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cadence: A musical punctuation, indicating the end of an idea, or preparing the ground for transition to a new one; essentially a juxtaposition of two *chords*.

calendering: To reduce the *asperities* on the surface of a magnetic tape, the tape is squeezed between large steel rollers, a manufacturing process called calendering.

Calrec Soundfield microphone: See *Soundfield microphone*.

cancellation: See *phase cancellation*.

canned: Slang for pre-recorded, as opposed to *live(3)*, music or visuals.

Cannon connector: See *XLR*.

cans: Headphones.

capacitance: See *impedance*.

capacitor (C): A device made up of two metallic plates separated by a dielectric (insulating material). Used to store electrical energy in the electrostatic field between the plates. It produces an *impedance* to an *alternating current*. Also called a *condenser*.

capo: The beginning of a piece of music. See *D.C.*

capstan: In a tape machine, the tape is moved by the effect of friction between a rotating motor-driven pillar, the capstan, and a *pinchwheel*, also called the *capstan idler*, that holds the recording tape securely against the capstan when a tape transport is in record or play mode. The *capstan motor* directly or indirectly drives the capstan and moves the tape past the heads. The capstan itself may be the extended shaft of the capstan motor.

capsule: In a microphone, the *diaphragm* or actual sound receptor, including, in various types of mics, the *moving coil*, *ribbon*, permanent magnet, or fixed *condenser plate*, and the housing in which these are mounted.

cardioid microphone: A *directional microphone* with an *acceptance angle* that is most sensitive to sounds coming from the front and sides, while rejecting sounds coming from the rear. Called cardioid because the *polar pattern* of the microphone is roughly heart-shaped. All directional mics have a *proximity effect*, whereby sound sources close to the mic will have an exaggerated low-frequency response. *Supercardioids* and *hypercardioids* are cardioids, but with a trade-off in the rear lobe. When using supercardioids and hypercardioids as sound reinforcement mics, it is important to note that the maximum rejection is not directly behind the mic as it is with a cardioid, but is off to the side between 110°-126°. However, a pair of hypercardioid microphones used as a stereo *X-Y pair* yields a very clean cardioid response pattern. See *pressure gradient*.

C

carrier: (1) A signal that is constant in amplitude or frequency and can be modulated by some other signal. The carrier itself does not transmit any information; all of the intelligence is in the modulation *sidebands*, which are in a band of frequencies on either side of the carrier frequency. Some signals, such as FM stereo, involve more than one carrier to encode the information, and the lower-frequency carrier is called a *subcarrier*. The subcarrier is mixed with parts of the audio signal and used to modulate the main carrier. In the receiver, the subcarrier is recovered by demodulation of the main carrier and then demodulated to recover its signal. See *amplitude modulation, frequency modulation, frequency modulation*. (2) In *FM synthesis*, the carrier is the operator at the bottom of a stack in an algorithm, through which the composite effect of other modulating operators connected to it is heard.

cartridge: (1) The needle assembly at the end of a phonograph tonearm. (2) In broadcasting, a short, looped tape usually used for recorded messages and/or commercials.

CAS: Cinema Audio Society. A Los Angeles-based organization of film and television recording personnel, founded in 1966.

Cat. 43: The Dolby Laboratories device that turns a Cat. No. 22 Dolby A-Type *noise reduction* card into a 4-band “noise fighter.” The precise frequencies of the bands are optimized for production sound problems and differ from those used in standard noise reduction applications. In 1991, Dolby formally introduced *SR*-type noise reduction, called the Cat. No. 430.

cathode: The cathode in any electronic component, such as a silicon diode or a vacuum tube, is the electrode normally connected to the negative voltage.

CAV: Constant Angular Velocity: In a mass storage device, such as a disk, CAV means that the disk assembly rotates at a constant speed, i.e., the data rate will increase for the tracks near the edge, and decrease for tracks near the center spindle. As opposed to *CLV*.

CCCC: See *LCRS*.

C.C.I.R.: Comité Consultatif International Radio. An international radio standards committee, whose recommended recording *pre-emphasis* and *post-emphasis* curves are standard on all recorders in most European and some other countries. The European analog to the *NAB*.

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CD: The CD sampling rate is 44.1kHz and there are 32 bits per sample, so the data rate of the encoded analog data is 1.41Mbps, but the inclusion of parity, synch, and subcode bits raises the real data rate to 4.3Mbps. A CD will hold about 650 Mb, or about 74 minutes of stereo, 16-bit audio. The digital portion of the CD audio system is not stereophonic, but *sequential monaural*. See also *Control and Display signals*. Compare with *Direct Stream Digital*. The CD file format is defined by *ISO 9660*. For more information on CD standards, please see [Sound on Sound](#), “Compact Disc Formats” by Mike Collins, January 1998. See also *SACD*. (Super Audio Compact Disc.) The CD specification is specified in “books,” each defining the standard for a particular type of CD:

Blue Book: CD Data (CD Extra)

The latest of the books to appear, this specifies the CD Extra format, designed to include CD-ROM data on a standard (audio, Red Book) CD. A CD Extra is actually a multisession CD, containing the audio tracks in its first session, followed by a data track in the second session, etc.

Red Book: System Description Compact Disc Digital Audio (CD-DA)

CD-DA (Digital Audio) Established in 1980 as the first of the books which defined consumer audio on CD. A Red Book CD may have up to 99 tracks; each track is divided into blocks of data called sectors; each sector contains, in addition to audio data, *EDC/ECC*, and 98 control bytes of *PQ subcodes*.

Yellow Book: System Description Compact Disc Read-Only Memory (CD-ROM)

CD-ROM (Read Only Memory). Yellow Book extends the Red Book specification by adding two new track types:

CD-ROM Mode 1: Storage of computer data
Mode 1 sectors include an improved ECC for Data.

CD-ROM Mode 2: Compressed audio, video, picture data
Mode 2 (Forms 1 & 2) CD-ROM/XA (Extended Architecture) is used to integrate computer data with compressed audio and/or video, including Photo CD and Karaoke CD.

White Book: System Description Compact Disc Bridge (CD-V)

Developed to cover the CD-V (Video) format, and supported by JVC, Matsushita, Philips, and Sony. These are a special kind of CD-ROM/XA bridge disc that allows the play of films and music videos on a dedicated CD-V player, or on a CD-i player equipped with a CD-V cartridge, or a computer with a CD-ROM/XA drive, an MPEG-1 decoder, and host playback application. The CD medium is modified to record video signals as well as digital stereo audio signals. The video information is recorded in analog form rather than digital. CD-V discs contain full-screen, full-motion video and CD-quality audio, and are independent of any broadcast standard, e.g., NTSC, PAL.

