. *See also:* bistable; monostable circuit.

3.1373 monostable circuit. A trigger circuit that has one stable and one quasistable state.

3.1374 MOS. Acronym for metal-oxide semiconductor.

3.1375 motherboard. **(1)** The main circuit board within a computer, bearing the primary components of a computer system, including the processor, main storage, support circuitry, bus controller and bus connector. *See also:* backplane; daughter board. **(2)** A standard size printed circuit board to which are attached one or more

daughterboards that add functionality and provide a selection of interface buffering.

3.1376 mount. (1) To place a data medium in a position and condition so that it can be accessed; for example, to mount a magnetic tape on a tape drive and connect the tape drive to an application. (2) To insert a removable storage medium into place so that it can be accessed.

3.1377 mouse. A cursor control device used as a locator, consisting of a hand-held control box with some sort of motion-sensing component such that the position or movement of the mouse on a surface controls the motion of a cursor on a display device. *Note:* A mouse usually includes one or more buttons which provide additional input information. *See also:* bus mouse; mechanical mouse; optical mouse; puck; serial mouse; shaft recorder; track ball. [IEEE Std 610.6-1991a]

3.1378 mouse port. A port used to interface with a mouse.

3.1379 moveable head. *See:* floating head.

3.1380 MSI. Acronym for medium scale integration.

3.1381 MTBF. Acronym for mean time between failure.

3.1382 MTTD. Acronym for mean time to diagnose.

3.1383 MTTF. Acronym for mean time to fix. *See:* mean time to repair.

3.1384 MTTR. Acronym for mean time to repair.

3.1385 multiaddress format. An address format that contains more than one address field; for example, a three-address instruction.

3.1386 multiaddress instruction. A computer instruction that contains more than one address. *Syn:* multiple address instruction; multiple instruction. [IEEE Std 610.12-1990]

3.1387 multiaperture core. A magnetic core, usually used for non-destructive reading, with two or more holes through which wires may be passed in order to create more than one magnetic path. *Syn:* multiple aperture core.

3.1388 multicomputer.* *See:* multiprocessor.
* Deprecated.

3.1389 multilayer. Pertaining to a printed circuit board with several layers of printed circuit etched or patterned, one over the other and interconnected by electroplated holes which can also receive component leads.

3.1390 multilevel address. *See:* indirect address.

3.1391 multimedia. A form of hypermedia consisting of a combination of two or more forms of the following: text, audio, graphics, animation, and full-motion video.

3.1392 multiple address instruction. *See:* multiaddress instruction.

3.1393 multiple aperture core. *See:* multiaperture core.

3.1394 multiple data stream. *See:* multiple instruction, multiple data; multiple instruction, single data.

3.1395 multiple instruction. *See:* multiaddress instruction.

3.1396 multiple instruction, multiple data (MIMD). Pertaining to a computer architecture in which the processors receive both instructions and data from separate sources. *See also:* multiple instruction, single data; single instruction, multiple data.

3.1397 multiple instruction, single data (MISD). Pertaining to a computer architecture in which all processors receive instructions from separate (multiple) sources but receive data from a single (common) source. *See also:* multiple instruction, multiple data; single instruction, single data.

3.1398 multiple punching. Punching more than one hole in the same card column by several keystrokes, usually in order to extend the character set of the keypunch. [ANSI X3.138-1988]

3.1399 multiplex. To interleave or simultaneously transmit two or more messages on a signal channel. [ANSI X3.138-1988]

3.1400 multiplication time. *See:* multiply time.

3.1401 multiplier. A device capable of multiplying one variable by another. *See also:* analog multiplier; four-quadrant multiplier; one-quadrant multiplier; two-quadrant multiplier. *Contrast with:* divider.

3.1402 multiplier servo. In an analog computer, an electromechanical multiplier in which one variable is

used to position one or more ganged potentiometers across which the other variable voltages are applied.

3.1403 multiply time. The elapsed time required to perform one multiplication operation, not including the time required to obtain the operands or to return the result to storage. *Contrast with:* add time; subtract time. *Syn:* multiplication time.

3.1404 multiplying punch. *See:* calculating punch.

3.1405 multiport memory. A type of memory that can be simultaneously read or written to by two or more devices through the use of separate address and data buses.

3.1406 multiprocessing. A mode of operation in which two or more processes are executed concurrently by separate processing units. [IEEE Std 610.12-1990a]

3.1407 multiprocessor. **(1)** A computer or network of computers that can execute two or more programs concurrently under integrated control. **(2)** A computer that has more than one processor. *Contrast with:* uniprocessor.

3.1408 multiprocessor architecture. An architecture employing two or more stand-alone processors whose activities are coordinated under a central control. *Contrast with:* single processor architecture.

3.1409 multirange amplifier. An amplifier that has a switchable, programmable, or automatically set amplification factor in order to adapt different analog signal ranges to a specified output range. [ANSI X3.138-1988]

3.1410 multistream computer. A computer that is capable of executing multiple streams of instructions simultaneously. *See also:* multiple instruction, multiple data; multiple instruction, single data.

3.1411 multitasking. A mode of operation that provides for concurrent performance or interleaved execution of two or more tasks. [ANSI X3.138-1988]

3.1412 MUX. *See:* multiplexer.

3.1413 n-address instruction format. An instruction format that specifies n address fields, referencing n storage locations. For example, a "three-address instruction" contains three addresses.

3.1414 n-bit byte. A string that consists of n bits; for example, an octet is an eight-bit byte.

3.1415 n-channel metal-oxide semiconductor (NMOS). A type of semiconductor technology which employs a metal-oxide semiconductor device, using electrons to conduct current in the semiconductor channel. *Note:* The channel has a predominantly negative charge. *Contrast with:* p-channel metal-oxide semiconductor. *See also:* complementary metal-oxide semiconductor; V-channel metal-oxide semiconductor. *Syn:* high-speed metal-oxide semiconductor.

3.1416 n-core-per-bit storage. A type of storage in which each storage cell uses n magnetic cores per binary character, where n may be any positive integer. *See also:* one-core-per-bit storage.

3.1417 n-level address. In indirect addressing, the nth address sought in the attempt to arrive at the location of the operand; for example, a third-level address represents the address of the address of the address of the operand. *Note:* A zero-level address is the same as an immediate address; a one-level address is a direct address; and a two-level address is an indirect address.

3.1418 N/M register set. A generic term to indicate the microprocessor registers that deal with the retention of high and low memory addresses. *Note:* Usually used in scalable RISC computer discussions. *See also:* register set.

3.1419 n-plus-one address instruction format. An n-address instruction format that also specifies the next instruction to be executed. *See also:* address format.

3.1420 n-tuple length register. A set of n registers that function as a single register. *Syn:* n-tuple register.

3.1421 n-tuple register. *See:* n-tuple length register.

3.1422 NAND element. *See:* NAND gate.

3.1423 NAND gate. A gate that performs the Boolean operation of nonconjunction. *Syn:* IF-A-THEN-NOT-B gate; NAND element. *Note:* NAND is synonymous with NOT-AND.

3.1424 nanocode. A collection of nanoinstructions. *Syn:* nanoprogram. [IEEE Std 610.12-1990]

3.1425 nanoinstruction. In a two-level implementation of multiprogramming, an instruction that specifies one or more of the basic operations needed to carry out a microinstruction. [IEEE Std 610.12-1990]

3.1426 nanoprogram. *See:* nanocode.

3.1427 National Television Standards Committee (NTSC). A standards-setting body for the television and video industries in the United States.

3.1428 NDR. Acronym for nondestructive read.

3.1429 near-letter quality (NLQ). Pertaining to printed output that is of nearly as high quality as that of a standard typewriter. *Contrast with:* letter-quality; draft-quality.

3.1430 needle. *See:* print wire.

3.1431 negation. The monadic Boolean operation whose result has a Boolean value opposite to that of the operand. *See also:* NOT gate. [ANSI X3.138-1988]

3.1432 negative. Pertaining to a voltage or charge that is associated with an excess of electrons. *Contrast with:* positive.

3.1433 NEITHER-NOR operation. *See:* nondisjunction.

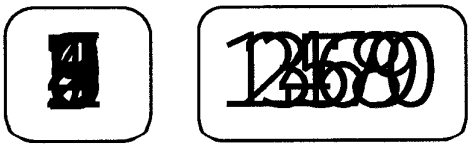
3.1434 net. **(1)** One complete circuit connecting at least one output to at least one input. *Note:* Must be some form of conductor such as a wire or a printed circuit trace. [IEEE Std 610.7-1995] **(2)** Abbreviation for network. [IEEE Std 610.7-1995]

3.1435 network (net). **(1)** An arrangement of components, or nodes, and interconnecting branches. [IEEE Std 610.7-1995] **(2)** *See:* circuit. [IEEE Std 610.7-1995]

3.1436 network architecture. *See:* computer network architecture. *Note:* Networking terminology is defined in IEEE Std 610.7-1995.

3.1437 nibble. Slang term for half a byte; or the first four or last four bits of an octet. *See also:* quartet. *Syn:* nybble.

3.1438 Nixie tube display device. A display device that employs a gas-filled digital indicator tube containing stacked metallic elements which, when energized, emit a glow in the shape of a number.



front view **side view**

Figure 9—Nixie tube display device

3.1439 NLQ. Acronym for near-letter quality.

3.1440 NMOS. Acronym for n-channel metal-oxide semiconductor.

3.1441 no-address instruction. *See:* zero-address instruction.

3.1442 no-op instruction. *See:* dummy instruction.

3.1443 node. Within a circuit, a point of interconnection between two or more components such as input and output terminals.

3.1444 noise immunity. The ability of a circuit to perform its function in the presence of noise.

3.1445 non-bus-based architecture. A computer architecture that is not designed on a bus connection; for example, a crosspoint switch. *Contrast with:* bus-based architecture.

3.1446 non-interlaced. Pertaining to a display device in which every line of pixels is refreshed on each pass. *Contrast with:* interlaced.

3.1447 non-polarized return-to-zero recording (RZ(NP)). Return-to-reference recording in which zeros are represented by the absence of magnetization, ones are represented by a specified condition of magnetization, and the reference condition is zero magnetization. The specified condition is usually saturation. Conversely, the absence of magnetization can be used to represent ones, and the magnetized condition to represent zeros. *Syn:* dipole modulation. *Contrast with:* polarized return-to-zero recording. [ANSI X3.138-1988]

3.1448 non-return-to-reference recording. The magnetic recording of binary characters such that patterns of magnetization used to represent zeros and ones occupy the whole storage cell, with no part of the cell magnetized to a reference condition. *Contrast with:* return-to-reference recording. *See also:* non-return-to-zero (change) recording; non-return-to-zero change-on-ones recording; non-return-to-zero recording. [ANSI X3.138-1988]

3.1449 non-return-to-zero (change) recording (NRZ(C)). Non-return-to-reference recording in which zeros are represented by magnetization to a specified condition, and ones are represented by magnetization to a specified alternative condition. The two conditions may be saturation and zero magnetization but are more

commonly saturation in opposite senses. This method is called "change recording" because the recorded magnetic condition is changed when, and only when, the recorded binary character changes from zero to one or from one to zero. [ANSI X3.138-1988]

3.1450 non-return-to-zero change-on-ones recording (NRZ-1). Non-return-to-reference recording in which the ones are represented by a change in the condition of a magnetization, and zeros are represented by the absence of change. This method is called "(mark) recording" because only the one or mark signals are explicitly recorded. *Syn:* non-return-to-zero (mark) recording. [ANSI X3.138-1988]

3.1451 non-return-to-zero (inverted) recording (NRZI).* *See:* non-return-to-zero change-on-ones recording.
* Deprecated.

3.1452 non-return-to-zero (mark) recording (NRZ(M)). *See:* non-return-to-zero change-on-ones recording.

3.1453 non-return-to-zero recording (NRZ). Non-return-to-reference recording in which the reference condition is zero magnetization. [ANSI X3.138-1988]

3.1454 nonconjunction. The dyadic Boolean operation whose result has the Boolean value 0 if and only if each operand has the Boolean value 1. *See also:* NAND gate. *Syn:* NOT-BOTH operation. *Contrast with:* conjunction. [ANSI X3.138-1988]

3.1455 nondestructive read (NDR). A read operation that does not erase the data in the source location. *See also:* multiaperture core. *Contrast with:* destructive read. [ANSI X3.138-1988]

3.1456 nondisjunction. The dyadic Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 0. *Syn:* NEITHER-NOR operation. *See also:* NOR gate. *Contrast with:* disjunction. [ANSI X3.138-1988]

3.1457 nonequivalence. The dyadic Boolean operation whose result has the Boolean value 1 if and only if the operands have different Boolean values. *See also:* nonidentity. *Contrast with:* equivalence. *See also:* exclusive-OR gate.

3.1458 nonerasable storage. **(1)** *See:* permanent storage. **(2)** *See:* read-only storage.

3.1459 nonidentity. The Boolean operation whose result has the Boolean value 1 if and only if all the operands do not have the same Boolean value. *Note:* A nonidentity operation on two operands is a nonequivalence operation. *Contrast with:* identity.

3.1460 nonimpact printer. A printer in which printing is not the result of a mechanical contact with the printing medium. *Contrast with:* impact printer. *See also:* electrosensitive printer; electrostatic printer; ink jet printer; magnetographic printer; thermal printer; xerographic printer.

3.1461 nonisolated amplifier. An amplifier that has an electrical connection between the signal circuit and another circuit including ground. [ANSI X3.138-1988]

3.1462 nonremovable disk. *See:* fixed disk.

3.1463 nonsequential computer. A computer that must be directed to the location of each instruction. *See also:* arbitrary sequence computer.

3.1464 nonvolatile memory. *See:* nonvolatile storage.

3.1465 nonvolatile storage. A type of storage whose contents are not lost when power is lost. *See also:* bubble memory; erasable storage. *Contrast with:* volatile storage.

3.1466 NOR element. *See:* NOR gate.

3.1467 NOR gate. A gate that performs the Boolean operation of nondisjunction. *Note:* NOR is synonymous with NOT-OR. *Syn:* inclusive NOR gate; NOR element. *See also:* OR gate.

3.1468 NOT AND gate. *See:* NAND gate.

3.1469 NOT element. *See:* NOT gate.

3.1470 NOT gate. A combinational circuit that performs the Boolean operation of negation. *Syn:* NOT element.

3.1471 NOT-IF-THEN element. *See:* NOT-IF-THEN gate.

3.1472 NOT-IF-THEN gate. A gate that performs the Boolean operation of exclusion. *Syn:* NOT-IF-THEN element.

3.1473 NOT OR gate. *See:* NOR gate.

3.1474 notebook computer. A portable computer that is approximately the size of a standard 3-ring notebook binder; about 10 in × 11 in × 2 in.

3.1475 NRZ. Acronym for non-return-to-zero recording.

3.1476 NRZ-1. Acronym for: non-return-to-zero change-on-ones recording.

3.1477 NRZ(C). Acronym for non-return-to-zero (change) recording.

3.1478 NRZ(M). Acronym for non-return-to-zero (mark) recording.

3.1479 NRZI.* Acronym for non-return-to-zero (inverted) recording. *See:* non-return-to-zero change-on-ones recording.
* Deprecated.

3.1480 NTSC. Acronym for National Television System Committee.

3.1481 nucleus. That part of a control program that is resident in main storage. *Syn:* resident control program. [ANSI X3.138-1988]

3.1482 numeric keypad. A keypad comprising of the numeric keys and usually the dot, comma and return keys. *Note:* It is most often located near the full keyboard, the keys being arranged in a 3×4 or 4×4 array to facilitate numeric data entry.

3.1483 numeric keypunch. A keypunch that processes only numeric data.

3.1484 numeric optical disk. *See:* optical disk.

3.1485 numeric punch. A hole punched in one of the punch rows designated as zero through nine. *See also:* digit punch.

3.1486 numerical control machine. A machine that produces drilled, milled, and machined parts under automatic control. *Syn:* numerical control tool. [IEEE Std 610.12-1990a]

3.1487 numerical control tool. *See:* numerical control machine. [IEEE Std 610.2-1987]

3.1488 nybble. *See:* nibble.

3.1489 octet. A byte composed of eight bits. *Syn:* eight-bit byte. *See also:* nibble.

3.1490 OEM. Acronym for original equipment manufacturer.

3.1491 off-line. Pertaining to a device or process that is not under the direct control of the central processing unit of a computer. *See also:* vary off-line. *Contrast with:* on-line. [IEEE Std 610.12-1990]

3.1492 off-line storage. Storage that is not under the control of a processing unit. *Contrast with:* on-line storage.

3.1493 offset. **(1)** The measure of unbalance between halves of a symmetrical circuit. **(2)** The change in input voltage needed to cause the output voltage of a linear amplifier to be zero. **(3)** The difference between the value or condition desired and that actually attained. **(4)** The difference between the address in a base register and the memory location of a datum. *See also:* relative address.

3.1494 on-chip interface. An interface through which the computer communicates with outside devices and circuits.

3.1495 on-line. Pertaining to a device or process that is under the direct control of the control processing unit of a computer. *Contrast with:* off-line. *See also:* vary on-line.

3.1496 on-line font. A font that may be reviewed and accessed automatically by a printer. *See also:* internal font; printer font. *Contrast with:* downloadable font.

3.1497 on-line storage. Storage under control of a processing unit. *Contrast with:* off-line storage.

3.1498 on-the-fly printer. An impact printer whose type slugs do not stop moving during the impression time. [ANSI X3.138-1988]

3.1499 one-address instruction. An instruction containing one address. *See also:* address format. *Syn:* single-address instruction; single-operand instruction.

3.1500 one-core-per-bit storage. A type of storage in which each storage cell uses one magnetic core per binary character.

3.1501 one-level address. *See:* direct address; n-level address.

3.1502 one-plus-one address format. *See:* address format.

