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CAD Computer Aided Design the use of a computer for automated industrial design. It employs graphic screens, digitisers, plotters and automated drafting equipment in addition to more conventional computing hardware.

Cabinet a container or enclosure for a rack containing printed circuit boards.

Cable flexible conductors (wires), insulated from each other and contained within an insulated outer covering. Cables in use in computer and electronics systems range from two insulated wires, known as a 'twisted pair' up to multi-core cables of complex configurations. It is possible to contain hundreds of conductors in a single cable.

Calculator a device or integrated circuit capable of performing mathematical operations.

Calibration the process of establishing the actual value of an instrument or device by measurement. This compares to the design, nominal or rated value which may not be strictly attainable due to errors, losses, leakage, etc.

Call a software technique. Program subroutines are 'called', which has the effect of transferring control to the subroutine. The call instruction automatically saves the return address for the main program at the top of the stack so that control is returned to the main program when the subroutine has completed its task.

CAM Computer Aided Manufacture the widespread use of computers to aid and improve the manufacturing process. Includes such processes as numerically controlled machine tools, computer aided production control and materials planning.

Capacitance the ability to store an electrical charge, measured in Farads (F), more practically in microfarads (μF) or picofarads (pF). A capacitor has the ability to store charge and discharge, hence its capacitance defines the value of the capacitor.

Capacitor an electronic component consisting of two metal plates separated by an insulator. Sometimes called a condenser. Each metal plate is a conductor, or electrode. The insulator, or dielectric,

is designed so that the two conductors have equal electrical charges but opposite polarity.

Capacity the size of computer memory, used as a comparison between models of computer. Measured in BYTES or WORDS (sometimes characters).

Card a punch card is literally a specially designed piece of card which is punched with holes representing codes which can then be read by a computer. There are several standards in use, in terms of size and coding.

Card is also loosely used as a jargon term for a printed circuit board (PCB).

Card column a line of punch positions running from the top to the bottom of a punch card. The most commonly used punch card convention has 80 rows running horizontally and 12 columns running vertically.

Card punch an electro mechanical device for punching holes in cards in specific codes for the purpose of storing information in a punch card.

Card sensing the converting of information contained in punched cards into electrical impulses by a unit in a card reader; an input device for a computer system.

Carriage return as used in typewriter operation. A key on a keyboard, or a program instruction, causing the print head or cursor on the display to return to the beginning of the next available new line.

Carry (bit) used in the normal arithmetic sense. Actually an extension bit called the carry bit is added into the accumulator. See appendix for LOGIC CIRCUITS.

Cascade connecting programs, routines or circuits together so that the output from one becomes the input of the next. Compare to 'DAISY-CHAINING'.

Cassette a magnetic medium for the storage of data. Magnetic tape in an enclosure.

Cathode Ray Tube ⇨ CRT.

CDD ⇨ CHARGE COUPLED DEVICE.

CCITT Consultative Committee International Telegraph and Telephone. A committee within the International Telecommunica-

tions Union. It concerns itself with the conventions which enable transfer of data over compatible links, either internationally or between devices from different manufactures. Conventions exist which define plugs, cables and software routines for handling data, to facilitate interchangeability of programs and devices between different manufacturers' products and across geographical boundaries.

Central Processing Unit (CPU) the heart of any computing system comprising groups of REGISTERS and LOGIC. Basically the CPU is made up of storage elements called registers, computational circuits in the arithmetic and logic unit, and the CONTROL BLOCK and input/output circuitry. Also called the processor or the central processor.

Central processor ◇ CENTRAL PROCESSING UNIT.

cgs system an earlier system of measurement, based on centimetre, gram, second. Now superseded by SI Units. ◇ SI MKS.

Chain a set of operations to be performed sequentially under program control.

Chain printer a type of high speed impact printer where the characters are all contained on a continuous metal chain. The commonly used characters are repeated two or three times to reduce access time. The chain moves across the paper continuously. Under program control a 'hammer' selects a character and strikes it from behind thus causing printing to take place on impact with the paper. The print head is a slug, or etched positive impression, of the letter to be formed. Drum printers also use a similar technique.

