S

S: Side. The difference component of a stereo signal, i.e., the components which come from the side of the stereo field. See *M & S*.

S & S: Sampling and Synthesis. A term used to describe synthesizers which combine elements of these processes to produce their sound.

Sabine equation: The *reverberation time* of a room is found using the Sabine equation:

$$\text{RT60} = 0.049 \times (\text{V/Sa})$$

where *V* is the volume of the room in cubic feet, *Sa* is the total number of sabins present, and *RT-60* is the reverberation time.

sabin: The efficiency with which materials in a room absorb sound and damp *reverberation* is measured in sabins, abbreviated *Sa*. The number of sabins of absorption is found by multiplying the number of square feet of a particular material by the *absorption coefficient* of that material. Also spelled *sabine*.

SACD: Super Audio Compact Disc. Philips/Sony's proposal for a next-generation CD which combines *DVD* technology to produce a hybrid disc that will play in conventional CD players, but offering better audio quality than currently available CDs when played in a DVD player. The upper later is the "conventional (Red Book) layer, while the lower layer provides around 4.7 Gb of high-density storage, increasing the audio capacity to 4.7Gb, the same as a first-generation DVD, and allow text, graphics, and video alongside audio. Audio will be encoded via either standard 16-bit PCM at 44.1kHz, or "Super Audio" using Sony's *DSD* data format and Philips' *DST* data compression technologies, yielding 74 minutes of six-channel audio with purportedly a frequency response of DC–1MHz and the same dynamic range as conventional digital recordings of 24–bit/96kHz resolution. SACD employs*SBM* noise-shaping, and *PSP* copy protection. The intention of the SACD standard is to ultimately combine a stereo DSD track and a six-channel DSD surround mix, plus optional data, text, graphics, and video data.

Here is a comparison between conventional (Red Book) CD and (the current (3/99) prototype specification for) SACD:

	Conventional Compact Disc	Super Audio Compact Disc
Diameter	4-3/4" (120mm)	4-3/4" (120mm)
Thickness	1/20" (1.2mm)	1/20" (1.2 mm)
Signal Sides	One	One
Signal Layers	One	Two
Data Capacity		
Reflective Layer	780 Mb	780 Mb
Semi-Transmissive Layer		4.7 Gb
Audio Coding"		
Standard Audio	16-bit PCM, 44.1 kHz	16-bit PCM, 44.1 kHz
Super Audio		1-bit DSD, 2.8224 MHz
Multichannel	2-channel	6 channels of DSD
Frequency Response	5-20,000 Hz	DC-1MHz
Dynamic Range	< 96 dB	< 120 dB
Playback Time	74 minutes	74 minutes
Enhancements	CD Text	Text, Graphics, Video

S

SACEM: Société des Auteurs, Compositeurs et Éditeurs de Musique. The French equivalent of *BMI/ASCAP*.

safe mode: One of the operating modes of tape recorder electronics. Any tracks placed in safe mode are prevented from entering record mode, even if the engineer accidentally depresses the record-ready button or master-record button. Opposite of *ready mode*.

safety: Short for *safety copy* or *safety master*, a duplicate of any audio or video tape made in case the master itself is lost or damaged. Also called a *protection copy*.

sample: (1) A digitally recorded representation of a sound. Also, a single *word* of the data that makes up such a recording. Also called a *patch* or a *program*. (2) To make a digital recording by taking regular measurements of the instantaneous voltage of an analog signal. See *sampling*. (3) Any single measurement of such a voltage.

sample-and-hold: The part of the *A/D converter* which actually does the job of sampling the signal. It measures the instantaneous signal voltage at a particular time and holds this level constant for the duration of the sampling interval as determined by the *sampling rate*. This level is meanwhile converted into a digital *word* before the sample-and-hold moves to the next sample. See *aperture time errors*.

sample (playback) synthesis: The production of a sound where a digital *oscillator* plays back a digitally sampled recording of an actual sound, such as a note played on a trumpet or guitar.

sampler: Essentially a digital recorder. A device that digitally records and plays back external sound sources, usually by allowing them to be distributed across a keyboard or other controller and played back at various pitches. Compare with *synthesizer*.

sampling: The process of encoding an analog signal in digital form by reading (sampling) its level at precisely spaced intervals of time. See *sample*, *sampling rate*.

sampling error: See *jitter* and *aliasing*.

sampling rate: The rate at which *PAM* samples of an analog signal are encoded by a digital device. The higher the sampling rate during the encoding process, the greater the spectral bandwidth of signal it is able to record accurately. Typical sampling rates vary from 11kHz to 96kHz. The sampling rate for CDs is 44.1kHz. See *sampling*, *Nyquist frequency*. Sampling rates can be changed via a *sampling rate converter*, when the process is known as *resampling*.

SAOL: Structured Audio Orchestra Language. See *MPEG-4*.

SAP: Second Audio Program. A sub-channel used in multichannel television sound, often for second language programming.

SATB: Soprano, Alto, Tenor and Bass.

S

saturation: In analog magnetic tape recording, saturation is the maximum magnetization that a tape can attain. Actual recorded levels are less than saturation because *saturation distortion* **is** introduced if saturation is approached, especially at low frequencies. At high frequencies, it is not possible to reach tape saturation because the signal itself acts to partially erase itself as it is being recorded because the high-frequency signal causes the record head to act like a tape de-gausser. This is called *self-erasure*, and limits the maximum level attainable in a tape recorder at high frequencies. Distortion occurs in an analog tape recording caused by input levels set in excess of 0VU. Setting a record input level too high on an analog medium is more forgiving than on a digital medium, and levels up to +3VU can sometimes be tolerated, but with a corresponding loss of high frequencies. See *overs*, *headroom*, *retentivity*.

saturation distortion: The distortion that results on magnetic recording tape when the applied audio signal is greater than its *retentivity*.

saturation point: The input signal level to a tape recorder that will cause the record head to produce saturation on the magnetic tape.

sawtooth wave: A geometrical waveform, typically generated by an oscillator, resembling a series of ramps. Sawtooth waves sound the same whether they rise left to right or fall left to right or a are series of alternating patterns (where the wave is sometimes called a *ramp wave*.) The sawtooth waveform contains all possible *harmonics*, both odd and even, giving a powerful and brassy timbre. The magnitude of each harmonic is the reciprocal of its number in the series, e.g., the fifth harmonic is $\frac{1}{5}$ the amplitude of the first. See Appendix C.

