DIGITAL TERMINOLOGY

Contents

1. GENERAL

1.1 This section provides REA borrowers, consulting engineers, and other interested parties with technical information for use in the design and construction of REA borrowers' telephone systems. It provides, in particular, descriptive definitions of various terms used in digital telephony.

1.2 The terms defined include those associated with digital switching, digital transmission, and digital computers. It is the intention of this section to define the terms most commonly used in digital telephony. Neither the word list nor the definitions are meant to be exhaustive.

APPENDIX

Glossary

Access Time - The time required to retrieve information from or store information into a computer's memory.

Address - A number designating a location in memory.

Algorithm - A set of processes in a computer program used to solve a particular problem in a finite number of steps.

Analog Signal - Any voltage or current that varies smoothly and continuously.

Analog-to-Digital (A/D) Converter - Circuitry which changes an analog signal into digital data.

AND Gate - A logic circuit with two or more inputs whose output is binary 1 if, and only if, all inputs are binary 1.

ASCII Code (American Standard Code for Information Interchange) - A binary code used to exchange information between computers.

Assembler - A program used to convert a symbolic program (English language, etc.) into binary computer language.

Asynchronous - Characteristic of any operation that is independent of a master clock or timing signals.

Automatic Protection Switch (APS) - Circuitry used to switch digital span line traffic to a spare span line in the event of a failure on the system's main span line.

BASIC Language - A computer language based upon common English language terms.

Binary - A system of numbers or codes involving only two states, typically 1 or 0.

Bipolar - Refers to two polarities, positive and negative. Digital information is normally transmitted in alternating bipolar pulses.

Bit - An abbreviation of "binary digit" which represents a single character in a group, either a 1 or 0.

Bit Rate - The speed at which bit positions are transmitted, normally expressed in bits per second.

Bit Stream - A continuous string of bit positions occurring serially in time.

Bootstrap - A method by which a computer can change from one state to another by its own actions.

Buffer - A temporary storage facility used as an interface between system elements whose data rates are different.

Bug - An instruction or series of instructions in a computer program which causes undesirable results.

Bus - A major electrical path used to transfer information between two or more electrical circuits.

Byte - The smallest number of binary digits which is acted upon as if it were a single entity. In most present-day systems, a byte is equivalent to 8 bits.

Call Processing Program - Software that controls the switching network in an electronic switching system.

CCIS (Common Channel Interoffice Signaling) - The Bell System's common channel signaling scheme (see Common Channel Signaling).

Central Processing Unit (CPU) - The portion of a computer which controls its operation and manipulates the data being processed.

Channel Bank - An electronic device used to digitally encode analog signals and time division multiplex the resultant digital signals and also demultiplex and decode these digital signals.

Clock - A device that generates periodic signals used for system synchronization.

Codec (Coder/Decoder) - A device used to convert analog voltage samples into binary coded digital data and vice versa.

Common Channel Signaling - A method where all signaling data is sent over a dedicated connection between the processors of two switching systems. Signaling and transmission are completely segregated and handled over separate facilities.

Companding - The process of compressing quantizing levels at low speech amplitudes at the transmitting end of a system and expanding these levels at the receiving end, thus reducing quantizing distortion.

Compiler - A computer program used to convert symbols meaningful to a human operator to codes meaningful to a specific computer.

Concentrator - A switching unit located at a distance from a central office which allows a large number of subscribers to be connected to the central office over a much smaller number of trunks. The concentration ratio is normally on the order of 5 to 1.

Crash - A complete failure of either a hardware device or software operation. A crash can halt the entire system's operation or just a particular function.

Cycle Time - The shortest period of time necessary to complete one computer instruction.

D - A designation referring to the channel bank or terminal equipment of PCM carrier systems. For example, the D3 channel bank uses 8-bit non-linear voice encoding to derive 255 possible coding levels. The D3 bank is designed in 24 channel groups for T1 application.

Data Base - Specific information pertaining to a particular central office such as subscriber directory numbers, trunk routes, etc. This information is utilized by the generic program.

Debug - The process of locating and correcting errors in a computer program.

Decode - To convert received PCM code words into pulse amplitude modulated pulses which are the same as the quantized samples at the transmitting end.

Demodulation - The process of retrieving an original signal from a modulated carrier wave.

Diagnostic - Relating to test programs used for error and fault detection in the functioning of hardware or software.

Digital Signal - A series of pulses or rapidly changing voltage levels that vary in discrete steps or increments.