Channel a hardware path, wires, along which signals may be sent, e.g. a data channel, output channel, etc.

Characters the letters A-Z, numerous special symbols and the numbers 0-9, coded for use by a computer.

Charge the quantity of unbalanced electricity in a body. An excess or deficiency of electrons, giving the body negative or positive charge.

Charge Coupled Device (CCD) a memory technology in which packets of electrical charge are separated by an insulating barrier in the semiconductor circuit. These packets, or minute charges, can be

moved step by step, in a DAISY-CHAIN fashion backwards and forwards along the chain.

Each packet, or charge, represents a BINARY digit. Each movement of the charge moves the binary digit into a new memory position.

CCD are used for some computer memory applications but their inherent speed makes them eminently suitable for scanning and TV camera purposes.

Chassis the metal frame which houses the printed circuit boards (PCB), power supplies, etc. which comprise the central processing unit of a computing system.

Chatter rapid closing and opening of contacts on a relay or switch.

Checkpoint a convenient point in a program for stopping and restarting or for the use of external events. ⇓ BREAKPOINT.

Chemical etching part of the process of photolithography in which the required circuit is protected by an etch-resistant material whilst the unwanted portions of the material are chemically eroded so as to leave only the exact circuit, or conductive path, remaining on the insulating base material.

Chip the SEMICONDUCTOR material on which integrated circuits are printed. A rectangular or square silicon chip is cut from a circular silicon wafer in mass production. The chip is normally to be seen mounted in a rectangular plastic package, ⇓ DIP/DIL, SIP/SIL. This rectangular package contains the packaging material, external connections and the chip itself which cannot normally be seen. There are literally thousands of different types of chip, only a few of which are microprocessors.

Circuit a combination of conducting electrical paths and devices constructed for a specific purpose.

Circuit breaker a device that opens electric circuits under anticipated but unusual conditions, e.g. overload of current, heat, etc.

Circuit diagram a diagrammatic representation of a circuit employing a variety of conventions and symbols, enabling competent technicians to 'read' a circuit easily.

Clear an activity to zeroise (or blank) one or more memory positions. A program normally clears REGISTERS before beginning an arithmetic task, so that the programmer can be confident there are

no errors due to residual contents of registers.

Clock a timer used in a system to originate accurately timed pulses and intervals for the timing of switching circuits. The most accurate clocks are based upon quartz crystal. When an alternating current is passed through a specific type of quartz crystal, mechanical vibrations, or oscillations, occur. The frequency of those oscillations is highly stable and predictable to a very high timing accuracy, thus the principle is widely used for timing purposes.

Clock rate a predefined time rate at which pulses are emitted from the clock within a computer system.

Closed loop a circuit or logic process in which the output signal or value always returns to start for comparison. Used in servo systems and analog control systems.

CMOS Complementary Metal Oxide Semiconductor. A SEMI-CONDUCTOR technology, using both positive and negative devices on the same silicon substrate. Its construction employs positive and negative channels in series, only one being switched on at one time. This gives the advantage of low power dissipation. CMOS also offers good immunity to electrical noise, or interference.

Coaxial cable a special purpose group of cables in which the conductors are arranged in cylindrical layers around a central core. Each cylindrical layer is insulated from the conductors on either side. Conductors may be made up from flexible wires, tubing or braid, for example. Insulation may be any of the normal insulating rubber or synthetic materials but the outer skin is normally quite thick, or armoured, to protect the contents.

COBOL an acronym of COmmercial and Business Oriented Language. The most widely used high level computer programming language for business data processing.

Code a communication for conveniently representing characters in a form the computer can understand, e.g. binary code. To code also describes the act of writing down the mnemonic instructions that form a program. The term 'program writing' is interchangeable with 'coding'.

Cold Start a system start up following a lengthy period of inoperation. An initial start up.

Coil a circular wound conductor, or group of conductors.

Collate the combination of data, or documents, into a predefined sequence.

Collector an n or p region in a semiconductor. \diamond BIPOLAR.

COM \diamond COMPUTER OUTPUT TO MICROFILM.