SBM: Super Bit-Mapping. See *dither*.

S

scale: Music is made up of sounds *pitched* at relative *intervals*. The spacing of these intervals makes a scale. There are several principal *modes* each of which can be found by starting on the notes A-G and playing up the white notes (only) on a piano to the corresponding note an *octave* higher. They are Aeolian (A-A), Locrian (B-B, rare), Ionian (C-C), Dorian (D-D), Phrygian (E-E), Lydian (F-F), and Mixolydian (G-G). These can be transposed to start on different pitches as the interval pattern between notes is the essential feature.

The modern major and minor scales correspond to the Ionian and Aeolian modes, respectively, and form the basis of most western music: (F=full-step, H=half-step, T=three half-steps)

Scale Name	View	Intervals	Example
Ionian (Major)		FFHFFFH	CDEFGABC
Aeolian (Minor)*	Tones are a minor third above tonic	FHFFHFF	CDE♭FGA♭B♭C
Dorian	Tones are major scale, one step below the tonic	FHFFFHF	CDE♭FGAB♭C
Phrygian	Pure minor with a lowered second degree	HFFFHFF	CD♭E♭FGA♭B♭C
Lydian	Minor scale with a raised fourth tone	FFFHFFH	CDEF♯GABC
Mixolydian	Tones are a major scale fifth below tonic	FFHFFHF	CDEFGAB♭C
Locrian	Tones are a major scale, half-step above tonic	HFFHFFF	CD♭E♭FG♭A♭B♭C
Harmonic Minor		FHFFHTH	CDE♭FGA♭BC
Whole tone		FFFFFF	CDEF♯G♯A♯C
Chromatic	Uses all 12 half-steps of the diatonic scale	12*H	CD♭DE♭EFG♭GA♭AB♭BC
Diminished		FHFHFHFH	CDE♭FG♭A♭ABC
Pentatonic	Five notes, omitting two of the seven	FFTF	CDEGA

   *The Aeolian minor scale is also called the natural minor scale.

Within a scale, there is an ascending or descending series of notes that subdivide an octave into various and usually unequal pitch steps. The scales were collectively known as modes, and before about 1600 all were in common use. Between about 1600-1900 western music was centered on just two of the above scale patterns, the major and minor scales, which form the basis of *diatonic* harmony. Major and minor scales can begin on any note: those starting on C comprise the following notes:

Tonic Supertonic Mediant Subdominant Dominant Submediant Leading Note Tonic

All major scales preserve this same pattern of steps. Minor scales have their Mediant a half-step lower and may also lower the Submediant and Leading Note. See *Circle of Fifths*. Many non-Western cultures employ scales with different patterns of tone and semitone, and different tunings. Closer-pitched divisions called *microtonal* intervals are used in Middle Eastern and Indian music. Other scale types include the Pentatonic (5-note), Whole Tone (6-note) and other variants of the major and minor scales.

S

scale construction: See *tonic* and *whole-step*. For example, the relative minor of a major scale starts at either a sixth up or a third down on the major *scale*. To find the third, fourth, fifth, etc. of a tonic, count up that number of scale steps. For example, to find the sixth of a tonic, the major sixth would be nine *half-steps* above the tonic; the minor is diminished, i.e., it is eight half-steps above the tonic. The fifth is seven half-steps above the tonic or below it. A fourth is five half-steps above or below the tonic. The seventh is ten half-steps (minor) or eleven half-steps (major) above or below the tonic.

scale distortion: Because the human ear has a sensitivity which varies with *frequency* and with *loudness* level, a musical ensemble must be reproduced at the same loudness as the listener would experience at the actual event if *frequency distortion* is not to occur. This happens because of the apparent amplitudes of the different frequencies will differ, with accentuation of the extreme high and low frequencies. Also called *volume distortion*. See *equal loudness curves*.

scaling: In a synthesizer or sampler, a method of relating a *parameter* to a control so that the degree to which the control effects the parameter can be varied. For example, a *pitch-bend* wheel might be scaled to produce a *half-step* bend for a given amount of movement, or it might be scaled to give a whole *octave*. Nonlinear scaling between control and parameter will produce an output corresponding to some sort of curve. If there is a point on the curve where the output changes radically in response to input, this is often called a *breakpoint*. The scaling of keyboard parameters is called *keyboard tracking*.

scan: The way melody and lyrics are phrased together. A good scan means words and music fit well together and are easily sung and understood. Bad scan may occur when words such as "a" or "the" are sung on high notes or emphasized notes of the melody, sounding awkward or misphrased.

Scheiber matrix encoding/decoding: The algorithm used in *Dolby Stereo* optical process to produce quadraphonic *LCRS* sound from two channels. In this process, common in-phase information would bleed into the center channel, while the surround channel would receive out-of-phase material. See *SVA*.

Schroeder diffusers: Used to construct *ESS*-type acoustic environments, a structure comprising a number of wells of different, carefully-chosen depths. As a ray of sound strikes the irregular surface, instead of bounding off it like a mirror, it bounces out of each well at a slightly different time, resulting in many small reflections, spread out in both time and space. The operating range of a single diffuser is limited to about four octaves because, if the deepest well is deeper than about fifteen times its width, it begins to behave as a diaphragmatic absorber. The well depths are most commonly given by:

$$d_h = \frac{L}{2N} \times \left[h^2 \right] \bmod N$$

where d is the depth of the diffuser, h is the well number, N is the prime number on which the sequence is based, and L is the wavelength of the lowest operating frequency. This is called the *quadratic residue sequence*.

S

SCMS: Serial Copy Management System. A *DAT* format *subcode* which prevents direct digital copies by inserting a copy-protect message when a digital-to-digital copy of a recording is made. Once the flag is in the subcode of a tape, no subsequent copies can be made from that tape. SCMS is designed into most home digital recorders, and is a problem when transferring material from a consumer-type deck to a digital workstation or when trying to make safety copies of recording sessions. SCMS does not, however, prevent copies made using analog inputs. Some pro-level DAT decks include an SCMS defeat switch or use *AES/EBU* digital interfaces which are unaffected by the SCMS flags. Pronounced "scams" or "scums."