Digital Pad - A device that introduces loss in an analog signal that is digitally encoded.

Digital-to-Analog (D/A) Converter - Circuitry which changes digitally encoded data into an analog signal.

Digroup - A basic PCM 24-channel group operating at 1.544 Mb/s.

Downtime - The time period during which a device or system is not functioning properly.

DS - A designation referring to the digital signal level and bit rate in the digital hierarchy (and other defined interface characteristics). For example, DS-1 refers to a digital signal at the first level, or 1.544 Mb/s.

Dump - The process of copying the data contents of an internal storage device into an external device.

Encode - To convert quantized samples into PCM words.

Engineering Loss - The system design cable loss value used to engineer digital span lines.

Failure Rate - The number of failures which occur during a given period of time.

Firmware - Computer programs incorporated as machine hardware such as instructions in read-only memory.

Flip-Flop - A bistable memory device that can store data as either a 1 or 0.

Floppy Disk - A thin, flexible, flat circular plate used to store information.

FORTRAN (Formula Translation) - A computer language developed for scientific applications.

Frame - A complete series of encoded bits containing the necessary information to reconstruct the sampled data for all channels of the digital group.

Garbage - Meaningless signals or bit patterns.

Generic Program - The computer program that controls the overall machine operation.

Hard Copy - Any system information printed in some permanent form.

Hardware - Physical equipment components.

Hexadecimal - A numbering system with 16 characters represented by 0 through 9 and A through F. Hexadecimal symbols A through F represent decimal numbers 10 through 15.

High-Level Language - A computer program language whose statements are translated into more than one machine instruction.

Highway - A transmission path capable of carrying multiplexed data.

I/O Device (Input/Output) - An interface between a computer or switching system and the outside world.

Instruction - A written statement, or the equivalent computer-acceptable code, that tells the computer to execute a specified single operation.

Integrated Circuit - A functional circuit whose components and interconnecting "leads" are formed on a single chip of semiconductor material.

Integrated Digital Network - A network in which A/D and D/A conversion takes place only at the subscribers' telephone sets.

Interface - A connecting point between two systems or subsystems.

Interrupt - The process, initiated by an external device, that causes the computer to interrupt a program in progress, generally for the purpose of transferring information between that device and the computer.

Jitter - The phase shift effect on a digital signal caused by transmission facility delays.

Language - The set of symbols, rules and conventions used to convey information, either at the human level or the computer level.

Large Scale Integration (LSI) - Large functional circuits made up of hundreds of gate circuits which form a complete system or instrument. Examples are memories, computers and certain test instruments.

Least Significant Bit (LSB) - The bit at the extreme right of a binary number which transmits the least amount of information.

Logic Circuit - An electronic element which takes a series of inputs and produces outputs according to the specific function the element is designed to perform.

M - A designation referring to digital multiplex equipment used to combine lower bit rate digital signals into higher bit rate signals in the digital system hierarchy. For example, M12 denotes a digital multiplexer combining DS1 signals into a DS2 signal.

Machine Language - Coded information consisting of binary digits that can be accepted and utilized by the computer.

Matrix - An orderly array of elements used to switch calls from one part of the system to another.

Medium Scale Integration (MSI) - Functional circuitry consisting of 12 or more gates which form a complete functional operating unit such as a decoder, counter or multiplexer.

Memory - An organized collection of storage elements into which units of information consisting of binary digits can be stored and from which this information can be later retrieved.

Microcomputer - An electronic device consisting of a microprocessor, program memory, data memory, and input-output circuitry capable of accepting, storing and arithmetically manipulating data.

Microprocessor - An electronic circuit contained on a single chip of silicon which performs the arithmetic logic and control operations of a digital microcomputer.

Mnemonic - An abbreviation or arrangement of symbols which stands for a particular instruction or process.

Modulation - The process by which some characteristic of a high frequency carrier signal, such as frequency, phase or amplitude, is varied by a low frequency information signal.

Most Significant Bit (MSB) - The one bit at the extreme left of a binary number which transmits the largest amount of information.

Nailed-Up Connection - A special circuit which has a reserved time slot in the bit stream and the matrix so that a path is always available.

NAND Gate - A logic circuit electrically equivalent to an AND gate followed by a NOT gate (inverter). Its output is binary 0 if, and only if, all the inputs are binary 1.

Non-Volatile Memory - A storage element whose contents are not destroyed if power is lost.