Command a pulse, signal or group of signals to start or stop an operation. A computer instruction which starts or stops an operation, or confirms an instruction to continue.

Comment a programmer's notes enabling a program to be understood by other people. Comments are written in areas that enable the program to ignore them except for storage, printing and display. They are external to program logic.

Compatibility the extent to which computers, peripherals, programs and circuits can operate in concert, without use of special interfaces, buffers, etc.

Upwards compatibility refers to the ability to take programs from one machine and run them on another, larger and more powerful machine from the same supplier.

Compensate the provision of program logic, a circuit or a special device to counteract known sources of error.

Compiler a program which translates (assembles) higher level languages into machine code instructions which can be recognised by the computer's central processing unit.

Complementary Metal Oxide Semiconductor \diamond CMOS.

Complements unless a microprocessor has a specific calculator chip all simple arithmetic has to be performed by software. Since the assembler language used on a microprocessor operates at the binary level a technique to perform arithmetic within the binary notation has to be employed. Many microprocessors do not include a calculator facility. Not all microcomputers utilise a calculator chip, which poses an extra problem since the processor can only add, it cannot subtract.

The technique employed to overcome this limitation is known as complements, or 'twos-complement' for a binary system.

For example in a simple decimal subtraction of 2 from 9 the sum appears: $9 - 2 = 7$.

The binary equivalent of this calculation, using binary addition to achieve the same result as the decimal subtraction of $9 - 2$ is as follows.

- (a) Find the twos-complement for binary equivalent of decimal 2.
- (b) Add the twos-complement of decimal 2 to to the binary value of decimal 9.
- (c) Ignore any carry bit in the result.

Thus, to find the twos complement of decimal 2.

- (a) (i) Decimal 2 = binary 0010.
- (ii) Replace all 1 bits with 0 bits.
Replace all 0 bits with 1 bits.
thus 0010 becomes 1101.
- (iii) Add a 1 bit to the result
thus 1101 becomes 1110.

Therefore the two-complement of decimal 2 = 1110.

- (b) Add binary value of decimal 9 to twos complement of 2.

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1001
1110
-----
carry 1 0111
    
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- (c) Ignoring carry bit the result is 0111, equals *decimal 7*.

See section on LOGIC CIRCUITS in appendix.

Component Value the rated value in terms of voltage, current, capacitance, etc. of a given electronic or semiconductor device.

Computer an assembly of central processing units and peripheral devices, having the ability to:

- store programs and data
- manipulate data
- perform arithmetic and calculations on data
- compare data and make yes/no decisions
- perform input and output operations on data and programs.

Computer Aided Design ◇ CAD.

Computer Aided Manufacture ◇ CAM.

Computer bureau ◇ BUREAU.

Computer Output to Microfilm (COM) a computer output device; it may be a printer or a typesetter that has an option to output microfilm as well as normal printing. It may be a special purpose COM device, perhaps using laser techniques.

Concatenate a programming term meaning to link together, referring to either data routines or whole programs.

Concentrator a device which enables several computers to share a single telephone line when operating teleprocessing links. The

24 *Conditional*

term is sometimes used as a synonym for 'multiplexer' but this is not a strictly accurate use of the term concentrator.

Conditional refers to the action to be taken at a decision point in a program. The action may be to BRANCH, JUMP or ABORT.

Conductance the ability to conduct electricity.

Conductor material or devices that carry, or conduct, electrical current.

Configuration a specific arrangement of peripherals and processor which clearly defines a computer's capacity. The term may also be applied to an arrangement of chips or components.

Connect time the time that passes between logging-on and logging-off a time-sharing computer system. Used as the basis for billing a system user.

Connector a device enabling components to be connected into a circuit. A plug or adaptor which enables current to pass from one device or circuit to another.

Console the control panel or control devices for a computer. The central device containing start/stop keys, power keys, status display lights and keyboard for input of variable key data, e.g. password, date, program name, etc. Often contains basic printer or display for operator messages.

Constant a value which is fixed, for use by a program. For example, on any given day, the date is a constant.

Contact a current-carrying component of a relay, switch or connector designed to open or close electrical circuits.