'scope: See *anamorphic.* Originally an abbreviation for *CinemaScope*™.

score: (1) (*noun*) The original-music composition for a motion picture or television production, recorded after the picture has been edited. (2) The conductor's chart, containing all *band parts* of a musical arrangement, and the individual band parts. (3) (*verb*) To write the music for a motion picture or television production soundtrack.

scoring paper: Music paper with several (usually five) lines printed above each *stave* for other information needed by the composer while writing a *score* or jingle. These lines may contain elapsed time counts or *SMPTE timecode* addresses, summaries of on-screen action, dialogue and/or narration, required effects, etc.

scoring stage: A large recording studio equipped with synchronous multitrack or other recording equipment, interlocked film and video playback, and large-screen projection in the studio itself. Motion pictures and video productions are scored here, the conductor watching the image and footage or *SMPTE timecode* data, and conducting performers so that the finished recording aligns properly with the footage.

scoring wild: The recording of a motion picture or television score using non-synchronous recorders. The conductor defines timings for each part of the score from footage counts of the edited film, and seeks a performance that approximates the required timing to a close tolerance, perhaps one-half of a second. The wild score can be made to fit exactly if its playback speed can be adjusted during transfer, by editing in/out short pauses, etc. See also *wild sound.*

scrape-flutter filter: In tape transports, a smooth or low-friction, non-magnetic, low-mass flywheel installed in the tape path in the order to minimize the pressure with which the tape meets guides, rollers, or other potential sources of scrape-flutter.

scratch demo: A quick and inexpensive demo, usually done in a home studio, to give a client a rough idea of what type of music is being composed or produced under contract.

scratching: A technique employed by some DJs, consisting of the rapid back and forth movement of a record turntable to cause the pick-up to produce the rhythmic scratching sound that is characteristic of rap and hip hop. This is done manually, with the turntable drive disengaged, or on a special turntable made for the purpose. Many records now feature scratching as an integral part of the recording process, and some CD players are now available with facilities for scratching and other effects.

screen: (1) A panel with surfaces designed to reflect or absorb sound, used to alter the acoustic behavior of a recording space, or to isolate one performer from another. (2) The shield part of a *shielded cable.* (3) A computer monitor.

S

scrub: To move backward and forward through an audio *waveform* under manual control in order to find a precise point in the wave for editing purposes.

SCSI: Small Computer System Interface. A bus specification standard used by personal computers to attach high-volume peripherals, such as mass storage devices, scanners, hard-disk recorders, etc. SCSI is a *parallel* data bus, and comes in several versions:

Type	Data Path Width (bits)	Max. Data Rate (Mbps)	Ave. Data Rate (Mbps)	Max. Total Cable Length
SCSI-1	8	5	2	9'9"
SCSI-2	8	5	2	19'6"
Fast	8	10	6	9'9"
Ultra (Fast-20)	8	20	8	4'11"
Ultra2 (Fast-40)	8	40	10	9'9"
Fast Wide	16	20	10	9'9"
Ultra Wide	16	40	12	4'11"
Ultra2 Wide	16	80	14	9'9"

S-DAT: Stationary-head Digital Audio Tape. A bi-directional cassette tape designed for domestic digital recording. The head is stationary, as opposed to the rotating head of *R-DAT*. The tape speed is very low compared to professional stationary-head systems, such as *DASH*. The required data rate for stereo operation is achieved by distributing the 16-bit data over 20 data tracks in each direction. The sample rates are the same as for R-DAT, but 4-channel recording is possible at 32kHz with 12-bit *nonlinear* operation. S-DAT is not compatible with DCC as the latter does not conform to the S-DAT standard. See *DAT*.

SDDS: Sony Dynamic Digital Sound. Developed by Sony, the SDDS split-surround format uses the usual *5.1* stems, plus additional left-center and right-center channels. The additional two speakers are employed at the front of the soundstage to deliver more uniform sound in wide-format theaters of screen widths of up to 60' or more, where there might be seats with a *hole-in-the-middle* in between the C-L, and C-R channels. An important aspect of the SDDS format is that it can be decoded into four, six, or eight channels for playback on a wide variety of audio systems. Proponents of this format claim that the extra front channels make a significant difference in the amount of depth, fullness and natural *image* of the audio. See *7.1*.

SDII: Sound Designer II. The audio format native to Digidesign's Sound Designer™ II (Macintosh) audio editing program. The original SoundDesigner format supports uncompressed, 16-bit mono sound files at several sampling rates. SDII supports 16-bit stereo files with sampling rates up to 48kHz; *ADPCM* compression is available at 2:1 and 4:1 ratios.

SDMI: Secure Digital Music Initiative. A working group formed by the *RIAA* to develop a "voluntary" method for protecting music copyright protection on the internet. SDMI is backed by the major labels, the aim of which is to simultaneously legitimize the distribution of music, while protecting copyright holders. There is an approximate analog in the UK with the name (Government's) Creative Industries Taskforce (CIT).

SDS: Sample Dump Standard. The MIDI standard used to transfer digital audio samples from one instrument to another over a MIDI cable. See *SMDI*.

SDU4: See *DS4*.

S

sealed enclosure: The opposite of a *ported enclosure*. A loudspeaker cabinet with no vents or ports, e.g., an *acoustic suspension* system or an *infinite baffle*.

search-to-cue: A feature in *zero-locators* that allows the engineer to instruct the recorder to find a designated time location on tape and stop there and await further instructions.

second: The *interval* between one note and another, one *half-step* (minor second) or two half-steps (major second) above or below it.

segue: (1) An instantaneous switch from one musical selection to another without a gap; the absence of *cross-fade*. (2) Musical term meaning, "continue on without stopping." (3) A piece of music written to fill a gap, particularly in a musical or to link scenes in a film or TV program.