3.1503 one-quadrant multiplier. A multiplier in which the multiplication operation is restricted to input variables of the same sign. *Contrast with:* four-quadrant multiplier; two-quadrant multiplier.

3.1504 one-shot. *See:* monostable.

3.1505 open architecture. An architecture for which design parameters and specifications are made available to any and all vendors or manufacturing firms, thus encouraging development of compatible products and enhancements. *Contrast with:* closed architecture.

3.1506 operable time. *See:* up time.

3.1507 operand. An entity on which an operation is performed.

3.1508 operand field. A field within a computer instruction that specifies an operand needed by the instruction. *See also:* address field; operation field.

3.1509 operand handler. In a pipelined machine, the portion of the computer that fetches data from memory and stores results in memory. *Note:* It receives its instructions from the instruction decoder, and passes operands to or from the execution unit.

3.1510 operate. In an analog computer, the computer-control state in which input signals are connected to all appropriate computing elements, including integrators, for the generation of the solution.

3.1511 operating time. The part of up time during which a functional unit is performing useful operations. *See also:* miscellaneous time; rerun time. *Contrast with:* idle time.

3.1512 operation. A program step executed by a computer. *See:* computer operation; logic operation.

3.1513 operation decoder. A device that selects one or more control channels according to the operation field of a machine instruction.

3.1514 operation field. The field of a computer instruction that specifies the function to be performed. *Syn:* function field; operation part. *See also:* address field; operand field. [IEEE Std 610.12-1990]

3.1515 operation part. *See:* operation field.

3.1516 operation table. A table that defines an operation by listing all appropriate combinations of values of the operands and indicates the result for each combination. *See also:* truth table.

3.1517 operational amplifier. A two-input amplifier designed to perform control or mathematical operations by means of an external feedback circuit connecting the output to one input, and very high gain for voltage differences of either polarity at the inputs. *Note:* Operational amplifiers are used in analog computers to provide mathematical operations such as summing and integration. *See also:* integrating amplifier; summing amplifier.

3.1518 operational relay. A relay that may be driven from one position or state to another by an operational amplifier or a relay amplifier.

3.1519 operator. **(1)** In symbol manipulation, a symbol that represents the action to be performed in an operation. [ANSI X3.138-1988] **(2)** A person who operates a machine. [ANSI X3.138-1988]

3.1520 operator console. *See:* master terminal. *See also:* operator control panel.

3.1521 operator control panel. A functional unit that allows an operator to control a computer system.

3.1522 optical character reader. A character reader that recognizes characters by transmitting light onto a surface and interpreting its reflections. *See also:* optical scanner; page reader. *Contrast with:* magnetic ink character reader.

3.1523 optical computer. A computer in which light and optics replace some or all of the traditional wires and electronic circuits.

3.1524 optical disk. A disk on which information is stored and retrieved by optical means, using a laser. *See also:* compact disc; laser disk; magneto-optical disk; video disk. *Syn:* digital optical disk; numeric optical disk. *Contrast with:* magnetic disk.

3.1525 optical font. A font that can be input by a special input device and translated into electronic form.

3.1526 optical mark reader. A reader that can perform mark sensing of hand-written pencil marks, and preprinted marks by detecting the presence or absence of reflected light.

3.1527 optical mouse. A mouse in which motion is sensed by transmitting light onto a special surface and

interpreting its reflections using an optical sensor. *Contrast with:* mechanical mouse.

3.1528 optical printer. *See:* electrostatic printer.

3.1529 optical reader. *See:* optical character reader; optical mark reader; optical scanner.

3.1530 optical recording. A method for storing data by using optical means.

3.1531 optical scanner. **(1)** A scanner that uses light for examining patterns. *See also:* bar-code scanner; optical character reader. **(2)** A device that scans optically and generates a corresponding output signal. **(3)** *See:* digitizer.

3.1532 optical sensor. A device capable of detecting light and producing an analog or digital output signal. *See also:* optical mouse.

3.1533 optical storage. Storage of information in which access to that information is obtained using optical signals. *See:* CD-ROM storage. *Syn:* photo-optic storage.

3.1534 optical wand. *See:* light pen.

3.1535 optically assisted magnetic storage. *See:* magneto-optical storage.

3.1536 optional-pause instruction. A pause instruction that allows manual suspension of a computer program. *Syn:* optional stop instruction.

3.1537 optional stop instruction. *See:* optional-pause instruction.

3.1538 OR element. *See:* OR gate.

3.1539 OR gate. A gate that performs the Boolean operation of disjunction. *Syn:* inclusive OR gate; OR element. *See also:* exclusive OR gate; NOR gate.

3.1540 OR-parallelism. Pertaining to the performance of multiple predicate operations concurrently, the successful completion of any results in a true response. *Note:* Successful termination of one predicate operation may cause the others to be immediately terminated. *See also:* OR-tying. *Contrast with:* AND-parallelism.

3.1541 OR-tying. The process of connecting together two or more logic gate outputs such that the common output is forced to ground when any of the individual gate outputs is low. *See also:* OR-parallelism.

3.1542 original equipment manufacturer (OEM). The manufacturer of a component in a computer system such that the component is used in assembling a larger system or component by another manufacturer. Many peripheral devices are made by an OEM but sold as part of a complete computer system by another vendor.

3.1543 oscillating scan head. A scan head that physically moves back and forth across the original page as it scans each line.

3.1544 oscillator. A circuit that continuously alternates between two or more states.

3.1545 outline font. A font defined in terms of mathematical curves that specify the visual representation of each character. *Note:* An outline font has no predetermined size, but rather is scaled to the desired size as needed. *Contrast with:* bit map font; vector font.

3.1546 output. **(1)** Pertaining to data transmitted to an external destination. [IEEE Std 610.12-1990] **(2)** Pertaining to a device, process, or channel involved in transmitting data to an external destination. [IEEE Std 610.12-1990] **(3)** To transmit data to an external destination. [IEEE Std 610.12-1990]

3.1547 output area. An area of storage reserved for output data.

3.1548 output buffer. *See:* buffer.

3.1549 output channel. A channel for transferring data from a device or logic gate to an external component. *See also:* input channel; input-output channel.

3.1550 output device. A device in a computer system used for presenting information to the user. *Note:* Common output devices include printers, display devices and plotters. *Syn:* output unit. *Contrast with:* input device. *See also:* input-output device.

3.1551 output hold time. *See:* hold time.

3.1552 output impedance. The electrical impedance at an output terminal of a circuit or device, as it appears to the circuit that uses the output signal.

3.1553 output media. Media that are generated as output; for example, paper reports, or magnetic tapes. *Contrast with:* input media.

3.1554 output terminal. **(1)** A terminal used to display or generate output. **(2)** A point in a system or communi-

cation network at which data can leave the system. *Contrast with:* input terminal.

3.1555 output unit. *See:* output device.

3.1556 over-sized packet. *See:* long packet.

3.1557 overlapped execution. A mode of operation in which the execution of one instruction overlaps the fetch and decode of the next to be executed. *See also:* pipelining.

3.1558 overlapping register set. A set of registers, only part of which is available to an application at any given time. *Note:* A subset of the available registers is shared with the calling routine and a subset may be shared with any routines called by the current routine.

3.1559 overload. A condition existing in an analog computer, within or at the output of a computing element, that causes a substantial computing error because of the voltage or current saturation of one or more of the parts of the computing element. *Note:* This condition is similar to an overflow of an accumulator in a digital computer.

3.1560 overpunch. To punch holes into a column of a punch card that already contains one or more holes. *Note:* Often used to represent special characters.

3.1561 p-channel metal-oxide semiconductor (PMOS). A type of semiconductor technology which employs metal oxide field effect transistors, using holes to conduct current in the semiconductor channel. *Note:* The channel has a predominantly positive charge. *Contrast with:* n-channel metal-oxide semiconductor. *See also:* complementary metal-oxide semiconductor.

3.1562 P register. A special-purpose instruction address register that holds the address of the next instruction to be fetched or executed.

3.1563 pack. *See:* disk pack.

3.1564 package. An external container, substrate, or platform used to hold a semiconductor or circuit. *Note:* it may be made of plastic or ceramic with many interfacing pins.

3.1565 packaging. The process of containing, connecting, protecting, and sealing circuits and components into enclosures such as devices, modules, or housings.

3.1566 packet. A unit of data of some finite-size that is transmitted as a unit. *Note:* Usually consists of a header containing control information such as a sequence number, the network address of the station that originated the packet, and the network address of the packet's destination. *See also:* long packet, short packet. [IEEE Std 610.7-1995]

3.1567 packing density. *See:* recording density.

3.1568 paddle. A cursor control device consisting of a rotatable knob and potentiometer used to control the position of a cursor on a display device.

3.1569 page. **(1)** In virtual storage, a fixed length block of instructions or data that has a virtual address and that is transferred as a unit between real storage and auxiliary storage. *See also:* segment. **(2)** To transfer data between real and auxiliary storage as in (1).

3.1570 page fault. In demand paging, a condition that causes a program interrupt when a page must be read in from disk into main storage.

3.1571 page frame. **(1)** In real storage, a storage location that has the size of a page. [ANSI X3.138-1988] **(2)** An area of main storage used to hold a page. [ANSI X3.138-1988]

3.1572 page orientation. The direction of print on a display device or page of paper; that is, left-to-right or top-to-bottom. *See also:* landscape orientation; portrait orientation.

3.1573 page printer. A printer that prints one complete page of output at a time. For example, a computer-output microfilm printer or a laser printer. *Contrast with:* character-at-a-time printer; line printer.

3.1574 page reader. A character reader whose input data are in the form of printed text. *See also:* optical character reader.

3.1575 page swapping. The process of exchanging pages between main storage and auxiliary storage.

3.1576 page turning. *See:* paging.

3.1577 paging. **(1)** A storage allocation technique in which programs or data are divided into fixed-length blocks called pages, main storage is divided into blocks of the same length called page frames, and pages are stored in page frames, not necessarily contiguously or in logical order. *See also:* segment. [IEEE Std 610.12-

1990a] (2) The transfer of pages between main and auxiliary memory, as in (1). *Syn:* page turning. [IEEE Std 610.12-1990a]

3.1578 paging device. An auxiliary storage device used primarily to hold pages. [ANSI X3.138-1988]

3.1579 paging rate. In a virtual memory system, the rate at which pages are being transferred between real storage and auxiliary storage.

3.1580 PAL. Acronym for programmable array logic.

3.1581 pane. A component of a window.

3.1582 panel. (1) A distinct portion of an equipment's surface, usually defined by or contained within a frame or border; for example, a maintenance panel or an operator control panel. (2) *See also:* control panel; display panel; plasma panel.

3.1583 panel interface. A screen-oriented user interface designed to permit interactive processing.

3.1584 paper feed. A mechanism that positions the printing medium as the paper is moved into a printing device.

3.1585 paper tape.* *See:* punch tape.
* Deprecated.

3.1586 paper tape punch. *See:* tape punch.

3.1587 paper tape reader. A reader that senses hole patterns in punched paper tape and translates them into internal machine data representations. *Syn:* perforated-tape reader.

3.1588 parallel. Many bits transmitted over a single pathway simultaneously. *Contrast with:* serial. *See also:* bit parallel.

3.1589 parallel adder. An adder in which addition is performed concurrently on multiple digits of the operands. *Contrast with:* serial adder.

3.1590 parallel architecture. A multiprocessor architecture in which parallel processing can be performed, that is, different parts of a single task can be executed concurrently on different processors. *See also:* coarse-grain parallel architecture; fine-grain parallel architecture; medium-grain parallel architecture.

3.1591 parallel computer. (1) A computer that has multiple arithmetic units or logic units that are used to accomplish parallel operations or parallel processing. *Contrast with:* sequential computer; serial computer. [ANSI X3.138-1988] (2) A computer design in which more than one operation can occur simultaneously. *See also:* simultaneous computer.

3.1592 parallel disk array (PDA). A form of RAID storage, known as level 3, in which an array of disk drives transfer data in parallel with one redundant drive that functions as a parity check disk.

3.1593 parallel inference machine. A computer containing an inference engine that can perform logic inference processing concurrently on two or more rules or goal clauses.

3.1594 parallel port. A port that transfers data one byte at a time, each bit over its own line. *Contrast with:* serial port.

3.1595 parallel printer. A printer that receives its input data in the form of a parallel stream of data. *Contrast with:* serial printer.

3.1596 parallel processing. Pertaining to the concurrent or simultaneous execution of two or more processes in multiple devices, such as processing units or channels. *Contrast with:* serial processing. *See also:* pipelining.

3.1597 parallel search storage. A type of storage in which one or more parts of all storage locations are queried simultaneously or concurrently.

3.1598 parallel-serial converter. *See:* serializer.

3.1599 parallel storage. A storage device in which digits, characters, or words, are dealt with simultaneously or concurrently.

3.1600 parallelism. (1) Concurrent operation of several parts of a computer system. *Note:* This could be simultaneous processing of multiple programs, or simultaneous operation of multiple computers. (2) Pertaining to specific techniques for implementing parallel operations. *See also:* AND-parallelism; OR-parallelism.

3.1601 parameter potentiometer. A potentiometer employed in analog computers to represent a problem parameter such as a coefficient or a scale factor. *See also:* coefficient potentiometer.

3.1602 parameter word. A word that directly or indirectly provides or designates one or more parameters. [ANSI X3.138-1988]

3.1603 parity bit. An extra bit attached to a byte, character string or word, used to detect transmission errors. [IEEE Std 610.7-1995]

3.1604 partition. **(1)** A portion of a computer's main storage that is set aside to hold a single program. **(2)** A portion of a storage medium that is set aside for some special purpose; for example, the boot partition of a magnetic disk contains operating system files from which the computer can be booted. **(3)** A portion of a storage medium that is treated as if it were an individual medium; as in a partition of a hard disk.

3.1605 patch bay. A specially designed rewireable panel that allows its user to dynamically rewire or perform analog programming. *Syn:* wiring panel.

3.1606 patch board. A specially designed reconfigurable connection board used to prototype or test integrated circuits. *See also:* problem board. *Syn:* patch panel.

3.1607 patch panel. *See:* patch board.

3.1608 path. *See:* channel; channel path.

3.1609 pause instruction. A computer instruction that specifies suspension of the execution of a computer program. *Note:* A pause instruction does not cause an exit from the program. *Syn:* halt instruction. *See also:* optional pause instruction; stop instruction.

3.1610 PC. **(1)** Acronym for personal computer. **(2)** Acronym for printed circuit.

3.1611 PCM. Acronym for punched card machine.

3.1612 PDA. Acronym for parallel disk array.

3.1613 pel. *See:* pixel.

3.1614 penetration CRT display device. A CRT display device characterized by a display screen covered with several layers of phosphor that are selectively energized by varying the voltage of the electron beam, allowing the display of multiple colors. *Note:* Often used to add color to a random-scan display device.

3.1615 perforated punch tape. *See:* perforated tape.

3.1616 perforated tape. A tape on which a pattern of holes is used to represent information. *Syn:* perforated punch tape; punched tape. *See also:* chadless tape; paper tape reader.

3.1617 perforated tape reader. *See:* paper tape reader.

3.1618 perforator. *See:* tape punch.

3.1619 peripheral. Pertaining to a device that operates in combination or conjunction with the computer but is not physically part of the computer and is not essential to the basic operation of the system; for example, printers, keyboards, graphic digital converters, disks, and tape drives. *Note:* Such devices are often referred to as "peripherals" or "peripheral equipment." *See also:* input-output device.

3.1620 peripheral control unit. *See:* controller.

3.1621 peripheral controller. *See:* input-output controller.

3.1622 peripheral storage. *See:* auxiliary storage.

3.1623 peripheral transfer. The process of transmitting data between two peripheral units. *See also:* radial transfer.

3.1624 peripheral unit. With respect to a particular processing unit, any equipment that can communicate directly with that unit.

3.1625 permanent font. *See:* internal font.

3.1626 permanent storage. A type of storage whose contents cannot be modified. *Contrast with:* erasable storage. *See also:* read-only storage. *Syn:* nonerasable storage.

3.1627 perpendicular magnetic recording. A type of magnetic recording in which magnetic polarities representing data are aligned perpendicularly to the plane of the recording surface. *Syn:* vertical magnetic recording. *Contrast with:* longitudinal magnetic recording.

3.1628 personal computer (PC). A single-user microcomputer designed for personally controllable applications. *See also:* desktop computer; home computer; laptop computer; workstation.

3.1629 phase. **(1)** A distinct part of a process in which related operations are performed, as in the shift phase of a shift-and-carry operation. **(2)** A relative measurement

that describes the temporal relationship between two signals that have the same frequency.

3.1630 phase-change recording. A method of recording information on optical storage in which the laser strikes the optical medium, causing it to crystallize in a controlled manner such that the change can be interpreted as a binary 0 or 1.

3.1631 phase-locked. Pertaining to two signals whose phases relative to each other are kept constant by a controlling device.

3.1632 phase-modulation recording. A type of magnetic recording in which each storage cell is divided into two regions that are each magnetized in opposite senses; the sequence of these senses indicates whether the binary character represented is zero or one. *Syn:* phase encoding. *See also:* double-pulse recording.

3.1633 photo-optic storage. *See:* optical storage.

3.1634 photocell. A semiconductor device, the electrical properties of which are affected by illumination. *Note:* One common type of photocell is the photoelectric cell which generates electricity when exposed to light, and is used to power many portable devices.

3.1635 photocomposer. *See:* phototypesetter.

3.1636 photodetector. A device that senses incident illumination.

3.1637 phototypesetter. A nonimpact printer that creates characters using photographic techniques. *Syn:* photocomposer.

3.1638 physical address. The address of a data item in physical memory. *See also:* virtual address.

3.1639 physical circuit. *See:* circuit.

3.1640 physical defect. *See:* fault.