NOR Gate - A logic circuit electrically equivalent to an OR gate followed by a NOT gate (inverter). Its output is binary 1 if, and only if, all inputs are binary 0.

NOT Gate (Inverter) - A logic circuit whose output is always the opposite of its input.

Off-Line - Referring to circuitry or devices not under direct control of the operating system.

On-Line - Referring to circuitry or devices in direct connection to, or under direct control of, the operating system.

OR Gate - A logic circuit with two or more inputs whose output is binary 1 if any or all inputs are binary 1.

Overload Level - The highest amplitude of an analog signal for which a PCM code word exists.

Parity Bit - A binary digit 1 added to an information word to make the total number of 1 bits either always odd or always even. This permits checking the accuracy of information transfers.

Patch - A modification to a computer program to correct errors or add features.

PCM Word - An 8-bit code group representing a specific quantized level.

Port - An access to a switching system.

Program - Step-by-step instructions that tell a computer what operations to perform.

Program Memory - The data storage area of a computer which contains the instructions that tell the computer what operations to perform.

Pulse Amplitude Modulation (PAM) - A time division modulation technique in which signal intelligence is represented by a pulse whose amplitude represents the amplitude of the modulating wave at a specific instant of time.

Pulse Code Modulation (PCM) - A time division modulation technique in which analog signals are sampled at periodic intervals and the values observed are represented by a coded arrangement of 8 bits.

Quantizing - The rounding off process whereby all samples whose amplitudes fall into one specific interval are given the same PCM code word.

Quantizing Distortion - The difference between the analog speech signal at the receive side and the corresponding signal on the transmit side due to the rounding off of speech samples.

Random Access Memory (RAM) - A storage element which may be written into or read out from at any memory address and at any point in time.

Read-Only Memory (ROM) - A non-volatile, nonalterable storage element which has been preinterconnected or programmed to instruct the machine to perform a particular set of functions.

Real Time - The time elapsed between events occurring externally to the computer.

Redundant - Any system that has identical backup components in case of failure in the primary components.

Regeneration - The process of reconstructing distorted pulses.

Remote Switching Terminal (RST) - A digital switching unit located at a distance from its host digital central office which allows a number of subscribers to be connected to the central office by means of a smaller number of trunks. Analog-to-digital conversion takes place at the RST and switching is accomplished on a direct digital basis at the central office. The remote subscribers have all features available to subscribers within the host office as long as the link to the host office remains intact.

Routine - A program or program segment designed to accomplish a single function.

Sampling - The process of taking instantaneous values of an analog signal at periodic time intervals.

Slip - The process of dropping or repeating a frame of data from time to time to compensate for gained or lost bits brought about by received digital signals running at slightly different bit rates than the digital system.

Small Scale Integration (SSI) - Amplifier or gate circuits that perform a single basic function. Examples are AND gates, OR gates, flip-flops, etc.

Software - A collection of programs and operating aids associated with a computer which facilitate its programming and operation.

Space Matrix - An array of crosspoints separated in space. In many modern systems every inlet has access to every outlet by means of separate paths.

Span Lines - Digital transmission media between central offices and between host and remote units.

Stored Program Computer - A computer controlled by an internally stored set of instructions.

Synchronous - Any operation where a series of events takes place under the control of a clocking device; the same operations taking place in different systems, or different parts of the same system, at exactly the same time.

T - Referring to a transmission system or span line equipment in the digital system hierarchy. Specifies information such as bit rate and the number of voice channels normally associated with that bit rate.

Time Division Multiplex (TDM) - The merging of several bit streams into a composite signal for transmission over a single communication channel.

Time Matrix - A series of memory devices used to rearrange the order of channels in a time division multiplexed bit stream, thus switching the channels in time.

Time Sharing - Using a central computer to serve several operators at remote locations by assigning different times of access to each.

Time Slot - A group of one or more bit positions which recurs at a constant interval and can be uniquely identified.

Time Slot Interchange - The functional element of a digital system which performs the switching of digital voice data. Provides the path by which information is passed between the calling line and the called line.

Tracking - A measure of how accurately a reconstructed analog waveform compares to the original analog signal that was digitally encoded.

Truth Table - A table or chart used to show the relationships between inputs and outputs for logic circuits.

Unipolar - Refers to one polarity. In digital systems, unipolar pulses are generated and used within the equipment, but are seldom transmitted over cables or other transmission media.

Volatile Memory - A storage element whose contents are destroyed when power is removed.