SEL: Sound Exposure Level. The SEL of a noise event is the *A-weighted SPL* lasting one second that would have the same acoustic energy as the event itself. SEL is a way of comparing the noisiness of events that have different durations, such as airplane fly-over noise.

selectivity: The characteristic that describes the ability of a tuned circuit or a receiver to select the signal frequencies desired and reject all others.

self-clocking: A device synchronization system whereby the clock information is embedded within the datastream, and the receiving device locks to it, as opposed to a *master clock* system. This system is not as stable as an internal clock as cables and network problems may introduce jitter. On professional systems, self-clocking protocols will be augmented with a master clock interface which sends *word clock* data.

self-erasure: See *saturation, HX/HX Pro*.

self-noise: The *intrinsic noise* or *hiss* produced by a microphone, measured in the absence of any input signal. Usually the self-noise specification is *A-weighted*: a self-noise figure of 18dB SPL or less is excellent, 28dB SPL is good, and over 35dB SPL is not good enough for quality recording. *Dynamic mics* have very low self-noise. The *S/N ratio* of a microphone is the difference in dB between the microphone's *sensitivity* and its self-noise. See also *reach*.

sel-sync or **sel synch**: Selective synchronization. (1) In a multitrack tape recorder, the use of the *record head* to replay material from other tracks to be heard by the musicians while they *overdub* a new track. This is essential for accurate synchronization as the extra few milliseconds afforded by its position will compensate for the inevitable delay if the signal was taken from the main *replay head* which is some millimeters farther down in the tape stream. Also called *simul-sync*. Ampex has trademarked Sel-Sync, but other products have similar features. The replay quality is less good when using the record head for a function for which it was not designed, thus it is important that the recorder returns to monitoring from the main replay head during *mixdown*. See *auto-input*. (2) On a recorder used for synchronization of sound with motion pictures or videotape, a separate *sync head* that records and plays the *sync tone* or other sync signal.

Selsyn motor: The trade name for a type of synchronous motor used to drive the projector, *dubbers*, and recorder in the dubbing, mixing, or *re-recording* theater. These motors, when connected to the generators and drive motors, will run in rigid interlock with one another, starting, running, slowing down, and running in reverse without loss of sync. See *rock and roll*.

S

semi-parametric EQ: A semi-parametric *equalizer* has two controls: frequency and boost/cut. A fully parametric band would allow the adjustment not only of the center frequency and the amount of cut or boost, but also the *Q* of the frequency band that is being affected.

semitone: See *half-step.*

sempre: Italian for "always," e.g., "sempre legato," always smoothly.

send: An output on a recording or sound reinforcement console for a signal to be sent to another device, such as an *equalizer* or *reverberator*. The signal rejoins the *chain* at the console via the *return* connector. Typical consoles will have several sends and returns. See *effects send.*

send level: A term used for both hardware audio *mixers* and software *synthesizers*, send level is the amount of a sound that is sent to an *effects processor* via the *effects send.*

sensitivity: (1) The minimum required signal at the input of an audio device in order to produce the rated output is generally called the sensitivity of the device. The higher the sensitivity, the lower the signal required at the input. A device with high sensitivity can process very small signals, but may be distorted by large ones, whereas one with low sensitivity can process large signals without distortion, but may add an unacceptable level of noise to a small signal. (2) In general, all information about a transducer's *response characteristics* to incoming sound waves. With respect to microphones, a standard performance specification that indicates the output voltage generated when a sound of known *SPL* and frequency arrives at the diaphragm. Given in mV by most manufacturers and generally specified for *broadband* response to *pink noise.* See *efficiency, transfer characteristic.* (3) See *velocity sensitivity.*

sensurround: A now-obsolete motion picture sound system which uses very strong, very low frequencies to simulate the effects of explosions, earthquakes, etc. It uses a special soundtrack on the film and separate amplifiers and high-power subwoofers to produce the effect. Originally, the first sensurround films simply triggered a noise generator during the scenes to have augmented LFE. Later versions recorded the very low-frequency on the print.

separation: (1) In a multiple microphone set-up, the extent to which any one microphone is able to reject unwanted sounds intended to be picked up by other microphones. Separation is desirable if *phase cancellation* is to be avoided, and can be increased by careful microphone choice an placement. See *directional microphone.* (2) The degree of isolation between signals flowing in two paths. Specified in decibels, indicating the level of a signal induced by one signal path in the other. See *crosstalk.*

sep mag: Separate magnetic film. Terminology for a print whose audio track is on a separate roll of mag film to be run in interlock with the picture; the same as *double-system.*

sequence: (1) A set of music performance commands (notes and controller data) stored by a *sequencer.* (2) To edit the master tapes of an album, putting the songs in the desired order, prior to cutting acetates and *lacquer masters*, etc.

sequencer: A device or program that records and plays back user-determined sets of music performance commands, usually in the form of *MIDI* data. Most sequencers also allow the data to be edited in various ways and stored on disk.

S

sequential monaural: A single bit stream read from a CD is a really one-channel serial data-stream, with time-division *multiplexing* used to interlace the left and right audio channels. See *CD-ROM*.

serial: (1) Data transmission whereby all bits are sent one after the other, as opposed to using a *parallel* interface where bits are sent in groups. Parallel protocols are more complex than serial and the connectors are more complicated and more expensive, all of which makes it harder to get the specification implemented correctly among vendors. For this reason, MIDI uses a serial transmission protocol and specifies a *serial interface*, even though the transmission time required is substantially higher than for a parallel protocol. As MIDI files are quite small, compared with files which contain actual audio or video content, the relative lack of transmission speed was felt to be a good trade-off for the simplicity of its implementation. (2) Network connections where devices in the network are hooked up in a line, i.e., one to the next. This is called a *daisy-chain*, and is the opposite of a *parallel* topology.

serial interface: A hardware interface which transmits computer data using a *serial* protocol. The connector requires only one transmit pin and one receive pin, plus ground. However, the time taken to transmit each word is greater than for a *parallel* interface.

serial port: A connector on a Mac which is used to connect devices which use a *serial interface*, such as some MIDI interfaces, and printers.

servo: Short for servomechanism. A control system that uses *feedback* from an output signal to compare to a *reference signal*. The difference between the two is an error signal, which is used to change the output signal in such as way as to reduce the error. Used to control speeds in tape recorders and turntables and to position the laser beam in CD players. *Negative feedback* in an amplifier is an example of an electronic servo.

session tape: The original recording made during a live playing session.

set-up: (1) The part of a recording session in which the engineer places various instrumentalists or vocalists, sets up the microphones, and gets basic sounds through the recording console. (2) The *program chain*.

Set-Up: A Universal System-Exclusive message of the non-real-time type which defines a list of events which are to be carried out a given *MTC* times by the receiving device, such as event name, start and stop times, plus *effect* parameters.