Continuous signals ⇨ ANALOG.

Control block this is the section within the central processing unit which performs the control functions. It is responsible for decoding microprogrammed instructions and then generating the internal control signals that perform the operations required.

Control bus a group of connecting paths which conveys control signals to regulate system operation.

Control character a character whose recognition by a program or system starts, stops or changes a control function.

Control program a sequence of instructions that will inform and guide the CENTRAL PROCESSING UNIT through the various operations it must perform.

Convention a standard, accepted procedure. In computer terms this relates to symbols, acronyms and so on.

Conversational language a language that looks like a version of standard English enabling rapid assimilation of the features of a system. Generally used in time sharing and enquiry type applications, e.g. APL and BASIC.

Converter a method or device for changing alternating current to direct current or vice versa. See SIGNAL INVERTER.

Core an assembly of very small ferrite rings or cores which when magnetised in one direction represent 0 and in the other 1. Core memory was the earliest form of non-volatile Random Access Memory (RAM) and was the basic memory technology for many years. Core is now being superseded by solid state memory for reasons of economy, space and performance.

Corruption damage or loss of data due to computer or software malfunction.

Counter a circuit designed to count pulses or a memory location which can be set to an initial number and incremented or decremented by signals received.

Couple circuits two circuits (or more) connected so that they interact electrically.

cps cycles per second. ⇨ CYCLE, FREQUENCY, and HERTZ.

CPU ⇨ CENTRAL PROCESSING UNIT.

Crash usually refers to physical contact between a disk and a reading head, causing damage to both. Can also refer to a dramatic failure of a computer program. In either case a failure of significant proportions.

Critical Path a term to denote the shortest route, path or time to reach a given objective. Used in connection with critical path network techniques. ⇨ PERT.

CROM Control Read Only Memory ROM that is designed to decode control logic, in the processor.

Cross assembler a process by which a program is assembled by one computer to enable it to run on another computer. Used frequently in microprocessor systems since there are so many different versions of programming languages that the only practical

way of using one computer to generate programs for other types is by using cross assemblers.

Cross talk a phenomenon which occurs when signals from one circuit interfere with another. The source of the signals is the 'disturbing' circuit, the other is the 'disturbed' circuit.

CRT Cathode Ray Tube. A display unit output device resembling a television tube or monitor. It is the display device used in a VDU (video display unit).

Cryoelectronics the field of study which concentrates on the behaviour of conductors at very low temperatures. The JOSEPHSON JUNCTION and the superconductor devices originally required cryogenic conditions.

Crystal ◇ GRAIN.

Crystal oscillator an energized crystal whose vibrations produce a constant frequency electronic oscillation. Dividing components or circuits are provided to create the exact frequencies required.

Current the rate of flow of electricity through a conductor, measured in ampères, or amps. Stated to be a direct or continuous flow (dc or DC), or flowing in pulses (ac or AC).

Current carrier an electrical conductor, which permits the free flow of current within the limits of its electrical resistance.

Current loop a communication line on which the presence or absence of current is used to represent data transmitted over that line.

Cursor a position indicator to enable the use of a VDU to see exactly where the next input character may be placed, or to keep tracking position. A visual indicator, it is analogous to the typing position on a typewriter.

Customer Engineer ◇ FIELD MAINTENANCE.

Cybernetics the study of man/machine interaction. It is generally taken to mean FEEDBACK control systems but can be much more broadly defined to include complex modelling, artificial intelligence, robotics and other advanced application areas.

Cycle the wave pattern of, for example, a sine wave. The wave alternates from positive to negative through 360°. When applied to alternating current, cycles are measured in cycles per second. In SI units this is measured in HERTZ, (Hz).

Cycle, instruction time the time taken to fetch an instruction from memory and then to execute it.

Cycles per second ⇨ CPS.

Cycle stealing when an input/output device uses DIRECT MEMORY ACCESSING (DMA) techniques, it avoids the need to use the central processor, so that the input device talks directly to memory. It can hold up the use of the input/output bus for an indefinite number of cycles while it accesses system memory. This technique is used to speed up certain priority tasks.