Green Book: System Description Compact Disc Read-Only Memory Extended Architecture (CD-ROM/XA)

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- Orange Book:** System Description Compact Disc Systems Part II: (CD-WO)
A digital standard for recordable, write-once CD. The specification covers both disk-at-once and track-at-once. Many older CD-ROM drives cannot read multisession discs, however, these discs can be converted to a Red/Yellow/Green Book disc by adding a TOC, allowing the disc to be read by any CD player.
- CD Single:** A small CD-DA that can record 20 minutes of stereo music; it is 80mm in diameter.
- CD-DA:** CD-Direct Access. Software for writing audio data on hard disk onto a CD-R, for example, Toast™ or Gear.™ Such packages create an unfinished audio session in *disc-at-once* mode. Digital audio tracks must first be converted to a computer *file format* like .WAV or AIFF.
- CD Extra:** Formerly called *CD Plus*. A solution to *mixed-mode* CDs, CD Extra inverts the track structure of Mixed Mode by creating two separate sessions: first audio, then data. CD Extra is a part of the Blue Book standard, making Blue Book CDs fully compatible with the Red Book in that Blue Book (data) CDs can be safely used on audio players. The one problem with CD Extra format discs is that its *multisession* format makes it unusable by first-generation CD-ROM players.
- CD-I:** (CD Interactive) An extension of Yellow book, allowing discs to contain a mix of audio and video, plus data which the user can control interactively. CD-I discs use Mode 2, Form 1 and Mode 2, Form 2 tracks which, like CD-ROM/XA, enable computer data and compressed audio, video, or pictures to be played back at the same time. CD-I tracks cannot be played on normal CD-ROM drives, but specialized CD-I players can play audio CDs, CD+G, Photo CD, and with a CD-V cartridge, Karaoke CD or CD-V discs.
- CD + MIDI:** A type of CD which includes both audio data and MIDI data, i.e., a recording of both the sound of a musical performance, as well as the MIDI data used to generate it. This allows the user to “play with the performance” by choosing different patches, etc. This requires a MIDI Out socket on the CD player.
- CD-R:** See *CD*.
- CD Single:** A small CD that can record 20 minutes of stereo music; it is 80mm in diameter.
- CD-V:** CD Video. The CD medium modified to record video signals as well as digital stereo audio signals. The video information is recorded in analog form, rather than digital, like a small laser disc.

CEDAR: Computer Enhanced Digital Audio Restoration. A British-developed system for the restoration and preservation of old audio recordings. See also *NoNoise*.

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cent: The smallest conventional unit of *pitch* deviation. One hundred cents equal one *half-step*. In an instrument, a cent is a term used in discussing pitch resolution; one cent is good, more than six cents is bad. See *half-step*.

center detent: A notched position in the range of a variable control, allowing the user to return the control to precisely that position, such as the midpoint between the left and right channels in a *balance* control. Use to denote the *flat* position on tone controls, etc.

center frequency: The frequency that is boosted or attenuated most by the operation of any *parametric equalizer* or other similar processing device or circuit. See *Q*.

center tap: In a *transformer*, the electrical midpoint of the windings, made accessible for external connection. Used, for example, in delivering power to *balanced line condenser* microphones. See *phantom power*, Appendix B.

C-format: The international standard *format* for professional 1" videotape equipment. Developed by Sony, and sometimes called *S-format* after that company's name. See *B-format*, *Betacam*, *VHS*.

CG: Computer Graphics.

chain: Also called *iron*. An integrated system composed of separate audio and/or video recording, processing, or playback circuits and/or devices which are used in conjunction with one another to produce one output result. See *B-chain*, *program chain*, *signal chain*, *side chain*.

change-over dots: See *projection*.

change-over projection: See *projection*.

channel: An independently processed or recorded signal. (1) An electrical signal path. In analog audio (such as a mixer), each channel consists of separate wired components. In the digital domain, channels may share wiring, kept separate through logical operations. (2) A system for independently addressing up to sixteen separate MIDI devices over a single MIDI cable. MIDI provides definitions for 16 channels which transmit not audio signals, but digital control signals for triggering synthesizers and other devices. MIDI data are associated with a particular channel by virtue of a *Channel ID Number* that is interwoven with other MIDI data being recorded. A *track* holds data that (depending on the sequencer) may or may not be restricted to one MIDI channel. MIDI's 16-channel limitation has been overcome by employing multiple independent MIDI ports that each route sixteen channels, offering the possibility of hundreds of channels. (3) The left or right signals of a *stereo* audio system, or the left, right, center, surround and/or subwoofer signals of a multichannel system, such as *LCRS* or *5.1*. (4) In film, A complete, self-sufficient recording setup. A *production channel* would include a recorder, mixer, microphones, headsets, etc. A *transfer channel* would include a 1/4" tape deck, a 35mm *mag recorder*, a *resolver*, and a monitoring system.

channel assignment matrix: In a recording console, the group of buttons or switches by which the signal from any input channel can be assigned to one or more *busses*, and thereby be sent to one or more tracks of the multitrack recorder.

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channel bit rate: The actual bits being read from a digital medium are greater than the number strictly required to encode the audio signal. This is because of *ECC* and synchronization bits, etc. For example, with a CD, the audio bit rate is 1.41Mbps, but the channel bit rate is actually three times as high, 4.32Mbps.

channel insert: An *insertion point* in a mixer channel which opens up the signal path and allows an *outboard* device to be inserted *in-line*. The *output point* (the place where the signal is routed to the outboard device) is called the *channel insert send*, and the place where the effected comes back into the mixer is called the *channel insert return*. The actual point at which the channel signal path is broken with the insert connection is not standard among all consoles. Some are between the preamp and equalizer sections, some after the equalizer, but before the fader, and some are post-fader. Some are switchable with an internal jumper or other modification. If, for example, the channel insert send is post-fader, the fader setting will affect the action of a compressor that is inserted into the channel's signal path. On the other hand, a post-fader insert is good when it is desirable to send a single channel's signal direct to a tape track, making the fader into a convenient record-level control. See *normalised connection*.

channel message: A class of *MIDI* messages which only affect devices on a *MIDI* network set to a particular channel, i.e., all non-system messages. Channel messages may be of either Channel Mode or Channel Voice type. See *MIDI*.

channel mode: See *MIDI mode*.

channel path: The record section of the signal chain in a *mixer*. See also *monitor path*.

channel pressure: A type of *MIDI* channel message that is applied equally to all of the notes on a given channel; the opposite of *poly pressure*, in which each *MIDI* note has its own pressure value. Also called *aftertouch*, channel pressure is generated on keyboard instruments by pressing down on a key or keys while they are resting on the keybed. Also called *channel key pressure*.

channel separation: Channel separation refers to the amount of *crosstalk* between the channels of a stereo system. It is the inverse of interchannel crosstalk, as measured in decibels. A small amount of crosstalk is equivalent to a large channel separation.

channel strip: One of multiple identical sections in a *mixer* from the *mic preamp* and *phantom power* (if present) to the *bus* outputs, and typically includes the *input pad*, *EQ*, and *signal routing*, including *pan*, *effect sends* and *effect returns*, and *main channel fader*, and optionally an automation interface. There is one channel strip per mixer input.