3.1641 physical format. *See:* low-level format.

3.1642 physical memory. The main storage actually provided in a computer. *See also:* virtual storage.

3.1643 physical system. A part of the real physical world that is directly or indirectly observed or employed by mankind.

3.1644 pick device. An input device that is used to specify or detect a particular display element or segment. *See also:* electronic pen; light pen. *Contrast with:* pointing device. [IEEE Std 610.6-1991]

3.1645 picture element. *See:* pixel.

3.1646 piggyback board. *See:* daughter board.

3.1647 pin. Any of the leads on a device that connect it to the system, each of which provides some function such as input, output, control, power, or ground.

3.1648 pin feed. *See:* tractor feed.

3.1649 pinboard. *See:* plugboard.

3.1650 PIO. Acronym for programmed input-output.

3.1651 pipe. The circuitry in a pipelined processor that implements the overlapping parallel functions.

3.1652 pipeline processing. *See:* pipelining.

3.1653 pipeline processor. A processor in which execution of instructions takes place as a series of units, arranged so that several units can be simultaneously processing appropriate parts of several instructions. [ANSI X3.138-1988]

3.1654 pipelining. **(1)** Parallel processing in which instructions are executed in an assembly-line fashion: consecutive instructions are operated upon in sequence, but with several being initiated before the first is complete. *Syn:* pipeline processing. **(2)** A technique for operation in which each instruction is broken into multiple steps, which are performed by different portions of the computer. A typical instruction stream allows a different instruction to be at each step in the pipeline at any point in time, allowing multiple instructions to overlap execution. *Note:* In microprocessors, pipelining can make multiple cycle instructions appear to execute in a single clock cycle once the pipeline is full. See figure 10.

3.1655 pixel. The smallest element of a display surface whose characteristics are independently assigned. *Note:* This term is derived from the term "picture element." *Syn:* pel; picture element. [IEEE Std 610.6-1991]

3.1656 PLA. Acronym for programmable logic array.

3.1657 placeholder. *See:* dummy.

3.1658 plasma display device. A display device employing a plasma panel to display data on the display screen. *Note:* An image can persist for relatively long periods of time on such a device. *Syn:* gas-discharge display device; gas plasma display device.

3.1659 plasma panel. A grid of electrodes encased within two flat glass plates separated by an ionizing gas in which the energizing of selected electrodes causes the gas to be ionized and light to be emitted at that point. *Note:* Also called a matrix-addressed storage display device. *Syn:* gas panel. *See also:* plasma display device.

3.1660 plated wire storage. A type of magnetic storage in which information is stored by magnetically recording it on a plated wire surface.

3.1661 platen. In impact printers, the surface against which a print element strikes in order to make character imprints.

3.1662 platter. (1) *See:* disk (2) One disk within a stack of disks, such that the disks are attached to a common spindle.

3.1663 playback. To output data or text for review purposes. *Syn:* playout; printout.

3.1664 playback head. *See:* read head.

3.1665 playout. *See:* playback.

3.1666 plotter. An output device that presents data on paper in the form of a two-dimensional graphic representation. *See:* analog plotter; digital plotter; drum plotter; electrostatic plotter; flatbed plotter; raster plotter.

3.1667 plotter step size. (1) The minimum distance between two points or parallel lines on a plotter. *See also:* increment size. (2) The distance between adjacent addressable points of a plotter.

3.1668 plotting board. The flat surface of a flatbed plotter on which the output is displayed. *Syn:* plotting table.

3.1669 plotting head. A head within a plotter that is used to create marks on the display surface.

3.1670 plotting table. *See:* plotting board.

3.1671 plugboard. A printed circuit board into which plugs or pins may be placed to control the operation of equipment. *Syn:* pinboard [IEEE Std 610.7-1995]

3.1672 plugboard chart. A chart that shows, for a given job, where plugs may be inserted into a plugboard. *Syn:* plugging chart

3.1673 plugging chart. *See:* plugboard chart.

3.1674 PMOS. Acronym for p-channel metal-oxide semiconductor.

3.1675 pocket. A card stacker in a card sorter. *Syn:* bin.

3.1676 point-of-sale terminal. A job-oriented terminal for recording sales data in machine-readable form at the time and place at which each sale is made. [IEEE Std 610.12-1990a]

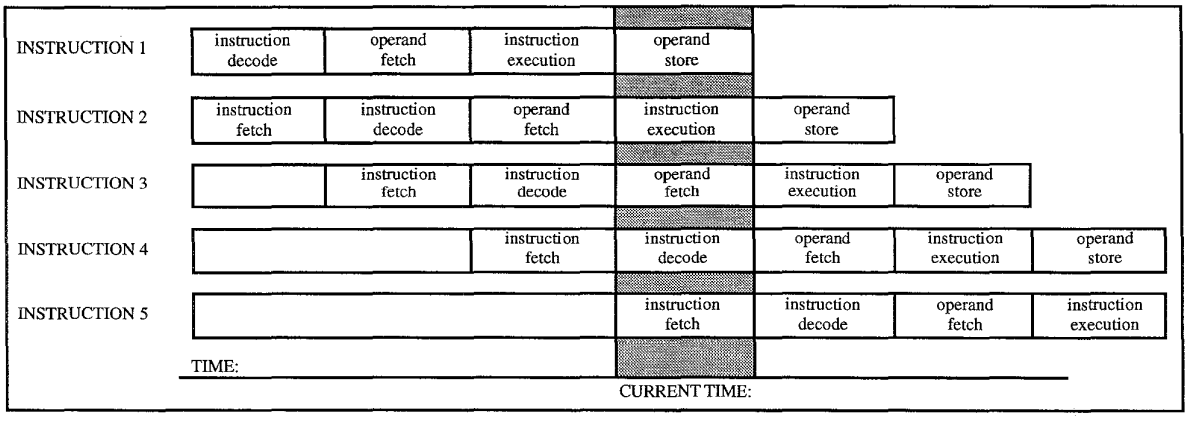


Figure 10—Pipelining

3.1677 pointer. **(1)** A data item that specifies the location of another data item; for example, a data item that specifies the address of the next employee record to be processed. [IEEE Std 610.12-1990] **(2)** An identifier that indicates the address or storage location of a data item.

3.1678 pointing device. An input device that is used to specify a particular addressable location. *See also:* cursor control device; stylus. *Contrast with:* pick device. [IEEE Std 610.6-1991]

3.1679 polarity. The orientation of any device that has poles or signed electrodes.

3.1680 polarized dipole magnetization. *See:* polarized return-to-zero recording.

3.1681 polarized return-to-zero recording (RZ(P)). Return-to-zero recording in which zeros are represented by magnetization in one sense, ones are represented by magnetization in the opposite sense, and the reference condition is the absence of magnetization. *Syn:* polarized dipole magnetization. *Contrast with:* non-polarized return-to-zero recording.

3.1682 port. An input or output connection between a peripheral device and a computer. *See also:* input-output port; mouse port; parallel port; serial port.

3.1683 portable computer. A personal computer that is designed and configured to permit transportation as a piece of handheld luggage. *Note:* U.S. Federal regulations limit use of the term "portable" to objects weighing no more than 21 pounds. *See also:* hand-held computer; laptop computer; notebook computer; transportable computer. [IEEE Std 610.2-1987]

3.1684 portrait orientation. A page orientation of a display surface having greater height than width. *Note:* Derived from portraits of people, which are usually vertical in format. *Contrast with:* landscape orientation.

3.1685 position. *See:* seek.

3.1686 positional servomechanism. In an analog computer, a servomechanism in which a mechanical shaft is positioned, usually in the angle of rotation, in accordance with one or more input signals. *Note:* Frequently, the shaft is positioned (excluding transient motion) in a manner linearly related to the value of the input signal. *See also:* repeater servomechanism, servomechanism.

3.1687 positioning time. *See:* seek time.

3.1688 positive. Pertaining to a voltage or charge that is associated with a deficiency of electrons. *Contrast with:* negative.

3.1689 postamble. A sequence of bits recorded at the end of each block on a magnetic medium for the purpose of synchronization when reading backward. *Contrast with:* preamble. [ANSI X3.138-1988]

3.1690 potentiometer. A resistor with an adjustable sliding contact that functions as an adjustable voltage divider. *See also:* function potentiometer; parameter potentiometer; servo potentiometer.

3.1691 potentiometer set. In an analog computer, a computer-control state that supplies the same operating potentiometer loading as under computing conditions and thus allows correct potentiometer adjustment.

3.1692 power supply. A unit that converts voltage from one level to another, usually regulating the output. *Note:* Typically used to convert an AC voltage to a DC voltage. *See also:* converter.

3.1693 power-fail circuit. A logic circuit that protects an operating program if primary power fails by informing the computer when power failure is imminent, initiating a routine that saves all volatile data. After power has been restored, the circuit initiates a routine that restores the data and restarts computer operations.

3.1694 pre-read head. A read head that is placed before another read head and is used to read data before the same data are read by the other read head.

3.1695 preamble. A sequence of bits recorded at the beginning of each block on a magnetic tape for the purpose of synchronization. *Contrast with:* postamble. [ANSI X3.138-1988]

3.1696 precision. The degree of exactness or discrimination with which a quantity is stated. *Note:* The result of a calculation may have more precision than it has accuracy; for example, the true value of pi to six significant digits is 3.14159; the value of 3.14162 is precise to six digits but only five digits are accurate. *See also:* accuracy. [IEEE Std 610.12-1990a]

3.1697 prefetching. In a pipelined process, to fetch the next instruction, or instruction part, before the processing unit requires it, resulting in a performance improvement by eliminating the lag between completion of one instruction and the availability of the next.

3.1698 preprocessor. A device that effects preparatory computation or organization.

3.1699 prerecorded data medium. A data medium on which certain preliminary items are preset; the remaining items are entered during subsequent operations.

3.1700 pressure-sensitive keyboard. *See:* membrane keyboard.

3.1701 presumptive address. *See:* base address.

3.1702 presumptive instruction. A computer instruction that is not an effective instruction until it has been modified in a prescribed manner.

3.1703 preventive maintenance. Maintenance performed specifically to prevent faults from occurring. *Contrast with:* corrective maintenance.

3.1704 primary storage. *See:* main storage.

3.1705 primitive. A basic or fundamental unit, often referring to the lowest level of machine instruction or the lowest unit of a language.

3.1706 print bar. *See:* type bar.

3.1707 print chain. In a chain printer, a revolving carrier on which the type slugs of an impact printer are mounted. *Syn:* print train.

3.1708 print controller. The parts within a printer that perform the processing required to generate an image. *Contrast with:* print engine.

3.1709 print drum. In a drum printer, a rotating cylinder that presents characters at more than one printing position. [ANSI X3.138-1988]

3.1710 print element. An interchangeable unit employed in element printers that contains a complete set of type slugs. By changing the print element, one can change the character font, size, and density. Examples include "daisy wheels," "golf balls," and "thimbles." *Syn:* type element.

3.1711 print engine. The mechanism within a printer that actually transforms the desired image to the paper. *Contrast with:* print controller.

3.1712 print head. **(1)** A head within a printer that mechanically controls the creation of an image on paper. **(2)** A term commonly applied to that component in a dot-matrix printer that is responsible for forming characters using a pattern of dots.

3.1713 print through. An undesired transfer of a recorded signal from one part of a magnetic medium to another part when these parts are brought into close proximity. [ANSI X3.138-1988]

3.1714 print train. **(1)** In a train printer, a track in which the type slugs are engaged. **(2)** *See:* print chain.

3.1715 print wheel. In a wheel printer, a rotating disk that presents the characters of a character set at a single printing position. *Syn:* type wheel.

3.1716 print wire. One of a set of wires that is used in a dot-matrix printer to transfer ink to the paper.

3.1717 printed card form. The layout or format of the printed matter on a card; the printed matter usually describes the purpose of the card and designates the precise location of card fields.

3.1718 printed circuit (PC). A circuit in which the conducting wires are "printed" as conductive strips on an insulating board. *Syn:* etched circuit. *See also:* printed circuit board.

3.1719 printed circuit board. A circuit board onto which the pattern of copper foil connecting the components has been etched or printed. *See also:* plugboard. *Syn:* printed circuit card. *Contrast with:* wire-wrapped board. *Note:* The term "card" is often used synonymously with "printed circuit board."

3.1720 printed circuit card. *See:* printed circuit board.

3.1721 printer. An output device that produces a hard copy record of data mainly in the form of discrete graphic characters belonging to one or more predetermined character sets. *See also:* bidirectional printer; character printer; character-at-a-time printer; color printer; continuous-stream printer; graphic printer; high-speed printer; impact printer; line printer; nonimpact printer; page printer; serial printer; teleprinter.

3.1722 printer driver. An application software component that allows the computer system to control and communicate with a particular printer without concern for the printer's hardware characteristics.

3.1723 printer font. A font that resides in or is intended for a printer. *Note:* Can be internal, downloaded, or on a

font cartridge. *Contrast with:* screen font. *See also:* internal font; on-line font.

3.1724 printing line. The writing line on a printer. *See also:* printing position. [ANSI X3.138-1988]

3.1725 printing position. **(1)** One character position in a printing line. **(2)** The location of the printer head.

3.1726 printout. **(1)** Computer output printed on paper. **(2)** *See:* playback.

3.1727 problem board. In an analog computer, a removable frame of receptacles for patch cords and plugs that offers a means for interconnecting the inputs and outputs of computing elements. *See also:* patch board; patch panel.

3.1728 process-bound. *See:* compute-bound.

3.1729 processable scored card. A scored card including at least one separable part that can be processed after separation. *See also:* stub card.

3.1730 processing unit. A functional unit that consists of one or more processors and their storage. *See also:* central processing unit.

3.1731 processor. **(1)** A device that interprets and executes instructions, consisting of at least an instruction control unit and an arithmetic unit. *See also:* coprocessor; preprocessor. **(2)** A device that contains a central processing unit.

3.1732 processor architecture. The system-visible interfaces to a central processor, including its instruction set, stack and register structures, and trap and interrupt-handling methods.

3.1733 processor storage. *See:* internal storage.

3.1734 program. The process of incorporating digital data onto a integrated circuit. *See also:* computer program.

3.1735 program attention key. *See:* attention key.

3.1736 program counter. A register in the processing unit that contains the address of the next instruction to be executed. *Syn:* instruction address register.

3.1737 program loading. Placing executable instructions into the memory of a computer where they can be executed.

3.1738 program production time. That part of system production time during which a computer program is successfully executed.

3.1739 program register. *See:* instruction address register.

3.1740 program test time. That part of system production time during which a computer program is tested.

3.1741 programmable. Pertaining to a device such as a circuit or a keyboard that can accept instructions that alter its basic functions. *Contrast with:* hardwired. *See also:* micro-programmable computer; user-programmable computer.

3.1742 programmable array logic (PAL). A programmable, two-level logic device in which the input decode (AND array) logic is programmable, but the output (OR array) is fixed. *Contrast with:* programmable logic array.

3.1743 programmable function key. *See:* user-definable key.

3.1744 programmable logic array (PLA). A general-purpose integrated circuit that consists of an array of gates that can be programmed to perform various functions. *Contrast with:* programmable array logic. *See also:* field programmable logic array.

3.1745 programmable read-only memory (PROM). A type of read-only memory whose contents can be initialized, or burned, only once, and cannot thereafter be altered. *See also:* electrically erasable programmable read-only memory; erasable programmable read-only memory; PROM burner.

3.1746 programmable terminal. *See:* intelligent terminal.

3.1747 programmed input-output (PIO). A method for transferring data between an interface and memory in which the program polls the input-output device to see if data is available. *Contrast with:* direct memory access. *See also:* direct memory transfer.

3.1748 PROM. Acronym for programmable read-only memory.

3.1749 PROM burner. *See:* PROM programmer.

3.1750 PROM programmer. A device used to program PROM devices and to reprogram EPROM, using electrical pulses. *Syn:* PROM burner.

3.1751 propagation delay. **(1)** The amount of time between when a signal is impressed on the input of a circuit and when it is received or detected at the output. **(2)** The time delay between when a signal is input to a device and a resultant action occurs on its output. *Syn:* latency.

3.1752 protect notch. *See:* write-protect notch.

3.1753 protect tab. *See:* write-protect tab.

3.1754 protected field. On a display device, a display field in which a user cannot enter, modify or erase data. *Contrast with:* unprotected field.

3.1755 protected location. A location whose contents are protected against accidental alteration, improper alteration, or unauthorized access.

3.1756 protected storage. A type of storage in which data cannot be modified by an application program except under specified conditions. *See also:* read-only storage.

3.1757 protocol. **(1)** A formal set of conventions governing the format and relative timing of message exchange in a computer system. [IEEE Std 610.7-1995] **(2)** A set of semantic and syntactic rules that determine the behavior of functional units in achieving meaningful communication. [IEEE Std 610.7-1995]

3.1758 pseudoternary coding. A means of digital signaling in which three signal levels are used to encode binary data.

3.1759 puck. An input device used as a locator consisting of a hand-held control box with cross hairs that can be moved over a data tablet containing an image such that the user can identify a point in the image. *Note:* This term is sometimes used to refer to a mouse. [IEEE Std 610.6-1991]

3.1760 pulse. A variation in the value of a magnitude which is short in relation to the time schedule of interest, the final value being the same as the initial value. *Note:* In digital logic circuits, a pulse is usually a voltage. *See also:* recovery time; strobe. [IEEE Std 610.7-1995]

3.1761 pulse modulation. The encoding of information by varying the basic characteristics of a sequence of pulses, such as the width, duration, amplitude, phase or the number of pulses. [IEEE Std 610.7-1995]

3.1762 pulse repetition frequency. *See:* pulse repetition rate.