SEU4: See *DS4*.

seventh: The *interval* between a note and another that is seven *scale* steps above or below it. This will be either ten *half-steps* (minor seventh) or eleven half-steps (major seventh).

SFI: A file extension specifying Turtle Beach's SoundStage™ audio format. Typically encountered as `FILENAME.SFI`.

S-format: See *C-format*.

sfx: Sound effects.

Shannon's channel capacity theorem: The formula,

S

$$\mathbf{DR_{max}} = \mathbf{W} \log_2 (1 + \mathbf{SN}),$$

where DR is data rate, W is channel *bandwidth*, and SN is the *S/N ratio*. It expresses the relationship between these three variables in digital audio. See also *oversampling*.

sharp: (1) Higher in pitch, as opposed to *flat*. In reference to musical *scales*, sharp (♯) indicates one *half-step* higher. (2) In *filters*, sharp refers to the rapidity with which the response of the filter falls off in the filter stopband, synonymous with *rolloff slope*. In general, the sharper the filter, the greater its *phase-shift*. See also *FIR*.

shielded cable: One or more insulated wires covered by a wrapped or braided metal shield. The wires carry the electricity, while the shield acts as an *EMI* barrier to the audio signals. See *balanced line*.

shelving EQ: A typical layout for semi-pro mixers provides low- and high-shelving equalization from a pair of knobs labeled "bass" and "treble" and one *semi-parametric* midrange band. The low and high EQ are called *shelving* because a graph of their response curve looks somewhat like a drawing of a shelf. Any portion of the tone above (in the case of treble EQ) or below (in the case of bass EQ) a factory-preset is boosted or attenuated.

Shelving
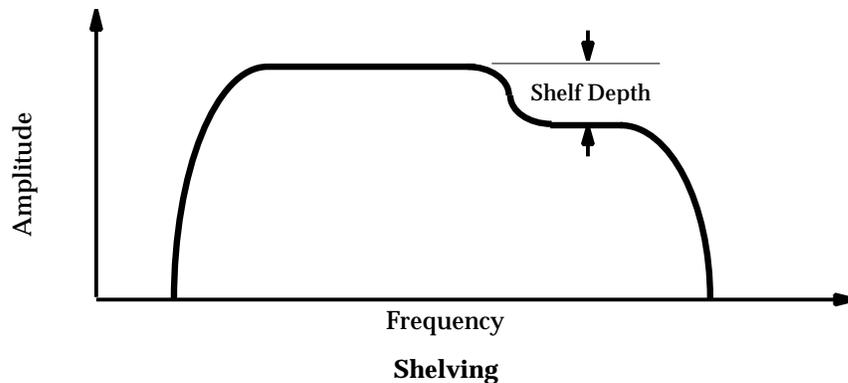
shock mount: A microphone suspension system that prevents mechanical vibrations of the stand from reaching the mic. Usually made of elastic bands mounted on a metal frame, which together hold the mic in position without rigid mechanical contact with the stand.

shoot: In film, slang for recording. It is derived from the previous use of *optical sound* in all film sound recording, i.e., sound recorded on film.

short circuit: A circuit in which some unplanned event, such as the failure of a component or a stray piece of metal bridging two *live* contacts, has reduced the *resistance* in the circuit, resulting in increased *current* flow through the circuit. It can be said that a complete short circuit has zero resistance and consequently infinite current flow, however, AC line voltage will limit this to either 120V or 240V, which is plenty of current by which to get dead. In anticipation of these accidents, most devices have fuses or other componentry integral to the device and/or its power supply which are designed to fail, breaking the circuit, in the presence of abnormally high voltage.

shortcut: A file on a PC-type computer that is similar to the Mac's *alias* feature.

S

shotgun microphone: See *gun microphone.*

shuttle: To wind the tape on a tape recorder back and forth in order to locate a specific audio event.

SI: Système Internationale. The international measurement standard known as "metric," as in SI Units. See *watt.*

sibilance: The high-pitched whistling caused by air passing around the teeth, such as is produced by saying certain letters: f, s, t, x, or soft-c. Most sibilance occurs in the 5-10kHz region. See *de-esser.*

Side: (1) Any master tape of one song, whether recorded for inclusion in an album, or as the A- or B-Side of a single. Always capitalized, Side is used in recording contracts, so precise definition is important. (2) In the *AFTRA* Code of Fair Practice, a Side is a master tape of no more than 3½ minutes. If the total length of the song is longer than that, AFTRA singers receive additional payment.

side-addressed: See *end-addressed.*

sidebands: (1) Frequency components outside the natural *harmonic series*, generally introduced to the tone by using an audio-range wave for *modulation.* See *AM, FM.* (2) Elements of a high-frequency carrier signal created when the data/voice signal is modulated with the *carrier* signal, as in *FM synthesis.* The new sets of *partials* generated by the modulated carrier give the tones a *timbre* other than that of the original *sine wave.*

side chain: A circuit which measures how strong the input signal is which is being modulated by a *compressor.* This information is then used to control the *gain* of the circuit output. The compressor will behave differently, depending on whether the side chain responds to average signal levels or to absolute signal *peaks.* In the example below, for *Dolby B*-type *companding,* the side chain feeds any signals above 3kHz to the compressor:

Side Chain
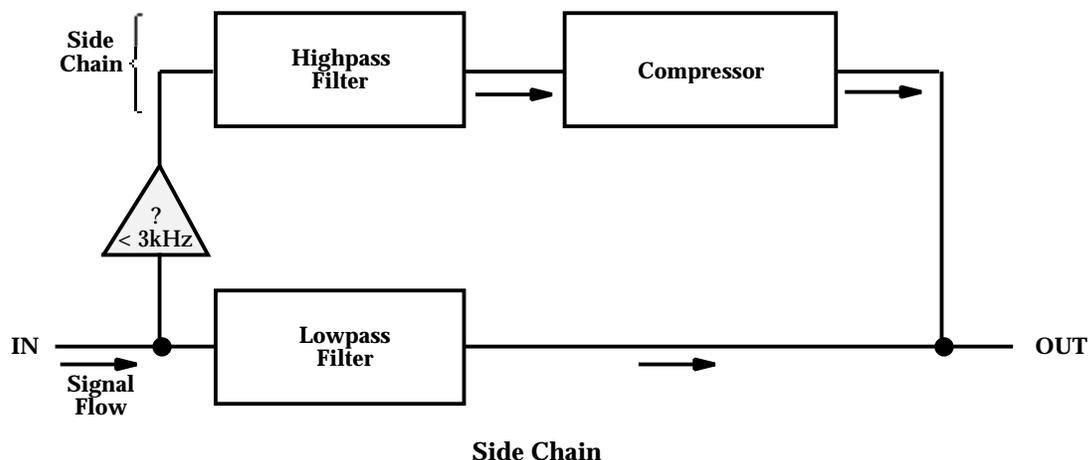
sign: A musical symbol (𝄋) indicating a particular place in the music, e.g., D.S. (Dal Signo), meaning "play from the sign." D.S. (S.R.) means "play from the sign without repeats," and D.S. (C.R.) means "play from the sign with repeats."