Channel Voice: A classification of *MIDI* channel message relating specifically to a musical performance, where features of the performance (notes, articulation, etc.) are individually described by a unique message. Channel Voice messages include Note On, Note Off, Polyphonic Key Pressure, Channel Pressure, Program Change, Pitch-bend, and Controller Change. These messages all include a specific channel number, allowing similar messages to address different devices on the same *MIDI* network. The message will only be implemented by a receiving device whose channel number matches that of the message.

channelize: See *MIDI mapping*.

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characteristic impedance: See *termination*.

charge (C): Charge is a measure of the quantity of electricity and its unit is the *coulomb*. In an electrical circuit, charge consists of negative charges, or electrons. A positive charge can be thought of as simply an absence, or deficiency of electrons. Charge is what is moving in an electric current. See *ampere*.

chart: (1) A musical score or arrangement. The term is used both to designate the conductor's *full score*, or any *band part*. (2) A list of current hit singles or albums.

chase: (1) The process whereby a slave device attempts to *sync* to a *master clock*. (2) In MIDI parlance, to chase means, upon playback, to look backward to earlier MIDI events to see if there were any program or channel change messages prior to the playback point which would affect playback. See *controller chasing*.

chase-lock: A type of controller for a video or audio recorder that will listen to the *SMPTE timecode* signal from the *master clock* device and will adjust its own speed to find the correct time and then will lock into synchronization with the external timecode. Unlike *sync-lock*, chase-lock controllers respond to changes in timecode sequence.

chasing: See *controller chasing*.

chassis ground: The practice of connecting the signal ground of a device to the rack rails or other common grounding location on a multi-component electronic system.

chatter: When the input signal level to a noise gate hovers near the threshold level, the gate may be unsure if it should be open or closed. It may rapidly open and close, resulting in the audio cutting in and out; this is known as the gate "chattering." To correct this problem, adjust the threshold setting to be slightly lower or higher.

checksum: A number derived from arithmetical actions on data, used to check that data has not been corrupted after transmission or recording and replay.

chip: (1) In vinyl record production, the thin thread of acetate lacquer that is carved out of the master disc by the cutting stylus. Also called *swarf*. (2) A slang term for *integrated circuit*.

chirping: An effect caused by the overuse of *single-ended noise reduction* systems whereby the low-level signals take on an electronic, "ringing" character, known as chirping. If the signal is very noisy, the *noise floor* itself begins to sound chirpy, which can be more annoying than the original, broad-spectrum, noise.

chord: The playing of multiple notes simultaneously. The opposite of an *arpeggio*. See *inversion*.

chorus: (1) A regularly repeated section of a song or other musical composition. (2) A group of singers, also called a *choir*.

C

chorusing: A type of audio effect in which a *delayed* (30-40ms) or *detuned* copy of a signal is mixed with the original signal. The mixing process changes the relative strengths and *phase* relationships of the *overtones* to create a more complex sound. See *ADT*, *double-tracking*. The mixture becomes extremely complex as the relative phases of the signals cause partial cancellation and reinforcement over a broad frequency spectrum. The simplest way to achieve chorusing is to detune one synthesizer *oscillator* from another to produce a slow *beating* between them. See *comb filter*.

chromatic: Pertaining to the full twelve-note *scale*, as opposed to the eight-note *diatonic* scale.

Cinema Digital Sound (CDS): A new system of digitally recording motion picture sound format introduced by the Optical Radiation Corporation, a division of Kodak, in 1990, for the film "Dick Tracy" for digital sound on 35mm or 70mm film *formats* via a laser beam, which reportedly combines the dynamic and frequency ranges and low distortion of the CD on six discrete channels. Five channels encompass the full audio bandwidth and the sixth is designated a subwoofer channel, containing only the lowest frequencies. The CDS-encoded film is capable of being shown with conventional stereo optical sound, but requires a special sound system to reproduce the six channels digitally. First used in 1990, this format lasted only two years and is now obsolete. See *AC-3*, *5.1*.

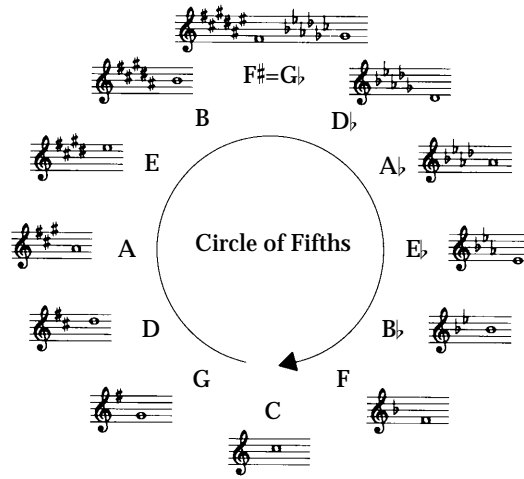
CinemaScope: The trademark of a widescreen camera system developed by Twentieth Century Fox, the first true stereophonic motion picture sound system which had the soundtracks on the same film with the picture. First used in 1953, CinemaScope was responsible for popularizing the *anamorphic* film *format*.

Cinerama: A widescreen system comprising three 35mm cameras/projectors running in *interlock* with 7-track *mag* film.

CIRC: Cross Interleaving Reed-Solomon Code. The combined error detection and correction scheme used in CDs. See *interleaving*.

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Circle of Fifths: Also known as the *Cycle of Fifths*. A way of thinking of the twelve major and minor keys as a circle, arranged in steps of a fifth, which can be read in either direction. Starting from C_{maj} and proceeding clockwise, the key signature of each new key gains one sharp until F_{maj} is reached. At that point, F[#] becomes G_b_{maj} and the cycle continues, removing a flat at each step until back to C. If one goes counter-clockwise, the circle is a series of perfect cadences, with each new tonic key becoming the dominant of the next. For this reason, the Circle of Fifths is often used for *modulation*(3), especially to or back from a remote key, i.e., a key on the far side of the circle.



circuit: A complete path that allows electrical *current* from one terminal of a voltage source to the other terminal.

circumaural: A headset with a large cushion which surrounds the ear to exclude external noise, unlike *supraaural* or *intraaural* designs.

CIT: See *SDMI*.

clangorous: Containing *partials* that are not part of the natural *harmonic series*, i.e., *partials* which are not whole-number multiples of the *fundamental frequency*. Clangorous tones often sound bell-like.

clef: In written music, a symbol placed at the beginning of the *stave* which assigns a *pitch* to a specific line on the stave, and by inference, to all of the other lines and spaces. Three clef symbols are commonly used, derived from the medieval forms of the letters G (♩), F (♮), and

C (♯).