3.1763 pulse repetition rate. The number of pulses per unit time. *Syn:* pulse repetition frequency. [ANSI X3.138-1988]

3.1764 punch. **(1)** A device for making holes in some data medium such as a card or paper tape. *See:* card punch; card reproducing punch; calculating punch; spot punch. **(2)** A perforation created by a device as in (1). *See also:* digit punch; eleven punch; numeric punch; twelve punch; zone punch. **(3)** To make a perforation as in (2). *See also:* gang punch; overpunch.

3.1765 punch card. A card into which hole patterns can be punched such that the patterns can be used to store or represent information. *Note:* This term is often used in place of "punched card"; a standard-sized punch card has twelve rows of 80 columns. *See also:* aperture card; binary card; binder-hole card; check card; control card; data card; edge-coated card; edge-notched card; edge-punched card; header card; interpreted card; laced card; scored card; short card; trailer card; twelve-row punch card. *Syn:* Hollerith card.

3.1766 punch tape. A tape in which hole patterns can be punched such that the patterns can be used to store or represent information.

3.1767 punched card. A card punched with hole patterns such that the patterns store or represent information. *See also:* punch card.

3.1768 punched card holder. *See:* card hopper.

3.1769 punched card machine (PCM). *See:* card reader.

3.1770 punched card reader. *See:* card reader.

3.1771 punched paper tape. *See:* perforated tape

3.1772 punched tape. *See:* perforated tape.

3.1773 punched tape reader. An input unit that senses the hole patterns in a perforated tape, transforming the hole patterns into electrical signals representing data.

3.1774 punching station. The place in a punch where a card or paper tape is punched.

3.1775 pushdown storage. A type of storage in which data are ordered in such a way that the next data item to be retrieved is the most recently stored item. *Note:* Commonly characterized as "last-in-first-out," or LIFO. *Syn:* stack storage.

3.1776 pushup storage. **(1)** A type of storage in which data are ordered in such a way that the next data item to be retrieved is the item that was stored first. *Note:* Commonly characterized as "first-in first-out," or FIFO. order. **(2)** *See:* stack.

3.1777 QIC. Acronym for quarter-inch cartridge.

3.1778 quadded components. The use of four identical components in a particular circuit configuration in order to reduce the probability of overall circuit failure due the possible occurrence of a fault in one or more of such components during circuit operation.

3.1779 quadded logic. The quadruple replication of each individual gate in a logic circuit.

3.1780 quadruple-address instruction. *See:* four-address instruction.

3.1781 quadruple-length register. Four registers that function as a single register. *Syn:* quadruple register. *See also:* double-length register; n-tuple length register; triple-length register. [ANSI X3.138-1988]

3.1782 quadruple register. *See:* quadruple-length register.

3.1783 quantizer. **(1)** A device that digitizes analog input; for example, a digitizing tablet, motion sensor, or a light pen. **(2)** *See:* digitizer.

3.1784 quarter adder. An adder that accepts two inputs, producing only a sum as output according to the table below. *See also:* exclusive OR. *Contrast with:* full adder; half adder.

input #1	0	0	1	1
input #2	0	1	0	1
output sum	0	1	1	0

Figure 11—Quarter adder

3.1785 quarter-inch cartridge (QIC). A type of storage medium for magnetic tapes in which each tape is encased in a small cartridge. *Syn:* minicartridge.

3.1786 quarter-squares multiplier. An analog multiplier incorporating inverters, analog adders, and square-law function generators, whose operation is based on the identity:

$$xy = \frac{(x+y)^2 - (x-y)^2}{4}$$

3.1787 quartet. A byte composed of four bits. *Syn:* four-bit byte. *See also:* nibble. [ANSI X3.138-1988]

3.1788 quintet. A byte composed of five bits. *Syn:* five-bit byte. [ANSI X3.138-1988]

3.1789 QWERTY keyboard. A standard keyboard layout, named for the first six keys of the third row from the bottom. That is, when the row is read across, the keys read Q W E R T Y U I O P. *Contrast with:* Dvorak keyboard.

3.1790 R-S flip-flop. A flip-flop that has two level-sensitive data inputs; R and S. *Note:* The R input is used to make the output a logical zero (false) and the S input is used to make the output a logical one (true).

3.1791 radial transfer. The transmission of information between a peripheral unit and a unit of equipment that is more central than that of the peripheral unit using a connection that is dedicated to that perhieral unit. *See also:* peripheral transfer. [IEEE Std 610.7-1995]

3.1792 RAID level 2. A form of RAID storage, known as level 2, in which Hamming codes are used for error correction.

3.1793 RAID storage. Acronym for redundant arrays of inexpensive disks; a type of storage that uses several magnetic or optical disks, known as a disk array, working in tandem to increase disk capacity, improve data transfer rates, and provide higher system reliability. *Note:* Six basic architectures of RAID storage, referred to as levels 0 through 5, have been defined, as follows:

Level	Description
0	Data striping without parity
1	Mirrored disk array
2	
3	Parallel disk array
4	Independent disk array
5	Independent disk array

Figure 12—Types of RAID storage

3.1794 RALU. Acronym for register-arithmetic and logical unit.

3.1795 RAM. Acronym for random-access memory.

3.1796 RAM disk. A simulated storage disk created and maintained by a special driver that stores data electronically (in RAM, or random-access storage) rather than magnetically. *Note:* Such storage is inherently dynamic. *Syn:* virtual disk.

3.1797 random-access memory (RAM). High-speed read/write memory with an access time that is the same for all storage locations. *Note:* Often used synonymously with "main storage." *See also:* dynamic random-access memory; memory board; static random-access memory. *Syn:* random-access storage.

3.1798 random-access storage. *See:* random-access memory.

3.1799 random-scan display device. A type of CRT display device in which the beam moves from point to point, creating an image composed of vectors. *Note:* This method is often called "vector graphics." *See also:* refresh display device. *Contrast with:* raster display device. *Syn:* refresh line-drawing display device; stroker display; vector display.

3.1800 raster CRT. *See:* raster display device.

3.1801 raster display device. A cathode ray tube display device in which the electron beam makes a line by line sweep of the screen, called raster scanning, creating an image composed of dots by modifying the intensity of the beam. *Note:* This method is often called "raster graphics." *Contrast with:* random scan display device. *See also:* cell-organized raster display device; matrix-addressed storage display device; raster scan. *Syn:* raster CRT.

3.1802 raster font. *See:* vector font.

3.1803 raster graphics. Graphics terms are defined in IEEE Std 610.6-1991. *See:* raster display device.

3.1804 raster grid. On a raster display device, the grid of addressable coordinates on the display surface.

3.1805 raster order. **(1)** The order in which pixels are scanned in a raster display device; usually left-to-right; top-to-bottom. **(2)** The order in which pixel information is stored in memory such that it may be displayed on a raster display device.

3.1806 raster plotter. A plotter that generates a display image on a display surface using a line-by-line scanning technique. *See also:* electrostatic plotter. *Contrast with:* analog plotter; digital plotter. [ANSI X3.138-1988]

3.1807 raster scan. A technique employed in raster display devices in which the electron beam "scans" the display surface line by line, illuminating the pixels, creating an image on the display surface.

3.1808 rate servomechanism. In an analog computer, a servomechanism in which a mechanical shaft is translated or rotated at a rate proportional to an input signal amplitude.

3.1809 read. To obtain data from a storage device, from a data medium, or another source. *See also:* backward read; delete; destructive read; nondestructive read; read cycle; read/write; scatter read; write. [IEEE Std 610.12-1990a]

3.1810 read-around ratio. The number of times a specific spot, digit, or location in electrostatic storage may be consulted before spillover of electrons causes a loss of data in surrounding spots. *Note:* The surrounding data must be restored or deterioration may result in loss of data.

3.1811 read cycle. A cycle in which data are transferred from some storage location to the device that requested the read. *Contrast with:* write cycle.

3.1812 read cycle time. The minimum time interval between the starts of successive read cycles in a storage device that has separate read and write cycles. *Contrast with:* write cycle time.

3.1813 read head. A head capable only of reading information from the storage medium. *Contrast with:* read/write head; write head. *See also:* pre-read head. *Syn:* playback head.

3.1814 read-modify-write (RMW) cycle. A cycle in which an item is read, its contents are modified, and then is written back to storage in a single operation. *See also:* read cycle; write cycle.

3.1815 read/only. Pertaining to a storage medium which can only be read from. *Contrast with:* read/write; write-once/read-many.

3.1816 read/only memory (ROM). Memory that can only be read from. *Contrast with:* read/write memory.

See also: programmable read-only memory; read/only storage; erasable programmable read-only memory.

3.1817 read/only storage. A type of storage which can be read, but not modified except by a particular user, or when operating under particular conditions; for example, punched paper tape, or a storage device in which writing is prevented by a lock-out. *Syn:* nonerasable storage; fixed storage. *See also:* control read-only memory. fixed-program read-only storage; protected storage.

3.1818 read path. In a reader, a path that has a read station.

3.1819 read station. The location in a reader where the data on a medium are read. *Syn:* sensing station.

3.1820 read/write. Pertaining to an operation, process, or object that is involved in both reading and writing. For example, a read/write head is a head that can perform both read and write operations. *See also:* read: write. *Contrast with:* read/only; write-once/read-many.

3.1821 read/write cycle. A cycle in which one read operation and one write (or rewrite) operation are performed.

3.1822 read/write head. A head capable of both reading from or writing on the medium. *Syn:* combined head: record head. *Contrast with:* read head; write head.

3.1823 read/write memory (RWM). Memory into which information may be stored (or written) and from which information may be retrieved (or read); for example, digital tape recorders and random-access memory. *Contrast with:* read-only memory.

3.1824 read/write opening. *See:* read/write slot.

3.1825 read/write slot. An opening in the jacket of a floppy disk allowing access to the storage medium by the read/write heads. *Syn:* read/write opening.

3.1826 reader. **(1)** An input device that is capable of sensing stored information, and of conveying that information into on-line storage. **(2)** Any device which can sense, detect, or convert data from one medium to another. *See also:* badge reader; card reader; character reader; magnetic tape reader; optical character reader; optical mark reader; paper tape reader.

3.1827 readout device. *See:* character display device.

3.1828 ready light. An indicator light on a system or system component that indicates that the system is on and ready for operation.

3.1829 real address. The address of a storage location in real storage. *See also:* address translator. [ANSI X3.138-1988]

3.1830 real estate. *See:* footprint.

3.1831 real storage. The main storage in a virtual storage system. *Note:* Although real storage and main storage are physically identical, conceptually real storage represents only parts of the range of addresses available to the user of a virtual storage system, whereas, the main storage includes the total range of addresses available to the user.

3.1832 real time. **(1)** In software engineering, pertaining to a system or mode of operation in which computation is performed during the actual time that an external process occurs, in order that the computation results can be used to control, monitor, or respond in a timely manner to the external process. [IEEE Std 610.12-1990] **(2)** The actual time in the real world during which an event takes place. *Syn:* actual time; true time.

3.1833 real-time clock. **(1)** A device that signals the computer at regular intervals in order that it may keep up with some external event. **(2)** *See:* time-of-day clock.

3.1834 receive channel. A channel used within a data circuit to receive data. *Contrast with:* transmit channel.

3.1835 receiving perforator. *See:* tape punch.

3.1836 recognition time. The time elapsed between the change of the value of a digital input signal and its recognition by the digital input unit.

3.1837 reconfiguration. A strategy for repairing components in which failing components are switched out of operation and replaced by failure-free components.

3.1838 record. To put data into a storage device.

3.1839 record gap. *See:* interblock gap. [IEEE Std 610.5-1990]

3.1840 record head. *See:* read/write head.

3.1841 recorder. A device that makes a permanent record, usually graphic, of varying signals. *Syn:* strip chart recorder.

3.1842 recording. The process of storing information on some storage medium for later retrieval. *See:* magnetic recording; optical recording.

3.1843 recording area. The area on a disk or storage medium on which information can be recorded. *Contrast with:* handling zone. *Syn:* recording zone.

3.1844 recording density. The number of bits in a single linear track, measured in bits per unit of length or area of the recording medium. *Syn:* bit density; packing density; surface density. *See also:* track density.

3.1845 recording medium. The material on which program instructions and text are recorded; for example, magnetic tape.

3.1846 recording zone. *See:* recording area.

3.1847 recovery time. **(1)** When sending or receiving pulses, the time required between the end of a pulse and the beginning of the next pulse. **(2)** The time required by some peripheral devices between one access and another.

3.1848 rectangular mode. In an analog computer, a mode of operation that produces a transformation from polar to rectangular coordinates or a rotation of rectangular coordinates. *See also:* resolver.

3.1849 rectifier. **(1)** *See:* diode. **(2)** An electrical device which converts alternating current to direct current.

3.1850 red, green, blue (RGB) display device. A color display device characterized by its ability to provide three different color responses independently to the screen lined with multi-colored phosphor.

3.1851 reduced instruction set computer (RISC). A computer characterized by a small instruction set and large collection of registers. *Note:* All or most instructions can be executed in a single clock cycle. *Syn:* load-store computer. *Contrast with:* complex instruction-set computer.

3.1852 redundance. The introduction of auxiliary elements and components into a circuit, module, or system unit to perform the same functions as similar elements in such units for the purpose of improving their overall reliability in performance and safety. Active redundance is that redundance wherein all redundant items are operating simultaneously, rather than being switched on when needed. Standby redundance is that redundance wherein the alternative means of performing the function is inoperative until needed and is switched in upon failure of the primary means of performing the function.

3.1853 redundant arrays of inexpensive disks (RAID). *See:* RAID storage.

3.1854 reel. A cylinder with flanges on which tape or film may be wound. *Contrast with:* spool. *See also:* leader; write ring. [ANSI X3.138-1988]

3.1855 reference. A baseline value against which relative measurements are stated or measured.

3.1856 reference address. *See:* base address.

3.1857 reference edge. That edge of a data medium that is used to establish specifications or measurements in or on the data carrier. *Syn:* guide edge.

3.1858 reference excursion. In an analog computer, the range from zero voltage to nominal full-scale operating voltage.

3.1859 refresh. **(1)** In computer graphics, to redraw an image on a non-permanent graphic display surface. *Syn:* regenerate; repaint. [IEEE Std 610.6-1991] **(2)** The process of repeatedly producing a display image on a display surface so that the image remains visible. **(3)** To write data periodically to dynamic storage so that it is not lost.

3.1860 refresh cycle. **(1)** A complete regeneration of a display screen. [IEEE Std 610.6-1991] **(2)** A complete recharging of the storage capacitors in a dynamic storage device.

3.1861 refresh display device. A type of display device whose screen surface does not retain an image for a long period of time, requiring the image to be continuously refreshed to remain visible and avoid flicker. *Syn:* refresh tube. *Contrast with:* storage tube display device. [IEEE Std 610.6-1991a]

3.1862 refresh line-drawing display device. *See:* random-scan display device. [IEEE Std 610.6-1991]

3.1863 refresh tube. *See:* refresh display device.

3.1864 regenerate. *See:* refresh. [IEEE Std 610.6-1991]

3.1865 regenerative track. That part of a track on a magnetic drum or magnetic disk, used in conjunction with a read/write head, such that the heads are connected to function as circulating storage. *Syn:* revolver track.

3.1866 register. A storage device or storage location having a specified storage capacity. *See also:* strobe.

3.1867 register architecture. A computer architecture whose design is based on the maintenance of data items in registers. *Contrast with:* stack architecture.

3.1868 register array. *See:* register file.

3.1869 register file. A set of registers which may be addressed by their number in the set. *Syn:* register array.

3.1870 register length. The storage capacity of a register.

3.1871 register memory. **(1)** Use of high-speed general purpose registers as one would use memory, as in using registers to hold frequently-used data items. **(2)** Registers specifically included in the machine design for use as high-speed storage.

3.1872 register set. A subset of the full array of registers in a machine which the processing unit is currently allowed to use. *Note:* Machines may have N registers of which the processor may be able to address only M at a time; this divides the register array into N/M register sets.

3.1873 register transfer language (RTL). A computer language used to represent the flow of information on a system level; for example, to show data at the level of computer devices such as registers, gates, and ALUs.

3.1874 register-arithmetic and logic unit (RALU). An arithmetic and logic unit which also contains a register array.

3.1875 register-transfer level. A description of computer operations where data transfers from register to register, latch to latch and through logic gates are described. *Note:* This may be an abstract description or microcoding.

3.1876 relational engine. A database engine for relational databases. *See also:* SQL engine.

3.1877 relative address. An address to which a base address must be added in order to form an absolute address of a particular storage location. *See also:* absolute address; base address; relocatable address; symbolic address.

3.1878 relative addressing. An addressing mode in which a base address is used to store the beginning address of some area in storage, and all locations within that are expressed in terms of their displacement from the beginning, or the relative address.

3.1879 relay. A special-purpose switch that is activated by an electrical signal. *See also:* operational relay.

3.1880 relay amplifier. In an analog computer, an amplifier that drives an electromechanical relay.

3.1881 relocatable address. An address that is to be adjusted by the loader when the computer program containing the address is loaded into memory. *Note:* Generally implemented through the use of relative addressing. *See also:* relative address.

3.1882 relocation. *See:* biasing.

3.1883 remote computer system. A computer system located at some remote site and connected via a communications network to one or more other systems. *See also:* satellite computer. [IEEE Std 610.7-1995]

3.1884 remote console. A console in a remote computer system. *See also:* master console.

3.1885 remote job entry (RJE). A service that allows a user to submit a batch job from a remote site.

3.1886 remote login (rlogin). A login to another computer in a remote location.

3.1887 remote terminal. A terminal that is not directly connected, or is physically separated from the computer with which it is communicating. *Contrast with:* local terminal.

3.1888 removable disk. A disk that can be removed from the disk drive. *Contrast with:* fixed disk.

3.1889 removable storage. Any storage medium, such as a disk, which can be removed from the storage device and stored or transported somewhere else. *Note:* Some portion of the interface may be included with the medium. For example, some removable disk cartridges include the heads as well as the disk.