S

signal: (1) The desired portion of electrical information, i.e., the information content of any transmission medium, i.e., the part of the *waveform* that is not *noise*. (2) A generic name for any one of a number of forms (magnetic orientation, voltage) which audio may take in the *program chain*.

signal entropy: A condition caused by audio data which is characterized by frequent *transients*, causing a *compression* algorithm to poorly encode data. If the signal is compressed before encoding, the data compression will be much more effective, with less effect on the audio. Signal entropy is not a problem for *ADPCM*-type compression algorithms.

signal generator: A test instrument that produces one or more of the following types of *waveforms* through a wide range of frequencies: sine wave, square wave, sawtooth, etc. See Appendix C.

signal ground: Each component of a sound system produces its own internal ground. This is called the audio signal ground of the device. Connecting devices together with cables can tie the signal grounds of the units together in one place through the conductors in the cable. See *ground loops*, *chassis ground*.

signal processing: The *modulation* of an audio signal in a generally desirable way by any device inserted into the audio *chain*.

signal processor: See *processor*.

signal-to-noise (S/N) ratio: Also abbreviated *SNR*. The ratio, expressed in dB, between the *signal* and the *noise*. To have good *dynamic range*, there must be a good S/N ratio so that the softest signals are not overshadowed by noise. There is approximately a 6.03dB increase in dynamic range per word-bit increase in a digital system; the S/N ratio can be expressed by:

S/N ratio = 20 log (number of quantization increments)

Bits	Increments	S/N ratio (dB)
8	256	54
14	16,384	90
16	65,536	102
20	1,048,576	120

A live musical performance needs a dynamic range of at least 70dB, or a minimum of 14 significant bits. See *noise*, *bit depth*.

simple time: See *time signature*.

simulDAT: A DAT recording made during a *Telecine* transfer in which the production audio is transferred to a DAT whose *timecode* matches that of the videotape.

simul-sync: See *sel-sync*.

sine wave: The *waveform* of a pure *alternating current* or voltage. It deviates about a zero point to a positive value and a negative value, consists of a single frequency and has a musical *pitch*, but a neutral *timbre*. Audio-range sine waves contain only the *fundamental frequency*, with no *overtones* and form the building-blocks for more complex sounds which are combinations of sine waves. Sub-audio sine waves are used by an *LFO* to *modulate* other waveforms to produce *vibrato* and *tremolo*. Also called a *sinusoid*. See *Fourier analysis*.

S

single-ended noise reduction: Single-ended NR systems work on playback only. Analog systems work by combining *dynamic filters* with low-level *expanders* so that the signal level decays, high frequencies are progressively filtered out. At very low levels, the expander acts as a soft gate to clean up pauses. Digital systems are more complicated and use a split-band expander. See *noise reduction.*

Single Note Retuning Message: A Universal System-Exclusive message of the real-time type which is intended to provide a performance control over the tuning of an individual note.

single-stripe: Magnetic film which is coated with oxide, containing a single audio track.

single-system sound: A way of producing sound for motion pictures where the sound is recorded directly onto the film in the camera at the time of shooting. Sound and picture are thus on a single strip of film from the start, with image and sound in projection sync with each other. Used primarily for news and sports where the relatively limited-fidelity of single system cameras can be tolerated. Cheaper than *double-system sound*, but also less flexible. Video is, by definition, single-system sound, but may be used as a double-system if a separate audio recorder is used during filming.

six-channel mix: A nomenclature used for an audio-only *surround-sound* mix, more generally referred to as *5.1* which can refer to either audio-only or audio-for-video.

six-mix: See *six-channel mix*, *5.1.*

sixth: The *interval* between a note and the one six *scale* steps above or below: either eight *half-steps* (minor sixth) or nine half-steps (major sixth).

skew: A deflection or dislocation of the proper path for magnetic tape as it passes over a misaligned tape head, guide, or roller.

slapback: (1) An unwanted and distracting *echo* caused by a reflective surface in any environment, e.g., a large window in a recording studio, a cement wall at a concert venue. (2) A tape delay and the *slap echo* it creates. See *delay line.*

slap echo: The single repetition of a signal at a fixed time delay to simulate an *echo* from a single reflecting surface, as opposed to a multiple echo from a *time delay*, where the delayed signal is repeatedly fed back into the delay input. The sound is repeated once or twice only, with a short delay of 40-60ms.

slate: To identify the various takes in a recording session by announcing the take numbers and recording them on one track of the tape. Slating and the notes taken at the time of recording are important once tape editing begins, otherwise it would be almost impossible to find any particular take.

slave: An audiotape or videotape transport, motion picture projector, magnetic film recorder or *dubber* whose movements follow the movement of a single *master* transport, accomplished electronically by using, for example, *SMPTE timecode*, or electromechanically by linkage of sprocketed machine motors to provide identical movement of all sprocket drives.

slew limiting: The effect which occurs when the input signal amplitude would require the output to change faster than the maximum *slew rate* of the device.