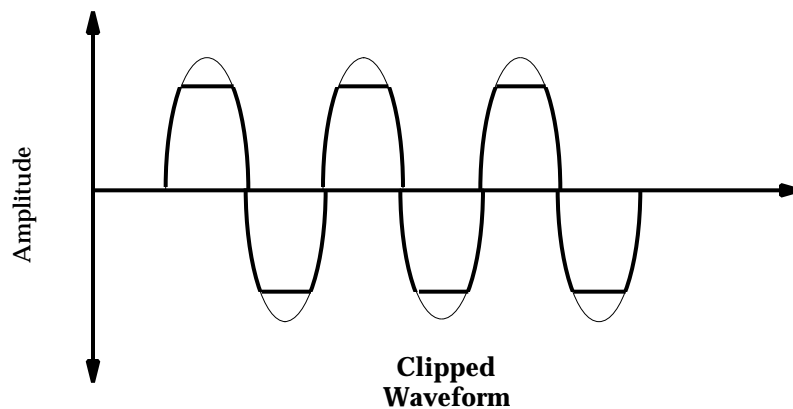
C



Four Clefs Showing the Position of Middle C

click track: A click track records a series of clicks, like a metronome, on one channel of a multitrack tape recorder or one channel on a MIDI sequencer. The click track is used to synchronize the recording of subsequent tracks by playing it back via headphones to the musicians while they are *overdubbing* the added tracks.

clipping: A *distortion* caused by cutting off the peaks of audio signals. Clipping usually occurs in an amplifier when its input signal is too high or when the volume control is turned up too high. A clipped waveform contains a great deal of *harmonic distortion* and sounds very rough and harsh. *Hard clipping* results in very sharp edges on the waveform, producing the maximum amount of high-harmonic content. *Soft clipping* produces rounded edges of the clipped waveform and is much less grating on the ears and tweeters than hard clipping as it contains much less very high-frequency energy. Different amplifiers produce different clipping effects; tube amps often produce soft clipping. See *full code*, *digital black*.



clock: (1) Any of several types of timing control devices, or the periodic signals that they generate. Clock pulses are usually derived from crystal-controlled oscillators. See also *MIDI Clock*, *master clock*. (2) In recording sessions for jingles or film scores, a stopwatch.

clock noise: An artifact of *digital-to-analog conversion* that creates staircase-like changes in voltage produced by the converter. Most clock noise is caused by shifts in the *zero-crossing* times. See *quantization noise*, *reconstruction filter*.

clock reference: See *master clock*.

clock resolution: The precision (measured in *ppq*) with which a sequencer can encode time-based information. A sequencer's internal clock is always set to some *ppq* value, and this setting is one of the main factors that determine how precisely the sequencer can record time-dependent information. The actual clock speed is usually determined by the *bpm* setting. See *MIDI clock*.

C

closed loop: A closed loop system is one which modifies its behavior based on the difference behavior between an output variable and a set point, i.e., it relies on *feedback* to determine its output. The opposite of *open loop*, an example of a closed loop system is a household thermostat. In audio, the main use for closed loop systems is in *power amplifier* output stages. See *bootstrap*.

cloth track: See *Foley*.

CLV: Constant Linear Velocity. As opposed to *CAV*, a mass storage system that has a disk whose speed varies to keep the data rate at the read/write head constant, regardless of the location of the data on the disk. The *CD* standard specifies CLV format.

CMRR: Common Mode Rejection Ratio. In a *balanced line* connection, the common mode is the noise whose phase is common on both lines. The degree of attenuation of the common mode by a *differential amplifier* is called the *rejection ratio*, and like other level-modulating devices, the output change is measured in dB.

cocktail party effect: The phenomenon of human aural discrimination among sounds of equal *loudness*, e.g., the ability to hear one conversation out of many at a party. Related to *auditory masking*.

coda: Musical symbol (Φ) which references a section of music which is to be repeated from or repeated to, as in “D.C. al Coda,” meaning “play from the beginning to the Coda.” A coda is a musical passage which gives a sense of completion to a movement or work, possibly an extended *cadence* or a substantial passage. A *codetta* is a short musical passage which links the subject and answer in a fugue, or at the end of the first passage of a sonata.

codec: COderDECoder. A device that digitizes an input waveform, eliminating redundant information, reducing the number of bits needed to carry the same data, then decoding the data at the receiving end, hopefully with a high degree of sonic transparency. See *PCM*, *PWM*.

code window: A display of the *SMPTE timecode* numbers, usually corresponding to each frame of picture viewed on a monitor. These numbers appear in a window that replaces a portion of the program image, usually at the bottom right of the screen. Depending on the equipment used, the timecode data in the window can be either generated in *real-time* from the source of the *SMPTE timecode* data, or have been recorded as a permanent part of the picture on a particular copy of a pre-recorded program. *BITC* is generally recorded onto copies of footage that will be used for *off-line* editing. The source of the *SMPTE timecode* data in this latter case is the *sync track* or *control track* of the original video footage.

coding: The process of altering the form of a signal, such as from analog to digital. Or, the coding may be used to allow a transformation of the signal not possible in its original form such as in *noise reduction*. Or, coding may be used to take advantage of effects inherent in the coding process itself, such as in *PCM* which allows recording and playback with low noise. The complementary stage to coding is *decoding*, a process which attempts to reconstruct the original signal, i.e., from digital back to analog for use with loudspeakers. See *codec*.

coercivity: The magnetic field strength required to bring any specific type of recording tape, when fully saturated, to complete erasure. Measured in Oersteds, and abbreviated H_c .

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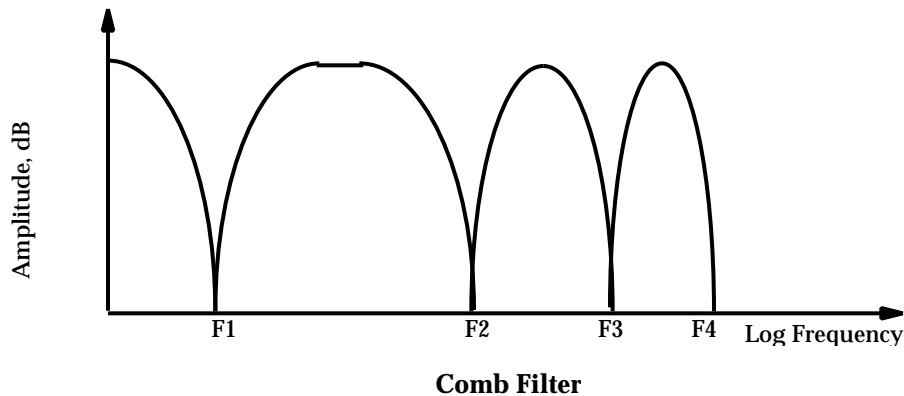
coherence: The *polarity* relationship between two complex sounds or signals being combined, measured at any instant. Total *phase* coherence indicates complete phase alignment, or full signal reinforcement. Incoherence, to any degree, designates a partial to complete *phase difference*, producing partial to total *phase cancellation*. The opposite of *incoherent*. See also *isochronous*.