3.1890 repaint. *See:* refresh. [IEEE Std 610.6-1991]

3.1891 repeat key. A key that continues to operate as long as it is held down. [ANSI X3.138-1988]

3.1892 repeater servomechanism. In an analog computer, a positional servomechanism in which loop input

signals from a transmitting transducer are compared with loop feedback signals from a compatible or identical receiving transducer. The latter is mechanically coupled to the servomechanism to produce a mechanical shaft motion or position linearly related to the motion or position of the transmitting transducer.

3.1893 repetition instruction. A computer instruction that causes one or more instructions to be executed an indicated number of times, for example:

```
do 10 times:
 write a record
 add one to a counter
end
```

3.1894 repetitive addressing. A method of implied addressing, applicable only to zero-address instructions, in which the operation field of an instruction implicitly addresses the operands of the last instruction executed.

3.1895 reproducing punch. *See:* card reproducing punch.

3.1896 reprogrammable read-only memory (RPROM). *See:* erasable programmable read-only memory.

3.1897 rerun time. That part of operating time that is used for repeating operations or programs whose repetition is due to faults or mistakes in operations.

3.1898 reset. **(1)** To set a variable, register, or other storage location back to a prescribed state. *See also:* clear; initialize. [IEEE Std 610.12-1990] **(2)** To place a binary cell in the initial or zero state. *See also:* set.

3.1899 resident. Pertaining to computer programs that remain in a particular storage device or in main storage.

3.1900 resident control program. *See:* nucleus.

3.1901 resistance. *See:* electrical resistance.

3.1902 resistor. An element within a circuit that has specified resistance value designed to restrict the flow of current. *See also:* potentiometer.

3.1903 resistor-transistor logic (RTL). A family of circuit logic in which the basic circuit element is a network of resistors and transistors.

3.1904 resolution. **(1)** A measure of the ability to delineate display detail. **(2)** The smallest distance between two display elements that can be addressed. [IEEE Std 610.6-1991]

3.1905 resolver. **(1)** In an analog computer, a device or computing element used for vector resolution or composition. **(2)** A functional unit whose input analog variables are the polar coordinates of a point and whose output analog variables are the Cartesian coordinates of the same point, or vice-versa.

3.1906 response time. The elapsed time between the end of an inquiry or command to an interactive computer system and the beginning of the system's response. [IEEE Std 610.12-1990]

3.1907 restart instruction. An instruction in a computer program at which the program may be restarted.

3.1908 retention cycle. The length of time specified for data on a data medium to be preserved. *Syn:* retention period. [ANSI X3.138-1988]

3.1909 retention period. *See:* retention cycle.

3.1910 return code register. A register used to store a code which is used to influence the carrying out of following programs.

3.1911 return-to-reference recording. Magnetic recording such that the patterns of magnetization used to represent zeros and ones occupy only part of the storage cell, and the remainder of the cell is magnetized to a reference condition. *Contrast with:* non-return-to-reference recording. *See also:* non-polarized return-to-reference recording; return-to-zero recording. [ANSI X3.138-1988]

3.1912 return-to-zero recording. Return-to-reference recording in which the reference condition is the absence of magnetization. [ANSI X3.138-1988]

3.1913 reverse channel. *See:* backward channel.

3.1914 reverse printer. *See:* bidirectional printer.

3.1915 reversible counter. A counter that can be incremented or decremented by a certain amount upon receipt of an appropriate signal.

3.1916 revolver track. *See:* regenerative track.

3.1917 rewind. To bring a magnetic tape or paper tape back to the beginning of the recording area.

3.1918 rewrite. To write again.

3.1919 RGB display device. Acronym for red, green, blue display device.

3.1920 ringdown. In telephone operation, a method of signaling to gain the attention of an operator.

3.1921 RISC. Acronym for reduced-instruction-set computer.

3.1922 rise time. **(1)** The time required for a voltage or current pulse to increase from 10% to 90% of its maximum value. *Contrast with:* fall time. **(2)** In digital logic, the time required to transition from a low state to a high state.

3.1923 RJE. Acronym for remote job entry.

3.1924 rlogin. Abbreviation for remote login.

3.1925 RMW cycle. Acronym for read-modify-write cycle.

3.1926 robot. A mechanical device that can be programmed to perform some task of manipulation or locomotion under automatic control.

3.1927 rod storage. A type of storage consisting of wires, coated with a nickel-iron alloy, which are cut in such a way as to form stacks of rods.

3.1928 roll in. To restore to main storage the sets of data that were previously rolled out. *Contrast with:* roll out. [ANSI X3.138-1988]

3.1929 roll out. To transfer sets of data, such as files or computer programs of various sizes, from main storage to auxiliary storage for the purpose of freeing main storage for another use. *Contrast with:* roll in. [ANSI X3.138-1988]

3.1930 ROM. Acronym for read-only memory.

3.1931 rotating storage device. A storage device that employs a circular medium that must be rotated in order to access the data.

3.1932 rotational delay. **(1)** The delay caused by waiting for the read/write head of a rotating storage device such as a disk drive to be positioned over the appropriate storage location on the disk. *Syn:* latency. *See also:* search time. **(2)** The part of access time that is attributed to the delay as in (1).

3.1933 rotational position sensing. The process of locating a given sector, a desired track, and a specific record by continually comparing the read/write head position with appropriate synchronization signals.

3.1934 Round Trip Time (RTT). The total time taken for a single packet or datagram to leave one machine, reach the other, and return. [IEEE Std 610.7-1995]

3.1935 row. A horizontal arrangement of characters or other expressions. *See also:* card row; tape row. [ANSI X3.138-1988]

3.1936 row binary. Pertaining to the binary representation of data on punch cards in which the significances of punched positions are assigned along card rows; for example, each row in an 80 column card may be used to represent 80 consecutive binary digits. *Contrast with:* column binary. *See also:* binary card.

3.1937 row pitch. The distance between corresponding points of adjacent rows measured along a track. *See also:* track pitch. [ANSI X3.138-1988]

3.1938 RPROM. Acronym for reprogrammable, programmable read-only memory. *See:* eraseable programmable read-only memory.

3.1939 RS-232. *See:* RS 232-C.

3.1940 RS-232-C. An EIA standard for asynchronous serial data communications between terminal devices, such as printers; computers; and communications equipment, such as modems. *Note:* This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment. Also known as EIA 232-D.

3.1941 RS-422-A. An EIA standard that specifies electrical characteristics for balanced transmission in which each of the main circuits has its own ground lead. Also known as EIA 422-A.

3.1942 RS-423-A. An EIA standard that specifies electrical characteristics for unbalanced circuits using common or shared grounding techniques. Also known as EIA 423-A.

3.1943 RS-449. An EIA standard that specifies cabling and connectors for RS-422-A and RS-423-A interfaces. Where RS-232-C was all inclusive, RS-449 is the equivalent connector and cabling specification. It references, in turn, RS-422-A and RS-423-A to specify voltage levels. Note. Within RS-449, control signals are typically

transmitted at RS-423-A levels, and clocks and data at RS-422-A. At lower speeds, RS-423-A may be substituted for RS-422-A for the clocks and data.

3.1944 RTL. **(1)** Acronym for register transfer language. **(2)** Acronym for resistor-transistor logic.

3.1945 RTT. Acronym for Round Trip Time.

3.1946 run. A single and continuous execution of a program by a computer.

3.1947 run-time. **(1)** The instant at which a computer program begins to execute. [IEEE Std 610.12-1990] **(2)** The period of time during which a computer program is executing. [IEEE Std 610.12-1990]

3.1948 RWM. Acronym for read/write memory.

3.1949 RZ(NP). Acronym for nonpolarized return-to-zero recording.

3.1950 RZ(P). Acronym for polarized return-to-zero recording.

3.1951 S/N ratio. Abbreviation for signal-to-noise ratio.

3.1952 safety ring. *See:* write-protect ring.

3.1953 sample-and-hold device. A device that senses and stores the instantaneous value of an analog signal. [ANSI X3.138-1988]

3.1954 sampling. The process of obtaining the values of a function for regularly or irregularly spaced distinct values of an independent variable.

3.1955 SASI. Acronym for Shugart Associates Systems Interface. *See:* small computer system interface.

3.1956 satellite computer. A processor connected locally or remotely to a larger central processor, and performing certain processing tasks. *See also:* remote computer system.

3.1957 saturation. **(1)** In a switching device or amplifier, the fully conducting state at which the device is passing the maximum possible current. *Note:* Most commonly used in reference to circuits containing bipolar or field-effect transistors. **(2)** In color graphics and printing, the amount of color in a specified hue. *Note:* The saturation affects the vividness of the image.

3.1958 save area. An area of main storage in which the contents of registers are saved. [ANSI X3.138-1988]

3.1959 scalable font. A font that can be scaled to produce characters in varying sizes. *See also:* derived font; outline font; vector font.

3.1960 scalar unit. An arithmetic unit that operates on one data element at a time. *Contrast with:* vector unit.

3.1961 scale factor. In an analog computer the multiplication factor necessary to transform problem variables into computer variables. *Note:* A problem variable is a variable appearing in the mathematical model of the problem. A computer variable is a dependent variable as represented on the computer.

3.1962 scan. To examine stored information sequentially, part by part. *See also:* interlaced scan; raster-scan; scanner.

3.1963 scan converter. A device on which a display can be written in refresh line-drawing mode and read out in raster scan mode.

3.1964 scan head. A head within a scanner that sweeps across the item being scanned and transmits the contents of that item to be processed by the scanner. *See also:* oscillating scan head.

3.1965 scanner. **(1)** A graphic input device that automatically digitizes images for input to a computer. *See also:* bar-code scanner; magnetic ink scanner; optical scanner; scan head. **(2)** Any device that is capable of scanning. *See also:* keyboard scanner.

3.1966 scanning. The process of examining information in a systematic manner.

3.1967 scatter read. A read operation in which data from an input record is placed into non-adjacent storage areas. *Contrast with:* gather write.

3.1968 scored card. A special card that contains one or more scored lines to facilitate precise folding or separation of certain parts of the card. *See also:* processable scored card; stub card. [ANSI X3.138-1988]

3.1969 scratchpad area (SPA). A portion of memory shared by a set of computer programs or processes for some special purpose. For example, memory used by two programs for interprocess communication. *Syn:* scratchpad RAM. [IEEE Std 610.5-1990a]

3.1970 scratchpad RAM. *See:* scratchpad area.

3.1971 scratchpad memory. A type of storage that is used for the temporary storage of intermediate data or pointers; as one would use a scratchpad.

3.1972 screen. *See:* display screen.

3.1973 screen font. A font designed for use on a display device. *Note:* Usually matches closely the font used when printing. *Contrast with:* printer font. *Syn:* graphical user interface font.

3.1974 SCSI. Acronym for small computer system interface.

3.1975 scuzzy. Colloquial pronunciation for "SCSI." *See:* small computer systems interface.

3.1976 search memory. *See:* associative memory.

3.1977 search time. **(1)** The time required to locate a particular item of data in a storage medium. **(2)** The time interval required for the read/write head of a rotating storage device to locate a particular record on a track corresponding to a given address or key. *See also:* rotational delay; seek time.

3.1978 second generation. A period during the evolution of electronic computers in which transistors were used to replace the first generation vacuum tubes. *Note:* Introduced in 1959, thought to have been the state of the art until the introduction of integrated circuits. *See also:* fifth generation; first generation; fourth generation; third generation.

3.1979 second-level address. *See:* indirect address; n-level address.

3.1980 secondary storage. A type of storage which is used to store information for extended periods, while still allowing for on-line access. *See also:* auxiliary storage; mass storage.

3.1981 section. **(1)** To divide a program into parts such that some portions reside in internal storage and others in auxiliary storage. *See also:* page. **(2)** One of the parts as in (1). **(3)** To divide a program or data into parts of varying lengths, known as sections, such that each section is placed in a main memory area of corresponding size, not necessarily contiguously or in logical order.

3.1982 seek. To position the head or access mechanism of a direct-access device to a specified location. *Syn:* position.

3.1983 seek time. The time it takes to position the head or access mechanism of a rotating storage device to a specified location. *Syn:* positioning time. *See also:* access time; search time.

3.1984 segmenting. A technique used in memory mapping whereby the address space is broken into several various-size blocks; physical addresses are obtained by biasing each of the individual segments.

3.1985 segment. On a magnetic drum or disk, one of a series of addressable segments within a track or a band on which information is stored. *See also:* cluster; hard sector; soft sector; storage element.

3.1986 selector channel. An input-output channel that can transfer data to or from only one peripheral device at a time. *See also:* multiplexer.

3.1987 selector pen. *See:* light pen. [IEEE Std 610.6-1991]

3.1988 self-adapting computer. A computer that can change its performance characteristics in response to its environment. [ANSI X3.138-1988]

3.1989 self-checking circuit. A circuit which is capable of withstanding a specified number of non-fatal failures while continuing to operate.

3.1990 self-organizing computer. A computer that can change its internal structure.

3.1991 self-repairing circuit. A circuit capable of automatically correcting for the effects of a failure so that the presence of the failure is not perceptible.

3.1992 self-testing circuit. A circuit in which for every signal line an error is detected for both stuck-at-zero and stuck-at-one failures.

3.1993 semi-random-access. A mode of data access that, in the search for the desired item, combines a form of direct access with a limited sequential search.

3.1994 semiconducting material. A solid material that conducts limited electric current by means of a small number of free electrons and additional electrons that can be freed from their local bonds by the addition of other elements or "doping." For example, silicon is a

semiconducting material. *Contrast with:* conducting material; insulating material. *See also:* hole.

3.1995 semiconductor. A device that is made of semiconducting material. For example: a diode, an integrated circuit, or a transistor.

3.1996 semiconductor storage. A type of storage whose elements are formed as solid state electronic components on an integrated circuit. *Contrast with:* core memory; magnetic storage.

3.1997 send channel. *See:* transmit channel.

3.1998 sense switch. A switch found on the front panel or console of a computer. *Note:* The computer can be programmed to check a switch and to take some action depending on whether the switch is on or off.

3.1999 sensing circuit. A circuit whose function is to detect the occurrence of some event at its input terminals.

3.2000 sensing station. *See:* read station.

3.2001 sensor-based system. An organization of components, including a computer, whose primary source of input is data from sensors and whose output can be used to control the related physical process being sensed.

3.2002 septet. A byte composed of seven bits. *Syn:* seven-bit byte. [ANSI X3.138-1988]

3.2003 sequence control register.* *See:* instruction address register.
* Deprecated.

3.2004 sequential. Pertaining to a circuit whose output values, at a given instant, depend upon its input values and internal state at that instant, and whose internal state depends upon the immediately preceding input values and the preceding internal state. *Contrast with:* combinational.

3.2005 sequential access. *See:* access.

3.2006 sequential access storage. A type of storage that provides only sequential access to data. For example, magnetic tape storage. *Syn:* serial access storage.

3.2007 sequential circuit. A logic circuit whose output values, at a given instant, depend upon its input values and internal state at that instant, and whose internal state depends upon the immediately preceding input values and the preceding internal state. *See also:* toggle; trigger circuit. *Contrast with:* combinational circuit.

3.2008 sequential computer. A computer in which events occur in time sequence, with little or no simultaneity or overlap of events. *Contrast with:* parallel computer; simultaneous computer. [ANSI X3.138-1988]

3.2009 sequential processing. *See:* serial processing.

3.2010 serial. One bit following another over a single pathway. *Contrast with:* parallel. *See also:* bit serial.

3.2011 serial access storage. *See:* sequential access storage.

3.2012 serial adder. An adder in which addition is performed by adding, digit place after digit place, the corresponding digits of the operands. *Contrast with:* parallel adder.

3.2013 serial computer. **(1)** A computer that has a single arithmetic and logic unit. [ANSI X3.138-1988] **(2)** A computer, some specified characteristic of which is serial; for example, a computer that manipulates all bits of a word serially. *Contrast with:* parallel computer. [ANSI X3.138-1988]

3.2014 serial interface. An interface that transmits data bit by bit rather than in whole bytes.

3.2015 serial mouse. A mouse that is connected to a computer system through a serial port. *Contrast with:* bus mouse.

3.2016 serial port. A port that transfers data one bit at a time. *Contrast with:* parallel port.

3.2017 serial printer. **(1)** A printer that receives its input data in the form of a serial stream of data. *Contrast with:* parallel printer. **(2)** *See:* character-at-a-time printer.

3.2018 serial processing. Pertaining to the sequential execution of processes in a single device, such as a processing unit or channel. *Contrast with:* parallel processing. *Syn:* sequential processing.

3.2019 serializer. A device that converts a set of simultaneous signals into a corresponding time sequence of signals. *Syn:* dynamicizer; parallel-serial converter. [ANSI X3.138-1988]

3.2020 servo amplifier. In an analog computer, an amplifier used as part of a servomechanism that supplies power to the electrical input terminals of a mechanical actuator.

3.2021 servo multiplier. An analog multiplier in which one variable is used to position one or more ganged potentiometers across which the other variable voltages are applied.

3.2022 servo potentiometer. A potentiometer driven by a positional servomechanism.

3.2023 servomechanism. **(1)** An automatic device that uses feedback to govern the physical position of an element; for example, a tracking servo. *See also:* positional servomechanism; rate servomechanism; repeater servomechanism; servo potentiometer. **(2)** A feedback control system in which at least one of the system signals represents mechanical motion. [ANSI X3.138-1988]

3.2024 session. The period of time during which a user of a terminal can communicate with an interactive system, usually equal to elapsed time between logon and logoff.

3.2025 set. To place a binary cell in the true or one state. *See also:* reset.