S

slew rate: Slew rate is a common specification for *transient* behavior of electronic devices. It is expressed in V/µs and tells how fast the output of the device rises, given a rapidly rising input. A slew rate of 40V/µs means that it would take one µs for the output to change by 40V. Since studio equipment typically operates on +15V and -15V internally, its output can never really swing 40V. In reality, it might go 5V in ⅛µs. An audio device will have a maximum slew rate above which it cannot operate. This maximum limits the high-frequency power output of amplifiers and limits the high-level, high-frequency handling capacity in all audio devices. Too low a maximum slew rate results in slew-induced *distortion*, **called** *transient intermodulation distortion* (TIM).

slip cue: In playing records, the process of locating the first note of music in any band, holding the disc motionless while the turntable rotates beneath it, then releasing the record so that music begins precisely when the disc is released. This is done either to effect precise *segues*, or to align the rhythm of one record with another one already playing, called *mixing*.

slope: See *rolloff slope*.

slop print: See *workprint*. Also called a *dirty dupe* or *scratch print*.

small-room X-Curve: See *X-Curve*.

small signal bandwidth: The bandwidth an audio device will exhibit at relatively low signal levels. Most audio devices will have a wider frequency range at low signal levels than high signal levels because of such effects as *slew limiting*. See *power bandwidth*.

smart slate: Timecode *slate* that contains a timecode generator. A "dumb" slate must be fed timecode continuously.

smart sync: The ability of some A/D-D/A converters, digital recorders, or other digital devices to automatically sync to *word clock*.

SMDI: SCSI Musical Data Interchange. A specification for sending MIDI sample dumps over the SCSI bus. This requires that the computer be connected to a sampler via both SCSI and MIDI interfaces. See *SDS*.

SMF: Standard MIDI File. A *file format* for transferring data between sequencers and between Macs and PCs. Sequence data is stored on disk in one of three formats: Type 0 packages all data into a single track, regardless of the number of original tracks. Type 1 retains the track layout, although the tempo and time signature of all tracks will be those of track one. Type 2 is the same as Type 1, except that each track keeps its own tempo and time signature, but is seldom implemented. The files include information called *meta events* about such things as track and instrument names, copyright notice, tempo change, *SMPTE timecode* offset, lyrics and *key* and *time signatures*. The time between sequence events is encoded in *delta time* messages of between one and four bytes.

SMP: Turtle Beach's SampleVision™ audio file format. Typically encountered as
`FILENAME.SMP`.

SMPTE: Society of Motion Picture and Television Engineers. Also used as an abbreviation for *SMPTE timecode*.

SMPTE curve: An *equalization curve* standard in the U.S. for 35mm *mag film*.

S

SMPTE leader: See *SMPTE Universal leader*.

SMPTE sync track: A square wave recorded onto an audio track. Note that this is only possible with digital audio, so for the most reliable results when transferring audio, use *jam sync*. See also *sync track*.

SMPTE timecode: A high-frequency timing reference signal developed by *SMPTE* and used for synchronizing film and videotape to audio tape and software-based playback systems. SMPTE is a tempo-independent code which comprises a continuous stream of absolute positional data, so if a short section of code gets lost or corrupted, the system knows exactly where it's supposed to be the next time a piece of valid code is read. Usually generated at the picture source, i.e., the SMPTE *master clock* generator that drives the film or television camera system, the signal is recorded onto the videotape or along the edge of the motion picture film, and sent simultaneously to the audio recorder. The signal contains encoded numerical information, allowing the same point in film or tape time to be located on the separate strips of film/videotape and audio tape, for proper alignment or *ADR*. The playback operator can select a SMPTE timecode number that instructs videotape and audiotape machines to locate a certain point and begin playing in sync from that absolute location.

Timecode data are in the form of a timecode address (*TCA*), which make up the HH:MM:SS:FF part of the timecode word, where HH is a two-byte number for absolute time hour, MM is minutes, SS is seconds, and FF denotes the absolute *frame* number. See *frame*, *jam sync*, *LTC*, *MTC*, *BITC*, *VITC*, and *bi-phase modulation*. **Also called** *longitudinal timecode*. **As opposed to** speed-only sync codes such as *pilot tone*, *FSK*, and *DIN sync*.

SMPTE Universal leader: Designed primarily for video, the *leader*, after Picture Start, features a sweep hand counting down from eight seconds. See *Academy leader*.

S/N: See *signal-to-noise ratio*.

snake: An assembly of cables or wires often used to carry several channels of audio signals between two points, such as from the stage to a mixer. The most commonly used snakes consist of several sets of *balanced line* connections, with a *snake box* at the mic end, fitted with the appropriate number of *XLR* -type microphone sockets, the long, large, multiwire cable on which the individual channels are carried, terminating in a large modular connector for connection to a distribution panel which is, in turn, connected to a power amplifier or preamp. Also called *multicore* or *rope*. A snake box is also called a *stage box*.

snake box: See *snake*.

snake track: A special *optical soundtrack* on a test film for adjusting the alignment of the optical sound system in a motion picture projector equipped to reproduce *SVA* soundtracks.

snapshot automation: A form of MIDI-controlled mixer *automation* in which the controlling device records the instantaneous settings (the snapshot) for all levels and panpots, and recalls these settings on cue.

SND: See *SouND resource*.

SNR: See *signal-to-noise ratio*.

S

soft clipping: A form of *clipping* where the edges of the clipped waveform are rounded rather than sharp. Soft clipping is much easier on the ears and tweeters than hard, as it contains much less very high frequency energy. Compare with *hard clipping*.