coincident pair: Also known as an X-Y or XY pair, this is a microphone configuration which commonly uses two *cardioid* or *figure-eight* microphones mounted at right angles to one another, the latter preferred only for special applications. This is called a coincident pair because the two microphones are mounted as closely as possible to each other so that the sound being captured arrives at both microphones at exactly the same time, regardless of the direction of the source. All coincident configurations have to use *directional* microphones in order to create the necessary level differences between the two channels of the stereo system; *omnidirectional* microphones do not produce level differences proportional to the angle of *incident* sound. This technique is favored by many broadcast applications because of good *mono compatibility*. Recording with a coincident pair is called *XY recording* in the US and the UK, *AB recording* throughout Europe, and also *crossed pairs*, or *normal stereo*. In the US, “AB recording” means a *spaced pair*. See also *Blumlein pair*, *near-coincident pair*. Contrast with *spaced pair*.

coloration: Coloration is the term for subtle *distortion* which results in a change in the *timbre* of a sound without that sound being otherwise noticeably distorted, such as a smearing type of distortion produced by *intermodulation distortion*. More prevalent at high audio frequencies.

color burst: See *video black*.

comb filter: A type of *notch filter* which produces a series of very deep notches, or dips, in its frequency response. The spacing of the notches along the frequency axis is at multiples of the lowest frequency notch. A comb filter is produced when a signal is time-delayed and added to itself. Frequencies where the time delay is one-half the period and multiples of these frequencies are cancelled when the signals are combined because they have opposite *polarity*, usually used to filter out 60Hz hum and its associated harmonics. If the signals are of equal strength, the cancellation is perfect and the notches are infinitely deep on a decibel scale. See *common mode*. Also called *timbral interference cues*.



C

combining amplifier: An amplifier, also called a *summing amplifier*, that combines two or more signals prior to sending them to a single audio bus, signal processor, tape recorder track, or other destination. For example, on a *mixer* the *aux send* controls on all channels feed a combining amplifier whose output can be routed to a reverb system, cue or headphone amp, the monitor amplifier, etc. There are also devices which are *active* combining amplifiers, called an ACA, as well as passive *combining networks*,

combining network: A typically *passive* network in which two or more signals are combined before being sent to a single bus, signal processor, or other destination.

combo: A combination of loudspeaker(s) and amplifier in one unit, usually portable. Used by guitarists, keyboard players, etc. for stage amplification.

Comma of Pythagoras: See *diatonic comma*.

commag: A technical term for *composite* magnetic print.

common mode: Common mode refers to equal voltages induced in the two wires of a signal-carrying pair. In a *balanced line* circuit, the signal voltages are of opposite *polarity* in the two signal wires. Any voltage which appears with the same polarity on each wire is called a common-mode voltage. Usually noise, such as a 60Hz *hum*, is induced in audio cables equally and in the same direction, and so is a common-mode voltage. If the signal is connected to a *differential amplifier* input, the common-mode voltages will cancel, while the signal voltages, being of opposite polarity on each input terminal, will add together. This is the reason why balanced lines are less prone to induced noise from external influences. See *CMRR*.

common mode rejection: The measurement of how well a *balanced* circuit rejects a *common mode* signal. See also *CMRR*.

comopt: A technical term for *composite* optical print.

compander: Short for compressor/expander. A compander is a device for *noise reduction* in audio devices such as tape recorders. The compander will reduce the *dynamic range* of the signal before sending it to be recorded. The compression makes the softer passages louder so the dynamic range recorded on the tape is less than it would be if it were not compressed. Then, on playback of the tape, the signal is expanded; that is, the softer passages, which are too loud on the tape, are reduced in volume to match the original signal, restoring its dynamics. In the expansion, which is similar to a fast-acting *AVC*, the noise introduced by the tape recording process is effectively reduced because the music, when loud, masks the noise, and during the soft passages, the volume is turned down, making the noise comparatively softer. Digital companding allows a device to achieve greater apparent dynamic range with a lower *bit depth*. See *dbx*, *Dolby noise reduction*.

companding converter: An A/D-D/A pair which uses a non-linear scale, i.e., one that has larger steps towards peak amplitude and smaller steps towards minimum amplitude. This scale increases the ability of the converter to resolve small changes in low amplitude signals, reducing *distortion*, but with the penalty of increased *noise*. The overall effect is that of a compressed analog input signal and a resulting expanded digital output. See *compander*.

C

compatibility: (1) The degree to which different pieces of equipment can be used together or are interchangeable, e.g., whether a tape recorded with one type of NR can be replayed on a tape player equipped with another type of NR. (2) See *mono compatibility*.

complementary: Any pair of audio signal processing procedures which perform two equal and opposite processes on the signal, one before recording, the other after playback. *Noise reduction* and tape recorder *pre-* and *post-emphasis* are examples. See *encoding*.

completely filled: See *4-track*.

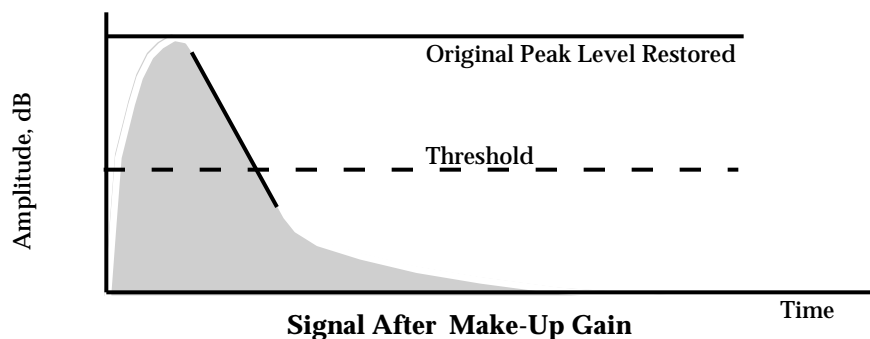
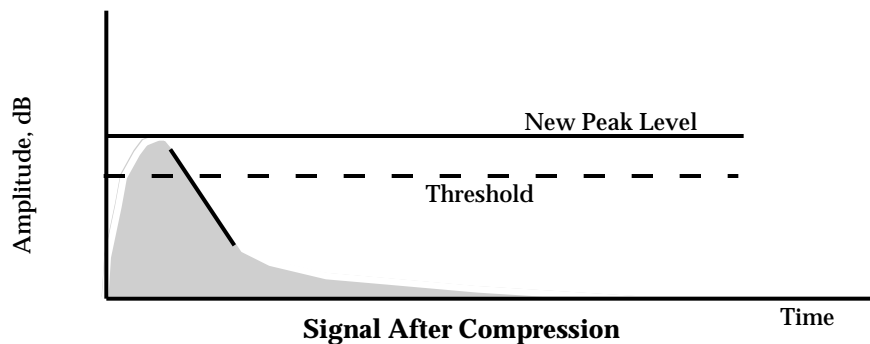
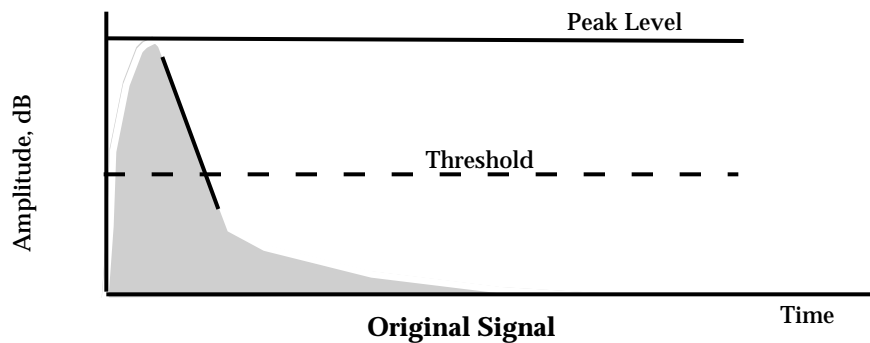
composite equalization: The overall *frequency response* modification produced when a signal passes through more than one equalizing circuit in the same device, or through several equalizers in a series.