3.2026 settling time. **(1)** Following the initiation of a specified input signal to a system, the time required for the output signal to enter and remain within a specified narrow range centered on its steady-state value. *Note:* The input may be step, impulse, ramp, parabola, or sinusoidal signal. **(2)** In a hybrid computer, the time required after a load has been completed until the digital-to-analog converter or digital-to-analog multiplier output voltage is available within a given accuracy. *Syn:* switching time.

3.2027 seven-bit byte. *See:* septet.

3.2028 sextet. A byte composed of six bits. *Syn:* six-bit byte. [ANSI X3.138-1988]

3.2029 shaft recorder. A sensor that is attached to the wheels of an input device such as a mouse; used for delivering electrical pulses as the wheel rotates.

3.2030 shaped-character printer. *See:* formed-character printer.

3.2031 shift key. A control key that controls the interpretation of other keys. That is, when used in conjunction with another key, the representation of that other key is different from that of the key alone. *Note:* Often used to form uppercase characters. *See also:* alternate key.

3.2032 shift register. A register in which the data bits can be shifted in one direction or both; for example, if the contents are 11010010 and the register is shifted to the right, the result is x1101001; where x is a zero, one, or the bit shifted off the right end, depending on the type of shift register. *See also:* circulating register.

3.2033 short card. A special-purpose punch card that is shorter in length than a standard 80-column punch card; For example, a 51 column card.

3.2034 short packet. A packet with a length of less than 64 bytes. *Syn:* under-sized packet. *Contrast with:* long packet. [IEEE Std 610.7-1995]

3.2035 Shugart Associates System Interface (SASI). *See:* small computer systems interface.

3.2036 signal. **(1)** A variation of a physical quantity, used to convey data. [ANSI X3.138-1988] **(2)** A time-dependent value attached to a physical phenomenon and conveying data. [ANSI X3.138-1988]

3.2037 signal-to-noise ratio (S/N ratio). The ratio of relative power of the usable signal to the noise signal present, expressed in decibels. [IEEE Std 610.7-1995]

3.2038 sign-off. *See:* logoff.

3.2039 sign-on. *See:* login.

3.2040 silicon. **(1)** A semiconducting material used in many devices such as integrated circuits and solar cells that in its pure form is a lightweight metal resembling aluminum. **(2)** A colloquial reference to an integrated circuit.

3.2041 SIMD. Acronym for single instruction, multiple data.

3.2042 simple circuit. **(1)** A circuit permitting the transmission of signals in either direction, but not in both simultaneously. *Contrast with:* two-way circuit. **(2)** A circuit permitting the transmission of signals in one specific direction only.

3.2043 simulator. A device, computer program, or system that performs simulation. *Note:* IEEE Std 610.3-1989 defines terms relevant to simulation.

3.2044 simultaneous computer. A parallel computer that contains a separate processing unit to perform each portion of the computation concurrently, allowing the units to be interconnected in a manner determined by the computation. *Contrast with:* sequential computer. *See also:* parallel computer.

3.2045 simultaneous peripheral output on-line (spool). *See:* spool.

3.2046 single-address instruction. *See:* one-address instruction.

3.2047 single-cycle instruction. An instruction that is completely executed in one machine cycle.

3.2048 single instruction, multiple data (SIMD). Pertaining to a computer architecture in which all processors receive instructions from a common source but receive data from multiple, disjoint sources. *Contrast with:* multiple instruction, multiple data; single instruction, single data.

3.2049 single instruction, single data (SISD). Pertaining to a computer architecture in which the processors receive instructions from a common source and receive data from a common source. *See also:* multiple instruction, single data; single instruction, multiple data.

3.2050 single-level interrupt. A signal causing transfer of processor control to a preassigned memory location at which an interrupt processing routine starts. *Note:* The program must poll all possible sources of interrupt to determine which one requires service.

3.2051 single-operand instruction. *See:* one-address instruction.

3.2052 single processor architecture. A computer architecture that uses a single processor. *Contrast with:* multiprocessor architecture. *Syn:* monoprocessor.

3.2053 single-sheet feed. A mechanism enabling a printer to print on individual sheets of paper. *Note:* Usually uses friction feed. *See also:* cut-sheet feed. *Contrast with:* continuous-feed.

3.2054 single-sided (SS) disk. A floppy disk on which information can be stored reliably on only one side. *See also:* double-density disk. *Contrast with:* double-sided disk.

3.2055 SISD. Acronym for single instruction, single data.

3.2056 six-bit byte. *See:* sextet.

3.2057 skew. The angular or longitudinal deviation of a tape or disk track from a specified reference. [ANSI X3.138-1988]

3.2058 slave. An input-output device that is driven or controlled by a master unit.

3.2059 slot. *See:* expansion slot.

3.2060 small computer systems interface (SCSI, scuzzy). A data-transfer interface used to connect multiple peripheral devices, such as disk drives, tapes, or printers to computer systems while taking up only one slot in the computer. *Note:* Previously, this was known as Shugart Associates Systems Interface.

3.2061 small scale integration (SSI). **(1)** Pertaining to an integrated circuit containing less than 100 transistors in its design. *Contrast with:* large scale integration; medium scale integration; ultra large scale integration; very large scale integration. **(2)** Pertaining to an integrated circuit containing fewer than 10 elements.

3.2062 smart terminal. An intelligent terminal that is preprogrammed for a particular application, for example, a word processing workstation with integrated spell checking.

3.2063 SNA. Acronym for systems network architecture.

3.2064 soft error. A storage error in which the data retrieved is incorrect, but the storage cell may be rewritten and will still retain data correctly. *Contrast with:* hard error; transient error.

3.2065 soft font. *See:* downloadable font.

3.2066 soft limiting. A type of limiting characterized by time constant delayed variations in the output in the range where the output is subject to limiting. *Contrast with:* hard limiting.

3.2067 soft-sector. Pertaining to a magnetic disk that is segmented by recorded data marks on the disk; the location of a sector is determined by the distance from a magnetically or photoelectrically sensed starting mark, known as an index mark. *Note:* This can refer to either a floppy diskette or a hard disk but generally refers to the former, which has one punched hole, known as an index hole, which marks the first sector. *Contrast with:* hard-sector.

3.2068 software engine. An engine characterized by a self-contained software module that performs a set of low-level tasks when called by an application program; for example, a database engine or an inference engine.

3.2069 sonic delay line. *See:* acoustic delay line.

3.2070 sonic pen. A pick device that is sensitive to audio signals. *See also:* light pen. [IEEE Std 610.6-1991]

3.2071 sorter. *See:* card sorter.

3.2072 source address. The address of a device or storage location from which data is to be transferred. *Contrast with:* destination address. [IEEE Std 610.12-1990]

3.2073 source data card. A data card which contains manually or mechanically recorded data that are to be subsequently punched into the same card.

3.2074 SPA. Acronym for scratchpad area.

3.2075 space. The absence of a signal; for example, in data communications, the "zero's" state. *Contrast with:* mark.

3.2076 SPC. Acronym for stored program computer.

3.2077 special-purpose computer. A computer designed to solve a restricted class of problems. *Contrast with:* general-purpose computer. *See also:* dedicated computer; incremental computer.

3.2078 specific address. *See:* absolute address.

3.2079 speech synthesizer. An input-output device that can process or generate the sound of human speech. *See also:* voice-operated device.

3.2080 spindle. A device within a disk drive that maintains the axis of rotation and the force to rotate the disk.

3.2081 spool. **(1)** To read input data from, or write output data to, auxiliary or main storage for later processing or output, in order to permit input-output devices to operate concurrently with job execution. *Note:* Derived from the acronym SPOOL for Simultaneous Peripheral Operations On Line. [IEEE Std 610.12-1990] **(2)** Secondary storage used as an interim holding area for output waiting to be printed as in (1). **(3)** A cylinder without flanges on which tape may be wound. *Syn:* hub. *Contrast with:* reel. *See also:* bore.

3.2082 spot punch. A punch device used for punching one hole at a time into a punch card.

3.2083 sprite engine. A graphics controller that supports sprites; small, high-resolution objects that can be moved about the display surface.

3.2084 sprocket feed. *See:* tractor feed.

3.2085 sprocket hole. *See:* feed hole.

3.2086 sprocket track. *See:* feed track.

3.2087 SQL engine. A relational engine that accepts SQL commands and accesses the database in order to obtain the requested data.

3.2088 SS. Acronym for single-sided disk.

3.2089 SS/DD. Abbreviation for a single-sided, double-density disk.

3.2090 SSI. Acronym for small scale integration.

3.2091 ST-506 interface. A data-transfer interface used in many early personal computers with hard disk capacities less than 40MB; characterized by a 34-pin control cable, a 20-pin data cable and an modest data-transfer rate.

3.2092 stable. Pertaining to a state of a circuit in which the circuit will remain until an input signal causes a change to another state. *Contrast with:* unstable. *See also:* bistable; monostable.

3.2093 stack. An area in memory for the temporary storage of data. *Note:* Can be implemented using either last-in-first-out or first-in-first out. *See also:* evaluation stack. *Syn:* pushdown storage; pushup storage.

3.2094 stack architecture. A computer architecture whose design relies on a push-down stack to store data and process operands. *Contrast with:* register architecture. [efm]

3.2095 stack storage. *See:* pushdown storage.

3.2096 stand alone. Pertaining to a system that is self-contained and not connected to other systems or system components.

3.2097 standard. **(1)** A set of detailed technical guidelines, used as a means of establishing uniformity in an area of computing development. **(2)** Pertaining to the set

of guidelines, as in (1). For example, a standard interface or a standard definition. **(3)** An agreement among any number of organizations that defines certain characteristics, specification, or parameters related to a particular aspect of computer technology. For example, ANSI, ISO, and IEEE are standards-making bodies. *Note:* Such organizations may include industrial, academic, or governmental entities. **(4)** In software engineering, mandatory requirements employed and enforced to prescribe a disciplined uniform approach to software development, that is, mandatory conventions and practices are in fact standards. [IEEE Std 610.12-1990] *See also:* convention; de facto standard; language standard; standard language.

3.2098 standard language. Any language that conforms to an existing language standard. For example, ALGOL 60 and ALGOL 68 are considered standard languages. [IEEE Std 610.13-1993]

3.2099 start-stop tape drive. A tape drive capable of coming to a complete stop and restarting in the gap between two recorded data blocks. *Contrast with:* streaming tape drive.

3.2100 start time. *See:* acceleration time.

3.2101 state. The input to and information stored in a circuit or device. *Note:* A full description of the state of a device allows its future behavior to be predicted for any combination of inputs. *See also:* switching time; wait state.

3.2102 static magnetic cell. *See:* magnetic cell.

3.2103 static random-access memory (SRAM). A static form of random-access memory that does not require periodic refresh to retain data. *Contrast with:* dynamic random-access memory.

3.2104 static storage. A type of storage that does not require periodic refreshment for retention of data. *Contrast with:* dynamic storage. *See also:* static random-access memory.

3.2105 static test. The computer-control state that applies a predetermined set of voltages and conditions to the analog computer, allowing a static check to be performed.

3.2106 status. (1) The condition at a particular time of a system or system component. **(2)** Pertaining to the condition as in (1), for example a status bit containing a bit that represents the status of a system.

3.2107 status word. Together with the contents of the processor's registers, this defines the state or condition of the processor at any given moment. *Note:* If the processor is interrupted, it must save the status word so it can return to its former task.

3.2108 stick printer. An element printer in which a stick moves from left to right, printing one character at a time.

3.2109 stop instruction. A computer instruction that specifies the termination of the execution of a computer program. *See also:* pause instruction.

3.2110 stop time. *See:* deceleration time.

3.2111 storage. (1) The retention of data in a storage device. [ANSI X3.138-1988] **(2)** The action of placing data into a storage device. **(3)** A storage device. [ANSI X3.138-1988] **(4)** Any medium in which data can be retained. [ANSI X3.138-1988]

3.2112 storage access. *See:* access.

3.2113 storage capacitor. A low leakage capacitor on which a data value can be stored.

3.2114 storage capacity. The amount of data that can be contained in a storage device measured in binary characters, bytes, words, or other units of data.

3.2115 storage cell. (1) One or more storage elements considered as a unit. [182] **(2)** The smallest subdivision of storage into which a unit of data can be placed, retained, and with which the unit can be retrieved. *See also:* binary cell; magnetic cell. *Syn:* data cell.

3.2116 storage channel. A channel that can be used to access a storage device.

3.2117 storage device. A device into which data can be placed, in which they can be retained, and from which they can be retrieved. *See also:* store.

3.2118 storage display. *See:* storage tube display device.

3.2119 storage element. The basic unit of a storage device, such as a sector, or a track.

3.2120 storage error. An error in which the data retrieved from storage is different from that which was originally stored in that location. *See also:* hard error; soft error; transient error.

3.2121 storage integrator. In an analog computer, a device used to store a voltage in the hold condition for future use.

3.2122 storage light. A light found on a storage device indicating that a parity check error has occurred on a character as it was read into storage.

3.2123 storage location. A location in a storage device that is uniquely specified by means of an address.

3.2124 storage medium. *See:* medium; storage.

3.2125 storage tube display device. A type of cathode ray tube display device that retains a display image on its surface in the form of a pattern of electric charges. *Syn:* charge-storage tube; display storage tube; direct-view storage tube; storage display. *Contrast with:* refresh display device. [IEEE Std 610.6-1991a]

3.2126 store. **(1)** A device into which data can be placed, in which they can be retained, and from which they can be retrieved. *Note:* This term is the equivalent of the term storage in British (U.K.) usage. **(2)** To place data into a device as in (1). **(3)** To retain data in a device as in (1).

3.2127 stored program computer (SPC). A computer that is controlled by internally stored instructions that are treated as though they were data, and that can subsequently be executed.

3.2128 streamer. *See:* streaming tape drive.

3.2129 streaming cassette. A magnetic tape cassette for a streaming tape drive.

3.2130 streaming tape drive. A tape drive that does not come to a stop at each interrecord gap; rather the tape moves continuously past the read/write heads. *Note:* This type of tape drive is particularly appropriate for performing nonstop dumps or for restoring magnetic disks. *Contrast with:* start-stop tape drive. *Syn:* streamer.

3.2131 string device. An input device that is used to specify or detect a character string. For example, an alphanumeric keyboard.

3.2132 strip chart recorder. *See:* recorder.

3.2133 strobe. **(1)** A pulse used to cause a register to assume and retain the state indicated by its data inputs. **(2)** A pulse used as an input to a trigger circuit.

3.2134 stroke. **(1)** A straight line or arc that is a segment of a graphic character. *See also:* stroke font. [IEEE Std 610.6-1991] **(2)** *See:* keystroke.

3.2135 stroke device. An input device that provides a set of coordinates that record the path of the device.

3.2136 stroke font. *See:* vector font.

3.2137 stroker display. *See:* random-scan display device.

3.2138 stub card. A card that has a separable stub attached to a regular punch card. *Note:* May also be scored.

3.2139 stylus. A pointing device used with a data tablet as a locator. Examples include light pens, sonic pens, and voltage pencils. *See also:* twinkle box.

3.2140 substrate. The base material upon which or in which a transistor or integrated circuit is fabricated; for example, materials such as glass-ceramic or silicon oxide.

3.2141 subtract time. The elapsed time required to perform one subtraction operation, not including the time required to obtain the operands or to return the result to storage. *Contrast with:* add time; multiply time.

3.2142 subtracter. A device whose output data is the arithmetic difference of the two or more quantities presented as input data. *See also:* adder-subtracter; full subtracter; half subtracter. *Contrast with:* adder.

3.2143 summary punch. A card punch used to record data that were calculated or summarized by another device.

3.2144 summer. A device whose output analog variable is equal to the sum, or a weighted sum, of two or more input analog variables. *Syn:* analog adder. [ANSI X3.138-1988]

3.2145 summing amplifier. An operational amplifier whose output analog variable is the integral of a weighted sum of the input analog variables with respect to time or with respect to another input analog variable.

3.2146 summing junction. In an analog computer, the junction common to the input and feedback impedances used with an operational amplifier.

3.2147 super-large scale integration. *See:* very large scale integration; ultra large scale integration.

3.2148 supercomputer. Any of the group of computers that have the fastest processing speeds available at a given time.

3.2149 supervisor. The part of an operating system that coordinates the use of system resources and maintains the flow of processor operations.

3.2150 surface density. *See:* recording density.

3.2151 switch. **(1)** An electrical or mechanical device used for opening, closing, or changing the connection of a circuit. *See also:* DIP switch; display switch; function switch; relay; sense switch. *Syn:* switchpoint. **(2)** To open, close, or change the connection of a circuit as in (1). **(3)** A device used for making a selection, as in a toggle.

3.2152 switch core. A magnetic core in which the core material generally has a high residual flux density and a high ratio of residual to saturated flux density; Switching does not occur when the magnetic force imposed on the core is below a threshold value.

3.2153 switch indicator. **(1)** An indicator that shows the setting of a switch. **(2)** *See:* flag.

3.2154 switch register. A register made up of a number of manual switches, typically equal to the number of bits in the computer, and generally located on the computer control panel. *Note:* Used to manually enter addresses and data into main storage and to manually intervene in program execution.

3.2155 switching. The process of using a switch.

3.2156 switching computer. A communications computer designed to handle switching messages or packets in a network. [IEEE Std 610.7-1995] switching element.* *See:* gate.
* Deprecated.

3.2157 switching time. **(1)** The time required for a device to change from one state to another. **(2)** *See:* settling time.

3.2158 switchpoint. *See:* switch.

3.2159 symbolic address. An address, expressed in symbols convenient to the computer programmer, that will be translated to an absolute or virtual address before it can be interpreted by the computer.

3.2160 symbolic addressing. An addressing mode in which the address field of an instruction contains a symbolic address.

3.2161 symbolic processor. **(1)** A computer which manipulates data at the algorithm level, typically not reducing computed equation values to a numerical resultant value. **(2)** A processor optimized to manipulate character strings and other symbolic data. *Note:* This is often done in the LISP or Prolog programming languages.