composite print: Film print that contains a *sountrack*.

compound time: See *time signature*.

C

compression: (1) The process of reducing the *dynamic range* of an audio signal by reducing the peaks so as to be able to boost the low levels. For every dB of compression applied, the *S/N ratio* is worsened by 1dB, assuming that the make-up gain is set so that the maximum levels of the compressed and uncompressed signals are the same, as the quieter parts of the original signal, plus any noise contained in these regions, will be raised in level. (2) A *dynamic-range* problem in loudspeakers caused by nonlinearity under conditions of high input power levels. At very high levels, the acoustic output increases more slowly or ceases to increase altogether as the input power increases, producing *nonlinear distortion*, i.e., a *frequency response curve* very different for very high levels. (3) Data compression used on digital audio files is a process *ADPCM*, *MACE*, for example. (4) The opposite of *rarefaction* whereby a quantity of data is reduced in order to occupy less storage space. See *ATRAC*.



C

compression driver: A specialized mid- or high-frequency speaker consisting of a small *diaphragm* and *voice coil* coupled to a large magnet structure. The unit is mounted to a horn which acoustically matches the *impedance* of the driver to the impedance of the air and shapes the signal. Expensive due to the precise tolerances required, compression drivers are substantially more efficient than traditional *direct-radiating* cone speakers.

compression ratio: (1) The ratio of the dB change from input level to output level effected by a *compressor*, once the threshold has been exceeded. (2) In data *compression*, the ratio of the number of bytes of uncompressed to compressed data, an indication of the space-saving efficiency of the compression algorithm.

compressor/limiter: A device for reducing the effective *dynamic range* of an input signal by preventing it from rapidly exceeding or falling below a selected amplitude threshold. The first part of a *compressor*, it is used to make loud parts of a signal softer and soft parts louder. Beyond the threshold, the ratio of the signal's input level to its output level (e.g., 2:1, 4:1) is user-selectable. A compressor is commonly used to keep mic levels within an acceptable range, but because it can slow a signal's rate of decay below the threshold, compressors are also used to add sustain to instruments such as electric guitar and bass. The *limiter* acts like a compressor, but operates only at the top end of the dynamic range. The limiter has a faster attack time (1 μ s to 1ms) than the compressor alone (1ms to 10ms). A compressor/limiter is inserted between the outputs of a MIDI soundcard, synthesizer, or mixer and the inputs of the mixdown deck. See *hard knee compression*, *soft knee compression*.

Comtek: (1) A Salt Lake City-based company that makes portable wireless transmitters and receivers. (2) The generic name for wireless headphone feeds to directors and for wireless timecode feeds to slates.

concert pitch: Established by *ISO* in 1955, the agreed reference frequency of 440Hz, for the note A above middle-C, notated A=440.

condenser microphone: A condenser, or *capacitor*, mic capsule has a conductive *diaphragm* and a metal backplate placed very close to the diaphragm. They are charged with static electricity to form two plates of a capacitor. When sound waves strike the diaphragm, it vibrates, varying the spacing between the plates. In turn, this varies the capacitance and makes a signal analogous to the incoming sound waves. There are two types of condenser mics: the true condenser and the *electret* condenser. In the former, the diaphragm and backplate are charged with a voltage from a circuit. In the latter, the diaphragm and backplate are charged by an electret material, which is in the diaphragm or on the backplate. All true condenser mics need a power supply to operate, such as a battery or *phantom power*. In general, condensers have a smooth, detailed sound with a wide, flat *frequency response*--usually up to 15kHz-20kHz, useful for cymbals or instruments that need a detailed sound, such as acoustic guitar, strings, piano, or voice. Condenser mics tend to be more expensive and fragile than *dynamic* microphones. Note that *omnidirectional* condenser mics have deeper lows than *cardioid* condensers, making the former a good choice for pipe organs and bass drum. See also *boundary microphone*.

conductance: The reciprocal of *resistance*, or electric current divided by voltage. The traditional unit of conductance is the *mho* (*ohm* spelled backwards). See also *impedance*.

C

conductivity: A material which exhibits efficient thermal or electrical transference through itself is said to have a high conductivity. Conductivity in a material is rated as its *resistivity*, the inverse of conductivity, in *ohms* per meter. Metals have a high conductivity owing to the large number of free electrons in metal atoms which efficiently transfer the current or heat from one part of the material to another. An *insulator*, on the other hand, is a material with few free electrons, and hence does not readily pass heat or current.

cone: The vibrating *diaphragm* of a *dynamic* or *moving coil* loudspeaker, usually made of paper and shaped roughly like a cone.

conform: (1) To re-edit sound *stems* to match a new version of the picture edit, which is the final matching of all music, dialog and/or special effects to the video image. This may involve synchronization, editing, and re-recording one or more of the components of the final sound/video mix. (2) To assemble sound elements from their original sources to match their location in a picture edit, often with the assistance of an *EDL*.

console: See *mixer*.

consonant: Literally “sounding together.” Musical tones that are consonant sound harmonious or in tune when sounded together rather than discordant or harsh. Musical intervals composed of tones that have relatively simple frequency ratios are more consonant than ones with more complex ratios. The most consonant interval is considered to be the *octave*, which has a frequency ratio of 2:1.

contact: See *wrap*.

contact enhancer: A chemical compound which, when applied to plugs, sockets, or other metallic electrical connection, improves the electrical conductivity between the metal surfaces, making a better, less noisy contact.

contact microphone: A mic that is physically attached to the body of an instrument or other sound source. It is primarily the vibration of the contact microphone’s body itself that is the *transducer*. By comparison, other microphones contain an internal *diaphragm* or membrane that vibrates in response to sound carried to it through the air, while the *capsule* of the microphone itself remains motionless. See also *bug*, *piezo pick-up*.

container: Film sound slang for Dolby Laboratories’ peak *limiter* designed specifically for controlling the dynamics of program material during *SVA* printmastering.