3.2162 symmetric channel. *See:* binary symmetric channel; symmetrical channel.

3.2163 symmetric multiprocessor. A multiprocessor system in which each processor is equal to all others. *Contrast with:* asymmetric multiprocessor.

3.2164 symmetrical channel. One of a pair of channels in which the transmit and receive directions of transmission have the same data signaling rate.

3.2165 synchronization bit. One or more bits that are added to a string of data to allow a receiving circuit to align its clocks with the data. *See also:* clock track.

3.2166 synchronous circuit. A circuit in which clock pulses synchronize the operations of the elements. *Contrast with:* asynchronous circuit.

3.2167 synchronous computer. A computer in which each event, or the performance of each operation, starts as a result of a signal generated by a clock. *Contrast with:* asynchronous computer. [ANSI X3.138-1988]

3.2168 synthetic benchmark program. A benchmark program that consists of a small program constructed especially for benchmarking purposes, but does not necessarily perform any useful function.

3.2169 sysgen. Abbreviation for system generation.

3.2170 system generation (sysgen). The process of using an operating system to assemble and link together all the parts that constitute another operating system.

3.2171 system production time. The part of operating time that is actually used by a user. *Contrast with:* system test time.

3.2172 system test time. The part of operating time during which the computer is tested for proper system operation. *Contrast with:* system production time.

3.2173 systems network architecture (SNA). A network architecture used widely by IBM and its compatible products for transmitting information units through and controlling the configuration and operation of a network. [IEEE Std 610.7-1995]

3.2174 tablet. *See:* acoustic tablet; data tablet; graphic tablet.

3.2175 tabulator. A device that reads data from some medium such as punch cards or punched tape, and which produces lists, totals, or calculations.

3.2176 tagged architecture. A computer architecture in which each word is "tagged" as either an instruction or a unit of data. *Contrast with:* Von Neumann architecture.

3.2177 tape. *See:* carriage controlled tape; chadless tape; magnetic tape; perforated tape; punch tape.

3.2178 tape deck.* *See:* tape drive.
* Deprecated.

3.2179 tape drive. **(1)** An input device that reads magnetic tape. *Contrast with:* disk drive. **(2)** A mechanism for moving magnetic tape and controlling its movement. *Note:* This mechanism is used to move magnetic tape past a read head or write head, or used to allow automatic rewinding. *Syn:* magnetic tape drive; transport. *See also:* hypertape drive; incremental tape drive.

3.2180 tape frame. *See:* tape row.

3.2181 tape punch. A punch device that produces a record of data, in the form of hole patterns, on a punch tape.

3.2182 tape reproducer. A device that prepares one tape from another tape by copying all or part of the data from the tape that is read. [ANSI X3.138-1988]

3.2183 tape row. A group of binary characters recorded or sensed in parallel on a line perpendicular to the reference edge of a tape. *Syn:* tape frame. *See also:* row pitch; skew. [ANSI X3.138-1988]

3.2184 tape station.* *See:* tape drive.
* Deprecated.

3.2185 tape transport.* *See:* tape drive.
* Deprecated.

3.2186 tape unit.* *See:* tape drive.
* Deprecated.

3.2187 taxonomy. A scheme that partitions a body of knowledge and defines the relationships among the pieces. It is used for classifying and understanding the body of knowledge. [IEEE Std 610.12-1990]

3.2188 TB. Abbreviation for terabyte.

3.2189 telecommunication circuit. A circuit that is designed to handle remote transmission of information. *See also:* wideband circuit. [IEEE Std 610.7-1995]

3.2190 telecopier. A device used for facsimile transmission.

3.2191 teleprinter. **(1)** *See:* printer. **(2)** *See:* teletypewriter.

3.2192 teletypewriter (TTY). **(1)** A generic term used to refer to any device consisting of a printer and a keyboard. **(2)** The typewriter-like device at one end of a telegraph line. *Syn:* teleprinter.

3.2193 temporary storage. Storage locations reserved for intermediate results. *Syn:* working storage.

3.2194 terminal. **(1)** An input-output peripheral device capable of transmitting entries to and obtaining output from a system. *See also:* channel-attached terminal; dumb terminal; facsimile terminal; graphic user terminal; input terminal; intelligent terminal; job-oriented terminal; link-attached terminal; local terminal; logical terminal; master terminal; output terminal; remote terminal; smart terminal; video display terminal. **(2)** Any point in a system or communication network at which data can either enter or leave.

3.2195 test instruction. A computer instruction that checks the condition of data and sets status or overflow flag bits for a subsequent branch instruction. For example:

```
test x (sets flag to zero, negative or
   overflow, depending on value of x)
branch p (if flag is TRUE, then branch to p)
n:      ....
p:
```

3.2196 text-based user interface. *See:* character-based user interface.

3.2197 thermal printer. A nonimpact printer in which the characters are produced by applying heated elements to heat-sensitive paper directly or by melting ink from a ribbon onto normal paper. *Syn:* thermal transfer printer. [ANSI X3.138-1988]

3.2198 thermal transfer printer. *See:* thermal printer.

3.2199 thermochromeric. Pertaining to heat-sensitive materials that change color when heated to different temperatures.

3.2200 thermochromeric display device. A display device that uses thermochromeric materials to form images on the display surface.

3.2201 thermographic printer. A nonimpact printer that creates images on paper through heat impressions.

3.2202 thimble. A print element shaped like a sewing thimble, used for letter quality printing, with type slugs arranged around its perimeter.

3.2203 thin film. *See:* magnetic thin film.

3.2204 thin film storage.* *See:* magnetic thin film storage.
* Deprecated.

3.2205 third generation. A period during the evolution of electronic computers in which integrated circuits, core memory technology and miniaturized components replaced transistors and discrete passive components. *Note:* Introduced in 1964, thought to have been the state of the art until the introduction of large scale integration, as is found in many microcomputers. *See also:* fifth generation; first generation; fourth generation; second generation.

3.2206 third-level address. *See:* n-level address.

3.2207 three-address instruction. An instruction containing three addresses. *See also:* address format. *Syn:* triple-address instruction.

3.2208 three-bit byte. *See:* triplet.

3.2209 three-input adder. *See:* full adder.

3.2210 three-level address. *See:* n-level address.

3.2211 three-plus-one address instruction. *See:* address format.

3.2212 three-state circuit. A digital circuit which has three output states: logical one (false), logical zero (true) and a high impedance output to isolate itself from the circuit.

3.2213 threshold element. *See:* threshold gate.

3.2214 threshold function. A two-value switching function of one or more not necessarily Boolean arguments that take the value 1 if a specified mathematical function of the arguments exceeds a given threshold value, and zero otherwise. *See also:* threshold operation.

3.2215 threshold gate. A combinational circuit that performs a threshold operation. *Syn:* threshold element. [ANSI X3.138-1988]

3.2216 threshold operation. An operation that evaluates the threshold function of the operands. *See also:* majority operation.

3.2217 thumbwheel. An input device consisting of a dial or wheel, inset into a surface so that only a portion of its rim protrudes, that can be moved in one degree of freedom to provide coordinate input data. *Note:* It is usually used in pairs to control the display of crosshairs on a graphics display surface. [IEEE Std 610.6-1991]

3.2218 time. **(1)** The measured or measurable period during which an action, process, or condition exists or continues. **(2)** The instant at which an event occurs.

3.2219 time base. A stable, periodic signal, usually a square wave, used to synchronize and to provide power to circuits.

3.2220 time delay. **(1)** The time interval between the manifestation of a signal at one point and the manifestation or detection of the same signal at another point. *Syn:* transport delay. *See also:* propagation delay. [IEEE Std 610.7-1995] **(2)** A time interval purposely introduced in the performance of a function.

3.2221 time delay register. *See:* delay line storage.

3.2222 time-multiplexed bus. A bus which uses time-division multiplexing techniques to share its data paths between a number of devices.

3.2223 time-of-day clock. A clock that indicates the actual time of the day. *Syn:* real-time clock. *See also:* wall clock.

3.2224 time out.* *See:* time-out.
* Deprecated.

3.2225 time-out. A condition that occurs when a predetermined amount of time elapses without the occurrence of an expected event. For example, the condition that causes termination of an on-line process if no user input

is received within a specified period of time. [IEEE Std 610.12-1990]

3.2226 time register. *See:* timer.

3.2227 time sharing. A mode of operation that permits two or more users to execute computer programs concurrently on the same computer system by interleaving the execution of their program. *Note:* Time sharing may be implemented by time slicing, priority-based interrupts, or other scheduling methods. [IEEE Std 610.12-1990]

3.2228 time skew. **(1)** In a conversion from analog to digital, the time difference between the conversion of one analog channel and any other analog channel, such that the converted (digital) representations of the analog signals do not correspond to values of the analog variables that existed at the same instant of time. **(2)** The time interval between two events which are intended to be simultaneous.

3.2229 timer. A register or storage location whose value is changed at regular intervals in such a manner as to measure time. *Syn:* clock register, time register. *See also:* interval timer; watchdog timer.

3.2230 timing pulse. *See:* clock signal.

3.2231 timing track. *See:* clock track.

3.2232 toggle. **(1)** *See:* flip-flop. **(2)** The action of changing state in a sequential circuit.

3.2233 touch panel. A touch-sensitive input device that allows users to interact with a computer system by touching an area on the panel. *See also:* touch screen.

3.2234 touch screen. A display screen equipped with a touch panel in front of it such that users may interact with a computer system by touching an area on the panel. *See also:* touch panel.

3.2235 touch-sensitive. Pertaining to an input device that can detect when a user touches its surface with a finger, pencil or other object. *See also:* light-sensitive.

3.2236 track. **(1)** A path that is to be followed. For example, the track followed by the read or write head in a storage device during access to a storage medium. *See also:* address track; alternate track; band; card track; clock track; feed track; recording density; regenerative track; storage element. **(2)** One consecutive stream of recorded data on a storage medium.

3.2237 track and hold unit. A device whose input analog variable is equal to either the input analog variable or a sample of this variable selected by the action of an external Boolean signal. *Syn:* track and store unit; track store.

3.2238 track and store unit. *See:* track and hold unit.

3.2239 track ball. An input device consisting of a ball, rotatable about its center and recessed into a surface, used as a locator. *Syn:* control ball.

3.2240 track density. The number of tracks per unit length of a data medium, measured in a direction perpendicular to the tracks. *See also:* recording density; track pitch.

3.2241 track pitch. The distance between adjacent tracks, measured in a direction perpendicular to the tracks. *See also:* row pitch; track density. [ANSI X3.138-1988]

3.2242 track store. *See:* track and hold unit.

3.2243 tracking servo. **(1)** A servomechanism that allows a device to follow the path of a target; for example, a telescope or a radar device. **(2)** A mechanism in a rotating storage device that keeps the head centered on a track by following recorded signals on the medium.

3.2244 tractor feed. A method for feeding paper or preprinted forms into a printer using an attachment that guides the paper using advancing sprockets that fit into specially prepared guide holes in the paper. *Syn:* form feed; pin feed; sprocket feed. *Contrast with:* friction feed.

3.2245 traffic. **(1)** Messages that are transmitted and received over a communication channel. **(2)** A quantitative measure of network load. *Note:* Generally refers to the packet transmission rate, frames/second or frames/hour.

3.2246 trailer. The portion of tape that follows the end-of-tape marker. *Contrast with:* leader.

3.2247 trailer card. A punch card that contains information identifying data on the preceding cards. *Note:* Usually the last card in a deck of cards. *Contrast with:* header card.

3.2248 trailer label. *See:* end-of-file label.

3.2249 train printer. An impact printer in which the type slugs are moved around on a circular track,known as a print train.

3.2250 transducer. A device for converting energy from one form to another.

3.2251 transfer function. The relationship between the input and output signals of a circuit, especially when expressed as a continuous mathematical function.

3.2252 transfer interpreter. A device that prints on a punch card the characters corresponding to hole patterns punched in another card. *See also:* interpreter.

3.2253 transfer time. The part of access time attributed to the time between the beginning of a transfer of data to or from storage and its completion.

3.2254 transformer. An inductive electrical device which uses electromagnetic energy to transform voltage and current levels within a circuit.

3.2255 transient error. A storage error in which data is retrieved incorrectly by the first read operation, but a second read operation is successful. *Contrast with:* hard error; soft error.

3.2256 transistor. A semiconducting device for controlling the flow of current between two terminals, the emitter and the collector, by means of variations in the current flow between a third terminal, the base, and one of the other two. *See also:* logic gate.

3.2257 transistor equivalent. **(1)** A model approximating the behavior of an electronic component using only transistors, resistors, capacitors and inductors. **(2)** An approximation of the size of an integrated circuit, counting all circuit elements as transistors or portions thereof.

3.2258 transistor-transistor logic (TTL). A family of bipolar integrated circuit logic in which the multiple inputs on gates are provided by multiple transistors.

3.2259 translation buffer. A set of registers in a memory management unit in which virtual addresses are converted to physical addresses. *Note:* Typically the complete map of translations will not fit into the memory management unit at one time so only a portion are buffered there while the entire map is in main storage.

3.2260 transmission. The propagation of a signal, message, or other form of intelligence by any means, such as radio, optical fiber, wire, or visual means.

3.2261 transmission media. The physical facility utilized for the interconnection and transmission of messages between a user station and network device; For example, twisted pair wire, coaxial cable, optical fiber, microwave, and infrared light beams. [IEEE Std 610.7-1995]

3.2262 transmit channel. A channel used within a data circuit to transmit data. *Contrast with:* receive channel. *Syn:* send channel.

3.2263 transparent latch. A latch that has a level sensitive trigger input such that when the trigger signal is in the 'enable' state the outputs follow the inputs, and when the trigger signal goes to the 'latch' state the outputs retain the data then at the inputs.

3.2264 transport. *See:* tape drive.

3.2265 transport delay. *See:* time delay.

3.2266 transportable computer. A personal computer that weighs more than 21 pounds, yet is designed and configured to permit easy transportation. *See also:* portable computer.

3.2267 tree machine. A multiprocessor whose processing elements are connected in an n-ary tree arrangement.

3.2268 trigger. **(1)** To cause a circuit or device to change state or to perform some other operaton. *See also:* clock. **(2)** A signal that causes a circuit or device to change state as in (1).

3.2269 trigger circuit. A sequential circuit that has a number of states, at least one of which is stable, and has one or more inputs that allow external signals to force a change of state. *See also:* flip-flop; multivibrator; strobe.

3.2270 triple-address instruction. *See:* three-address instruction.

3.2271 triple-length register. Three registers that function as a single register. *Note:* Typically used in display controllers to store x, y, z information. *Syn:* triple register. *See also:* double-length register; n-tuple length register; quadrulple-length register.

3.2272 triple register. *See:* triple-length register.

3.2273 triplet. A byte composed of three bits. *Syn:* three-bit byte. [ANSI X3.138-1988]

3.2274 true time. *See:* real time.

3.2275 truth table. An operation table for a logic operation.

3.2276 TTL. Acronym for transistor-transistor logic.

3.2277 TTY. Acronym for teletypewriter. *See:* teleprinter.

3.2278 tube. A generic term for any kind of vacuum or electron tube. *See:* cathode ray tube display device; Nixie tube display device; storage tube display device.

3.2279 turnaround time. The elapsed time between the submission of a job and the return of the completed output. [ANSI X3.138-1988]

3.2280 turnkey system. A complete computer system that is fully operational and supplied to the user in a ready-to-run condition.

3.2281 twelve punch. A zone punch in punch row twelve (top row) of a twelve-row punch card. *Syn:* Y punch. *See also:* eleven punch; zone punch.

3.2282 twelve-row punch card. A punch card with twelve rows.

3.2283 twinkle box. An input device employing light sensors, rotating disks, and a stylus, used to measure three-dimensional positions by angular light sensing.

3.2284 two-address instruction. An instruction containing two addresses. *See also:* address format. *Syn:* double-address instruction

3.2285 two-bit byte. *See:* doublet.

3.2286 two-input adder. *See:* half adder.

3.2287 two-level address. *See:* indirect address; n-level address.

3.2288 two-plus-one address format. *See:* address format.

3.2289 two-quadrant multiplier. A multiplier in which the multiplication operation is restricted to a single sign of one input variable. *Contrast with:* four-quadrant multiplier; one-quadrant multiplier.

3.2290 two-rail logic. *See:* double-rail logic.

3.2291 two-way circuit. A circuit in which the transmission of signals is permitted in both directions. *Contrast with:* simple circuit.

3.2292 two-wire circuit. A circuit formed by a pair of conductors that are insulated from one another and that each feed a load in one direction at a time.

3.2293 type bar. In a bar printer, a print element in the form of a bar that holds type slugs. *Syn:* print bar. [ANSI X3.138-1988]

3.2294 type element. *See:* print element.

3.2295 type font. *See:* font.

3.2296 type slug. A type element, usually with two characters arranged one above the other, for mounting on a type bar.

3.2297 type wheel. *See:* print wheel.

3.2298 typewriter key. *See:* typing key.

3.2299 typing key. Any key on a keyboard that represents a printable character, an alphanumeric or special character. *Syn:* typewriter key. *Contrast with:* control key.

3.2300 UI. Acronym for unscheduled interrupt.

3.2301 ULSI. Acronym for ultra large scale integration.

3.2302 ultra large scale integration (ULSI). **(1)** Pertaining to an integrated circuit containing more than 106 transistors in its design. *Contrast with:* large scale integration; medium scale integration; small scale integration; very large scale integration. **(2)** Pertaining to an integrated circuit containing more than 106 elements.

3.2303 unavailable time. The time during which a device cannot be accessed or used. *Contrast with:* available time.

3.2304 unbalanced. Pertaining to a relationship between two or more objects that are not alike or unsymmetrical in some respect. *Contrast with:* balanced.