Continue: A MIDI Real-Time *system message*, correctly written Song Continue.

continuous controller: A type of MIDI *channel message* that allows dynamic, *real-time* control changes to be made in notes that are currently sounding. There are 128 possible continuous controllers on each of 16 MIDI channels, and each of these controller types can have any data value between 0 and 127. Modulation (such as pan or volume) is an example of a true MIDI continuous controller. Continuous controller 1 is always the modulation wheel; controller 7 is the instrument’s main volume. See *controller*.

C

continuous sync: A software feature where the DAW will create a new clock based on incoming *SMPTE timecode* to enable recording to the DAW from an ATR. The result is that the sample rate of the DAW will vary continuously, effectively speeding up and slowing down to track the timecode variations. Continuous sync requires dedicated hardware, and may not be available on all DAWs. For example, ProTools™ has a feature for continuous sync which is necessary when syncing continuously to an ATR while recording on any digital machine as the SMPTE timecode-based clock is not guaranteed to be at the precise sampling rate. The ProTools Slave Driver™ does the sample rate conversion in the ProTools hardware so that the audio quality of the digital data isn't compromised.

contour generator: See *envelope generator*.

Control and Display signals (C&D): Also called *PQ codes*. In the CD format, eight additional bits are added to each *frame* of audio data; this means that a byte of information is available from the disc every 136 μs. Each bit in the added byte is given a one-letter name, P-W. Thus, eight separate subcodes can be recorded on and recovered from the CD. So far only P and Q are used: the P-code is used for the pause signal between musical tracks and at the end of the last track, and the Q-code tells the player if the recording is two- or four-channel (no quadrasonic CD player is yet available). The Q-code also contains timing information about the tracks and identifies the country of origin and date of the recording. No standard has been defined for the use of the other six subcodes.

control module: The part of a synthesizer that tells the sound generators and *controllers* what to do to make a given note. These modules include *envelope generators*, *LFOs*, the keyboard itself, and the *modulation* and *pitch-bend* wheels. These allow control of some aspects of a synthesizer's sound by sending signals to the sound generators and modifiers telling them now to behave. For instance, the keyboard sends a signal to the oscillator telling it what frequency to play. Also called *modulation modules*.

control panel: A file which becomes a part of the Mac's system software, giving the user either control over or adding functionality to various aspects of the operating system, peripherals, or applications. See also *extension*.

control track: (1) One track of a multitrack magnetic tape recorder used for recording special signals that provide control information to the recording console during automated mixdown. (2) A dedicated track prerecorded with a *pilot tone*, used on video tape which marks the start of each video frame in order to resolve playback speed by controlling and synchronizing the video frames. Can be used to count time for editing, but is prone to slip and lose count during winding. In 1" and 3/4" formats, *SMPTE timecode* information is sent to a separate *address track* which creates confusion about the names of both of the tracks. See *backing*, *sync-lock*.

control voltage: A voltage, usually varying, used in synthesizers to control various parameters of the signal being produced. Control voltages are used for *envelope control*, *pitch control*, and *filter bandpass* and *rolloff frequency control*, etc. Suitable control voltages can be generated in various ways, one of the most straightforward of which is by a standard keyboard. See *VCA*, *VCF*, *VCO*.

C

controller: (1) Any device, for example, a keyboard, wind synth controller, or *pitch-bend* lever, capable of modulating a sound by altering the action of some other device. (2) Any of the defined MIDI data types used for controlling the on-going quality of a sustaining tone via a *controller message*. In many synthesizers, the controller data category is more loosely defined to include *pitch-bend* and *aftertouch* data. See *continuous controller*.

controller change: A Channel Voice message which allows for musical effects such as *vibrato* or *sustain on* currently active voices.

controller chasing: A sequencer feature whereby whenever playback is requested, the sequencer looks back for the most recent controller, *pitch-bend*, *aftertouch*, and similar parameters and sets everything accordingly so that playback started in the middle of a song replays correctly.

convolution: (1) In any *linear system* or device, the output signal is a function of the input signal and the characteristics of the device. The interaction between the input and the device is described by a mathematical infinite integral called convolution. The output is the input convolved with the *impulse response* of the device. The *spectrum* of the output of a device is simply the spectrum of the input multiplied by the *frequency response* of the device via the *FFT*. (2) The *modulation* of one audio file by another. For example, the use of a hand-clap echo sample could be convolved with a guitar chord sample to produce an echo effect which sounds like it was produced by the guitar.

copy editing: The process of re-recording or copying selected extracts from original sound or video recordings and rearranging their order as they are copied, so that the copy will have all the desired segments in the correct order. This copy is called an *assembly*, and will generally need fine editing in order to meet timing or other production requirements.

corner frequency: See *rolloff frequency*.

correlated noise: See *distortion*.

cosine microphone: See *figure-eight microphone*.

cottage loaf microphone: See *supercardioid* or *hypercardioid microphone*. UK usage.

coulomb: The coulomb is the unit of electric *charge* (C), and is the quantity of electricity transferred in one second by a *current* of one *ampere*.

counts: A slang term for footage numbers or *cues* for specific events in a film or videotape. Also called *footage counts*. See *feet/frames*.

coupling: The process of or means by which energy is transferred from one system or medium to another. For example, the coupling of acoustic energy from a loudspeaker to the surrounding air.

cps: (1) centimeters per second. The speed of movement of tape past a tape read/record head, also denominated in *ips*, inches per second. (2) cycles per second, or *Hertz*.

C.R.: Con Repeats. As in, "Play from the beginning with repeats" is written, "D.C. (C.R)."

C

CRC: Cyclic Redundancy Check. A system of recording a *checksum* number along with data in order to detect, and in some cases, correct any corruption of the data. See *ECC*.

crescendo: A gradual increase in *loudness* of a musical sound.

crest factor: The ratio between the average amplitude as shown on a *VU meter* and the instantaneous amplitude as shown on a *peak meter*. The human ear is very sensitive to this difference.

critical distance: The distance from a loudspeaker where the *direct sound* is equal in intensity to the *reverberant sound*. See also *free-field*.

critical frequency: See *rolloff frequency*.

crossed pairs: See *coincident pair*.

cross-fade: A *velocity* threshold effect in a synthesizer in which one sound is triggered at low velocities and another at high velocities, with a fade-out/fade-in transition between the two. If the transition is abrupt rather than gradual, the effect is called *cross-switching* rather than cross-fading. Cross-fading can also be initiated from a footswitch, *LFO*, or some other controller.