3.2305 unconditional jump instruction. A computer instruction that specifies an unconditional jump. *Contrast with:* conditional jump instruction.

3.2306 under-sized packet. *See:* short packet.

3.2307 uniprocessor. **(1)** A computer that can execute only one program at a time. *Contrast with:* multiprocessor. **(2)** A computer system with one central processing unit.

3.2308 unit. A portion of a computer that constitutes the means of accomplishing some inclusive operation or function as; for example, an arithmetic unit. *See also:* arithmetic unit; control unit; execution unit; functional unit; logic unit; processing unit.

3.2309 unloading amplifier. An amplifier that is capable of reproducing or amplifying a given voltage signal while drawing negligible current from the voltage source. *Note:* The term buffer amplifier is sometimes used as a synonym for unloading amplifier, in an incorrect sense, since a buffer amplifier draws significant current, but at a constant load impedance (seen at the input).

3.2310 unloading circuit. In an analog computer, a circuit that is capable of reproducing or amplifying a given voltage signal while drawing negligible current from the voltage source, thus eliminating possible load errors.

3.2311 unprotected field. On a display device, a field in which a user can enter, modify or erase data. *Contrast with:* protected field.

3.2312 unscheduled interrupt (UI). An interrupt caused by the occurrence of an event within the computer that is not associated with normal functional operation. *See also:* duration of an unscheduled interrupt.

3.2313 unstable. Pertaining to circuit or device in which the circuit will remain for a limited time, after which the circuit will change to another state without any external stimulus. *Note:* Often used to describe an undesirable or unexpected circuit behavior. *Contrast with:* stable.

3.2314 up. A colloquial expression used in reference to a system or system component that is functioning and ready to use. *Contrast with:* down.

3.2315 up time. The time during operation in which a functional unit will yield correct results. *Syn:* available time; operable time. *Contrast with:* down time. *See also:* idle time; miscellaneous time; operating time.

3.2316 upward compatible. Pertaining to hardware or software that is compatible with a later or more complex version of itself; for example, a new version of a program that handles files created by an earlier version of that program is said to be "upwardly compatible." *Contrast with:* downward compatible. [IEEE Std 610.12-1990a]

3.2317 user. One who uses the services of a computer system. [IEEE Std 610.2-1987]

3.2318 user-definable key. A function key on a keyboard that initiates operations or functions that have been defined by the user by programming the terminal or keyboard. *Syn:* programmable function key; user-programmable key.

3.2319 user interface. An interface that enables information to be passed between a human user and the hardware or software components of a computer system. *See also:* character-based user interface; graphical user interface. *Syn:* human interface. [IEEE Std 610.12-1990a]

3.2320 user-programmable computer. A computer that can be programmed by the user. *Contrast with:* fixed-instruction computer. *See also:* microprogrammable computer.

3.2321 user-programmable key. *See:* user-definable key.

3.2322 user terminal. An input-output device by which a user communicates with a computer. [ANSI X3.138-1988]

3.2323 V-channel metal-oxide semiconductor (VMOS). A type of n-channel metal-oxide semiconductor in which a V-shaped notch is used to increase the density.

3.2324 V-series. CCITT recommendations describing the connection of digital equipment to the analog public telephone network.

3.2325 vacuum column. In a tape drive, a cavity in which a low air pressure is maintained so as to attract a tape loop between the spool and the driving mechanism.

3.2326 valuator. **(1)** An input device that provides a scalar value; for example, a thumb wheel or a potentiometer. **(2)** A logical input device used to input a scalar value in a graphics system. *Note:* A corresponding physical device is a control dial. [IEEE Std 610.6-1991]

3.2327 variable address. *See:* indexed address.

3.2328 vary off. To make a device, control unit, or line unavailable for its normal intended use. *Contrast with:* vary on.

3.2329 vary off-line. To place a device in a state where it is not available for use by the system. *Contrast with:* vary on-line.

3.2330 vary on. To make a device, control unit, or line available for its normal intended use. *Contrast with:* vary off.

3.2331 vary on-line. To restore a device to a state where it is available for use by the system. *Contrast with:* vary off-line.

3.2332 VDT. **(1)** Acronym for video display terminal. **(2)*** Acronym for visual display terminal. *See:* video display terminal.
* Deprecated.

3.2333 VDU. Acronym for video display unit. *See:* video display terminal.

3.2334 vector display device. *See:* random-scan display device.

3.2335 vector font. A scalable font that is stored as a series of geometric objects such as line or curve segments. *Syn:* raster font. *See also:* bit map font; outline font.

3.2336 vector graphics. Graphics terms are defined in IEEE Std 610.6-1991. *See:* random-scan display device.

3.2337 vector processor. *See:* array processor.

3.2338 vector unit. An arithmetic unit that operates on multiple data elements at the same time. *Contrast with:* scalar unit.

3.2339 verge-punched card. *Syn:* edge-punched card.

3.2340 vertical feed. Pertaining to the motion of a punch card along a card feed path with the short edge first. *Contrast with:* horizontal feed.

3.2341 vertical magnetic recording. *See:* perpendicular magnetic recording.

3.2342 vertical microinstruction. A microinstruction that specifies one of a sequence of operations needed to carry out a machine language instruction. *Contrast with:* diagonal microinstruction; horizontal microinstruction

3.2343 vertical tabulation. **(1)** On an impact printer or typewriter, movement of the imprint position to another writing line. **(2)** On a display device, movement of the cursor to another display line. *Contrast with:* horizontal tabulation

3.2344 vertically integrated microprocessor. A microprocessor in which vertical microinstructions can be performed. *Contrast with:* horizontally integrated microprocessor.

3.2345 very large scale integration (VLSI). **(1)** Pertaining to an integrated circuit containing between 2×104 and 106 transistors in its design. *See also:* large scale integration; medium scale integration; small scale integration; ultra large scale integration. **(2)** Pertaining to an integrated circuit containing between 5000 and 106 elements.

3.2346 very long instruction word (VLIW). An instruction word of uniform length, in excess of 128 bits.

3.2347 very-high-speed integrated circuit (VHSIC). An integrated circuit designed to operate at extremely high speeds.

3.2348 VHSIC. Acronym for very-high-speed integrated circuit.

3.2349 video board. *See:* graphics adapter.

3.2350 video disk. An optical disk used to store visual images that are to appear on a display device.

3.2351 video display.* *See:* video display terminal.
* Deprecated.

3.2352 video display device. *See:* display device; video display terminal.

3.2353 video display terminal (VDT). A terminal in which a CRT, liquid-crystal, or plasma display device is used for the visual presentation of data. *Syn:* video display unit; video terminal.

3.2354 video display unit (VDU). *See:* video display terminal.

3.2355 video monitor.* *See:* video display terminal.
* Deprecated.

3.2356 video RAM (VRAM). **(1)** A special type of RAM used to hold and transfer an image onto a display

device. *See also:* image memory. **(2)** A dual-port semiconductor memory that is specially designed for raster display devices. *Note:* One port is connected directly to the processor; the other to the display device.

3.2357 video terminal. *See:* video display terminal.

3.2358 video unit.* *See:* video display terminal.
* Deprecated.

3.2359 virgin medium. A data medium on which neither marks of reference, nor user data, are or have ever been recorded; for example, paper that is unmarked, or magnetic tape that has never recorded information. *See also:* blank medium; empty medium.

3.2360 virtual address. In a virtual storage system, the address of a storage location. *See also:* address translator; direct reference address; physical address.

3.2361 virtual address space. The set of all possible virtual addresses that a process can use to identify an instruction.

3.2362 virtual disk. *See:* RAM disk.

3.2363 virtual storage. The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. *Note:* The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage allocated to such use, but not by the actual number of main storage locations.

3.2364 visual display terminal.* *See:* video display terminal.
* Deprecated.

3.2365 visual display unit (VDU).* *See:* video display terminal.
* Deprecated.

3.2366 visual scanner.* *See:* optical scanner.
* Deprecated.

3.2367 visual terminal.* *See:* video display terminal.
* Deprecated.

3.2368 VLIW. Acronym for very long instruction word.

3.2369 VLSI. Acronym for very large scale integration.

3.2370 VMOS. Acronym for V-channel metal-oxide semiconductor.

3.2371 voice-coil actuator. An access arm that moves the head in relation to a magnetic field produced by a coil of wire in the manner of a speaker voice coil.

3.2372 voice-operated device. A device that can be controlled by human speech commands. *See also:* speech synthesizer.

3.2373 volatile storage. A type of storage in which information cannot be retained without continuous power application. *Contrast with:* nonvolatile storage.

3.2374 voltage gradient stylus. *See:* voltage pencil.

3.2375 voltage pencil. A stylus whose position is detected by voltage ratios measured on a resistive grid. *Syn:* voltage gradient stylus.

3.2376 volume. **(1)** A data carrier that is mounted and demounted as a unit; for example, a spool of magnetic tape, or a disk pack. **(2)** A storage medium, together with its data carrier, that can be handled conveniently as a unit; for example, a reel of magnetic tape or a disk pack. **(3)** The portion of a single unit of storage that is accessible to a single read/write head.

3.2377 volume header. *See:* beginning-of-volume label.

3.2378 volume label. *See:* beginning-of-volume label.

3.2379 Von Neumann architecture. A computer architecture characterized by a processor, memory and input-output devices interconnected with a single bus, thus allowing a single path to main storage for instructions and data. *Note:* This is the classic architecture and the basis for most modern computers. *Contrast with:* Harvard class architecture; tagged architecture. *Syn:* control flow architecture.

3.2380 voter. *See:* voting circuit.

3.2381 voting circuit. A logic circuit whose result is true only if the number of its inputs in the true state exceeds a predetermined amount. *Syn:* voter.

3.2382 voting computer. A fault tolerant computer with three or more processing elements, all computing the same operation, the final output of which is produced by the majority of the elements.

3.2383 VRAM. *See:* video RAM.

3.2384 wait state. A condition in which a device or component is idle; for example, a central processor that is waiting for some event and not executing instructions.

3.2385 wall clock. A clock that is on the wall. *Note:* A wall clock is typically referred to in order to demonstrate the difference between system time and real time. *Syn:* wall time. *See also:* time-of-day clock.

3.2386 wall time. *See:* wall clock.

3.2387 watchdog timer. A timer that prevents a computer program from looping endlessly or becoming idle because of program errors or equipment faults. *Note:* this is typically implemented by resetting the computer if the timer is not refreshed often enough.

3.2388 WCS. Acronym for writable control store.

3.2389 wheel printer. An element printer in which a set of type slugs, carried on the rim of a print wheel, is made available for each printing position. *See also:* daisy wheel printer.

3.2390 Williams-tube storage. A type of electrostatic storage that employs a cathode-ray tube.

3.2391 Winchester disk. A hard disk in which the magnetic heads and platter are contained within a sealed unit so that contaminants such as dust particles cannot interfere with the close tolerance between the disk and the head. *Note:* The entire assembly may be removable or fixed.

3.2392 window. In applications and graphical user interfaces, a defined portion of the display screen that is separated by a frame from the rest of the screen and which may be opened, closed, resized, and moved.

3.2393 wire printer. *See:* dot matrix printer.

3.2394 wire storage.* *See:* plated wire storage.
* Deprecated.

3.2395 wire-wrapped board. A circuit board in which electrical connections between components are accomplished by wrapping wire around contact posts on the board. *Contrast with:* printed circuit board.

3.2396 wired OR. A technique employed in circuit design in which separate circuits are connected to a common point so that the combination of their outputs results in an OR function, that is, the point at which the circuits are wired together will be true if any circuit feeding it is true.

3.2397 wiring panel. *See:* patch bay.

3.2398 word. A character string or bit string that is considered to be an entity for some purpose. *See also:* alphabetic word; bit; computer word; index word; instruction word; parameter word; status word.

3.2399 word length. The number of characters or bits in a word. [ANSI X3.138-1988]

3.2400 word mark. A mark that indicates the beginning or end of a word. *Note:* Used when word length is not fixed by the architecture but can vary under software control.

3.2401 word-organized storage. A type of storage in which data can be stored or from which data can be retrieved in units of computer words.

3.2402 word time. In a storage device that provides serial access to storage locations, the time interval between the appearance of corresponding parts of successive words.

3.2403 working area. *See:* working space

3.2404 working space. That portion of main storage that is assigned to a computer program for temporary storage of data. *Syn:* working area; working storage; working store. [IEEE Std 610.12-1990]

3.2405 working storage. **(1)** *See:* working space. **(2)** *See:* temporary storage.

3.2406 working store. *See:* working space.

3.2407 workstation. **(1)** An input-output device employed to perform applications such as data processing, software development, or computer-aided design. *See also:* data input station. [IEEE Std 610.2-1987a] **(2)** A single-user computer system that is dedicated to a particular task. *Note:* This term is commonly used in reference to an extremely powerful personal computer. *See also:* diskless workstation.

3.2408 WORM. **(1)** Acronym for write-once/read-many. **(2)** Acronym for write-once/read-mostly. *See:* write-once/read-many. **(3)** Acronym for write-once/read-multiple. *See:* write-once/read-many.

3.2409 WORM drive. A disk drive that uses write-once/read-many technology to store and retrieve data.

3.2410 write. To record data in a storage device or on a data medium. *See also:* delete; gather write; read; read/write; rewrite. [IEEE Std 610.12-1990]

3.2411 write-after-read. To write recently-read data back into storage after completion of the read cycle in order to prevent data loss. *Note:* Some media lose data by the mere act of being read and must be rewritten with the data.

3.2412 write cycle. A cycle in which data are transferred to some storage location from the device that requested the write. *Contrast with:* read cycle.

3.2413 write cycle time. The minimum time interval between the starts of successive write cycles of a storage device that has separate reading and writing cycles. *Contrast with:* read cycle time. [ANSI X3.138-1988]

3.2414 write-enable ring. *See:* write ring.

3.2415 write head. A head capable of writing information on the medium. *Contrast with:* read head; read/write head.

3.2416 write-once/read-many (WORM). Pertaining to a storage medium which, once written to, cannot be changed or updated. *Syn:* write-once/read-many; write-once/read-multiple. *Contrast with:* read-only.

3.2417 write-once/read-mostly (WORM). *See:* write-once/read-many.

3.2418 write-once/read-multiple (WORM). *See:* write-once/read-many.

3.2419 write-protect label. A removable label, the presence of which on a diskette prevents writing on the diskette. *Note:* Generally used only on floppy disks that are flexible. *See also:* write-protect notch. *Contrast with:* write-protect tab.

3.2420 write-protect mechanism. Any mechanism employed to prevent accidentally destroying data on a data medium. For example, a write ring on a magnetic tape, or a write-protect notch on a floppy disk.

3.2421 write-protect notch. A write-protect mechanism on flexible magnetic disks consisting of a notch on the side of the disk. *Note:* When the notch is not covered by a write-protect label, the disk is unprotected and may be written upon; when it is covered, the disk is write-protected.

3.2422 write-protect ring. *See:* write ring.

3.2423 write-protect tab. A write-protect mechanism used on rigid floppy disks consisting of a small plastic tab that slides back and forth over a hole. *Note:* When the hole is covered, the disk is unprotected and may be written upon. *Contrast with:* write-protect label.

3.2424 write ring. A removable plastic or metal ring that can be inserted within a tape reel to permit writing on the tape. *Note:* If the tape is mounted without a write ring, data may not be written on the tape; the tape is said to be "write protected." *See also:* write-protect mechanism. *Syn:* file-protection ring; safety ring; write-enable ring; write-protect ring.

3.2425 writeable control store (WCS). A control store implemented in read/write memory to allow the processor instruction set to be redefined or extended at a later date.

3.2426 writing line. An imaginary line on which the bottom of a displayed, printed, or typed character, excluding descenders, rests. *See also:* display line; printing line. [ANSI X3.138-1988]

3.2427 writing tablet. *See:* data tablet.

3.2428 X punch. *See:* eleven punch.

3.2429 x-position register. A register within a display controller which controls the position of the electron beam in the x, or horizontal, direction on the display device.

3.2430 X-series. CCITT recommendations describing public digital data networks.

3.2431 X-Y plotter. A plotter used to plot coordinate points in the form of a graph.

3.2432 xerographic printer. A page printer used to print optical images using electrostatic technology. *See also:* laser printer.

3.2433 y-position register. A register within a display controller which controls the position of the electron beam in the y, or vertical, direction on the display device.

3.2434 Y punch. *See:* twelve punch.

3.2435 yoke. A system of electromagnetic coils (for focus and deflection) employed with an electromagnetic cathode ray tube to provide the necessary control of focusing and deflection of the electron beam. *Note:* The focus coil is wound on an iron core which may be moved along the neck of the tube to focus the electron beam. The deflection coils are mounted at right angles to each other around the neck of the tube and may be rotated around the axis of the tube.

3.2436 Z-fold paper. *See:* continuous form.

3.2437 z-position register. A register in a display controller which simulates the beam position (on the display) in the z-direction. *Note:* The z-axis represents depth into and out of the display screen. This illusion is achieved by varying the intensity, or color, of the z-vector in proportion to the value of the z-coordinate.

3.2438 zero punch. A zone punch in punch row 10 (third from the top) in a twelve-row punch card. *See also:* eleven punch; twelve punch.

3.2439 zero-address instruction. An instruction that has no address field because the address is implied or no address is required. *See also:* repetitive addressing. *Syn:* addressless instruction; implicit address instruction; no-address instruction. [ANSI X3.138-1988]

3.2440 zero-latency storage. A type of storage that has an extremely small rotational delay, or latency. *See also:* disk cache.

3.2441 zero-level address. *See:* immediate address; n-level address.

3.2442 zig-zag fold paper. *See:* continuous form.

3.2443 zone punch. A punch (2) in one of the upper three rows (0, 11, 12) of a twelve-row punch card. *See also:* eleven punch; twelve punch; zero punch. *Contrast with:* digit punch.

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