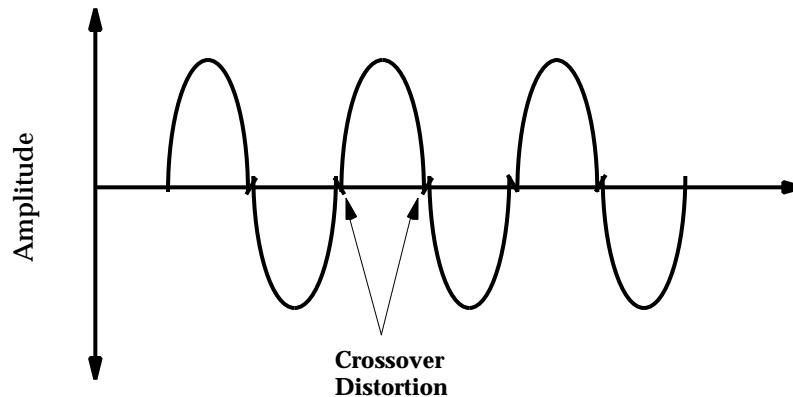
cross-fade looping: A sample-editing feature found in many samplers and most sample-editing software, in which some portion of the data at the beginning of a *loop* is mixed with some portion of the data at the end of the same loop, so as to produce a smoother transition between the end of the loop and the beginning of the loop replay.

cross-interleaving: See *interleaving*.

cross-mod: Cross-modulation test. A means of determining correct exposure on a track negative to result in minimum distortion on a positive print. Tests are conducted to determine the relationship of specific optical cameras to specific laboratories.

C

crossover distortion: A type of distortion present in some amplifiers which increases for low-level signals. In many amplifiers, the output devices are connected so that one of them is active during the positive half of the waveform, and the other one is active for the negative half. There is a region near zero current where the signal is transferred from one to the other. If this is not done smoothly, there will result a small discontinuity in the output waveform. This discontinuity causes higher-order *harmonic distortion*, and being constant in value, is more noticeable with low-level signals than with stronger ones. See *crossover frequency*.



crossover frequency: The frequency above and below which an audio signal is divided into two bands, each of which is directed to a separate destination. Precisely, the frequency at which each of the two bands is attenuated 3dB by the *crossover network*.

crossover network: A dividing network that splits a full-spectrum signal into two or more frequency bands and routes them to feed the various components of a speaker system. *Passive crossover* is a speaker design whereby multiple speakers are in a single enclosure and sound frequencies are separated and sent to be driven by the appropriate speaker. A two-way *biamp* monitoring system has a high-frequency loudspeaker (tweeter) and a low-frequency speaker (woofer). A three-way *triamp* system has a third speaker to reproduce midrange frequencies. *Active crossovers* divide a *line-level* output signal from a mixer or other sound source and route the resulting signals to individual amplifiers optimized for the different speaker components.

cross-switching: A *velocity* threshold effect in a synthesizer in which one sound is triggered at low velocities and another at high velocities, with an abrupt transition between the two. If the transition is smooth rather than abrupt, the effect is called *cross-fading* rather than cross-switching. Cross-switching can also be initiated from a footswitch, *LFO*, or some other controller. Also called *velocity-switching*.

crosstalk: In *multichannel* audio transmission systems, such as tape recorders, record players, or telephone lines, a signal leaking from one channel to one or more of the others is called crosstalk. Also known as *bleeding*. See *channel separation*.

C

crystal sync: A system for generating a sync signal that will ensure proper synchronization of film footage and its corresponding *sync sound* without using any *sync reference*, such as 60Hz AC line frequency. Two piezoelectric crystals, each tuned to the same high frequency, are installed in the camera and recorder. The crystal in the camera precisely controls the motor speed during shooting. The crystal in the recorder produces a *pilot tone* that is recorded on tape in the same way which the camera motor speed would be recorded through the conventional sync cable. Because the two crystals are tuned identically, the *dailies*, when synched with the magnetic film copy of the original sound takes, will maintain perfect sync once the *slate* marks are aligned. Crystal sync generators are also installed in portable video cameras and VTRs. See *Nagra*, *neo-pilot*.

C-Type: See *Spectral Recording*, *noise reduction*.

cue: (1) (*noun*) A piece of music for a specific scene or event in a film. A specific part of a *film soundtrack* which correlates to a visual event in the film is called a *cue point* or *hit point*. (2) (*verb*) To position a sound source to activate at a specific time. See *Real-Time MTC Cueing*, *spot*.

cue box: A wall-mounted or movable box that receives one or more *monitor mixes* from the recording console, and that has jacks to plug in several sets of headphones used to send the *cue mix* to singers or instrumentalists in overdubbing, a narrator, or other studio talent. Also called a *headphone box*. See *cue system*.

cue line: A line drawn on the *workprint*, meant to be seen during projection in post-dubbing or scoring, which gives the actor or conductor a visual cue to begin.

cue list/sheet: A list of the footages and frames, beginning with 00:00, at which specific shots begin and end. Used by the *re-recording* mixer who needs to know which sounds or music must be played as the final mix proceeds. See also *edit decision list*, *feet/frames*.

cue mix: The blend of live inputs and/or previously recorded tracks sent by the mixing engineer to the headphones of performers playing or singing in the studio. Also called the *headphone mix*.

cue mode: A tape machine operating mode in which the tape lifters are defeated while the playback electronics remain operative. Used most often during editing, thus also called *edit mode*.

cue point: See *Real-Time MTC Cueing*.

cue sheet: A track sheet for mixing that gives locations of edited sounds on a track-by-track bases, either in film footages or in timecode numbers. See *binky*.

cue system: The entire electronic circuitry contained within the recording console that allows the engineer to adjustably feed sound from any input module to the *cue mix*, then out to the musicians' or singers' headphones via the cue amp and *cue boxes*.

cue track: A track of recorded music and/or clicks which are sent over headphones to the musicians and/or singers to assist them in *overdubbing* additional music/vocals. If the track is simply tempo clicks, it is known as a *click track*.

C

cue-up: To locate a desired point, at which a specific sound event happens on a reel of tape, and to position that point just ahead of the *playback head* on a tape recorder. When playback begins, the desired sound will be heard immediately.

current (I): The flow of electrical *charge* measured in *amperes*.

cut: (1) (*verb*) To attenuate amplitude of a signal or particular frequency *band*; the opposite of *boost*. (2) To produce the master for a vinyl LP. (3) In film, the instruction used to terminate filming. (4) (*noun*) A musical selection on a record, tape, or CD, or a particular edited version of film.

cut-and-paste: On a hard-disk audio editing system, a term used to denote the ability of an audio editing program to move and/or copy sections of the recorded audio to a new location in the *track* or to other tracks.

cut effects: Sound effects that are taken from a sound library and edited, usually as opposed to recorded *Foley* effects. See *pull*, *M&E*.

cutoff frequency: See *rolloff frequency*.

cut switch: A switch or button that mutes an audio signal on a *mixer*.

cutter: Sound editor.

cut track: An edited track of a film soundtrack which is ready to be used either as a track in a *premix* (music or effects), or as a (dialog) track in the final mix.

C-weighting: Unlike *A-weighting*, *C-weighting* measures frequencies uniformly over the audio spectrum. An *SPL* meter will allow the choice of either (or neither) weighting function. See *B-weighting*, *equal loudness curves*.