soft knee compression: The output of a *compressor* whose gain reduction is brought in progressively over a range of input signal values, such as over 10db or so, starting a few dBs below the threshold. When the input signal amplitude comes within the range of the threshold, the compressor starts to apply again reduction, but with a very low ratio setting. As the input level increases, the compression is automatically increased until, at the threshold level, the ratio becomes infinite. Compare with *hard knee compression*.
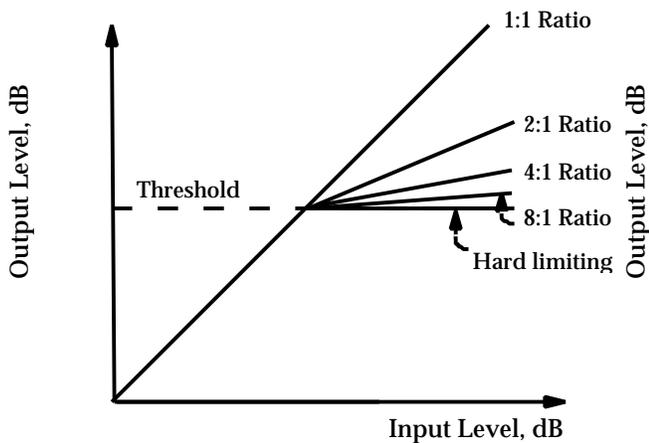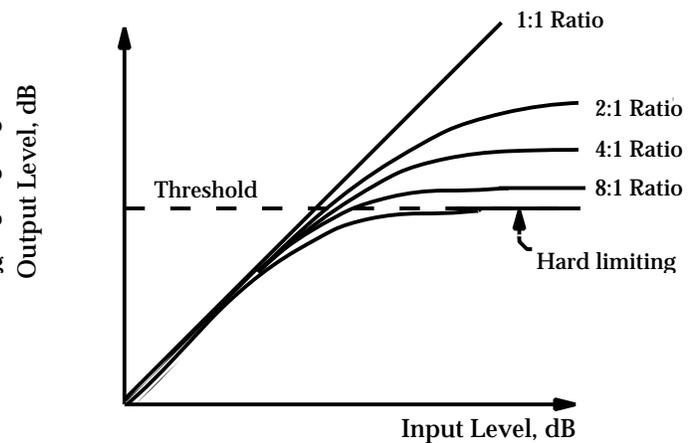
Hard-Knee Compression   **Soft-Knee Compression**

soft pedal: (1) On a piano, the pedal for producing a softer sound, accomplished by shifting the action sideways so that fewer strings per note are struck. On less expensive instruments, the hammers are simply moved closer to the strings. (2) A MIDI Controller Change message assigned to a *parameter* in a synthesizer which reproduces the function of a soft pedal.

Software Thru: When Software Thru is On, MIDI data at the sequencer's MIDI input passes through to the output. When it is Off, MIDI data at the input does not appear at the output. See also *MIDI Thru, Local Control*.

> **Local Control On, Software Through On**: Not recommended as this setting can cause *note-doubling*.
>
> **Local Control On, Software Thru Off**: Recommended mode. The sequencer records data, and you hear what you play on the keys.
>
> **Local Control Off, Software Thru On**: Alternate recommended mode. The keyboard acts like a master controller, but you'll only hear what you play if Software Thru is On and directing the input signal to a specific channel, i.e., the one that feeds the sound you want to hear. Most sequencers let you choose whether Thru echoes data on the incoming channel or directs this data to a different channel.
>
> **Local Control Off, Software Thru Off**: Not recommended. This allows the playback of tracks already recorded into the sequencer, but it is not possible to monitor what is being played or recorded.

solid-state: A term which indicates that a device uses semiconductor (IC) devices, instead of vacuum tubes. Note that tubes in the UK are called *valves*.

S

solo: (1) A feature on a mixing console that automatically routes one or more selected *channels* to the recording monitors or headphones without disturbing the main audio mix. Some studio consoles use *destructive solo*, where the solooed instruments replace the mix in the main stereo bus. On sound reinforcement mixing consoles, solo functions are normally routed to head-phones (non-destructive solo), allowing the engineer to check console channels while the con-cert is in progress. *In-place solo* is a function that permits the user to hear individual channels, but also in the correct stereo perspective, as defined by that channel's *pan* control. (2) A section of music which gives particular prominence to one musician.

solo-in-place: In a recording console, the function that allows all input signals to be *muted* ex-cept one, permitting that one to pass through to the monitor or mix buses exactly as heard in the composite mix, preserving its level, equalization and other processing and stereo position.

sone: A standardized unit of perceived *loudness.* A graph of sones vs. *SPL* shows, for any con-stant SPL, the relative loudness the ear perceives at each frequency, i.e., the inverse of the *equal loudness curves.*

song: (1) Strictly, a piece of solo vocal music, with or without accompaniment, and of short duration. In popular music, this has come to mean any music which is sung. (2) A synonym for a sequence, i.e., a selection of MIDI performance data recorded on a sequencer.

Song Position Pointer (SPP): A System Common MIDI message that tells a device how many sixteenth-notes have passed since the beginning of the MIDI sequence file. An SPP message is generally sent in conjunction with a Continue message in order to start playback from the middle of a song. Alternately, by reading a sync signal (such as *FSK* or *SMPTE timecode*) re-corded on a tape track and converting it to an SPP message, a *synchronizer* could instruct a MIDI sequencer to start playing a sequence at a given location and keep it in sync with the tape.

Song Select: A System Common MIDI message which outputs the number of the song (se-quence) which a sequencer or drum machine should play.

soprano: A high human or instrumental voice above the *alto* in pitch, ranging from about middle-C upwards. The very highest instruments in a given family are sometimes called so-pranino, such as sopranino recorder. Soprano parts are notated with the treble *clef.*

sostenuto pedal: A pedal found on a grand piano and mimicked on some synthesizers, with which notes are sustained only if they are already being held on the keyboard at the moment when the pedal is pressed. Compare with the *sustain pedal.*

sound: The vibration of some physical object, resulting in a pressure front moving through air molecules at 1130 feet per second, a zone of high pressure followed by a zone of low pressure. All sounds can be analyzed as having a number of specific characteristics: *pitch* (frequency), *timbre* (tone), *amplitude* (volume) and *envelope* (the shape of the sound as it changes over time.) What distinguishes one sound from another is the combination of *harmonics* and other *partials* that are present in the sound and how the amplitudes of the various partials change over time.

sound blanket: A think, sound-absorbent blanket, often a mover's quilt, that can be spread on the floor of a set or hung just outside camera range. Its purpose is to damp unwanted *reflec-tions, echoes,* or *reverberation* which would affect *location sound,* or to keep unwanted outside sounds from reaching a microphone during shooting of film or videotape.

S

sound board: A separate, resonant piece of wood in a piano, located under the string assembly. The sound board reflects the sounds back from the bottom of the piano case and out away from the piano. The quality and shape of the sound board give each piano a distinct *timbre*.

soundcard: A circuit board that installs inside a computer, adding new sound capabilities. These capabilities can include an *FM* or *wavetable synthesizer* and audio inputs and outputs. MIDI inputs and outputs are also normally included.

sound check: A diagnostic procedure carried out before a performance or recording, particularly when amplified instruments and/or a *PA* system is used to ensure that all of the equipment is in working order, and that sound levels are set correctly.

Sound Controller Message: One of ten defined MIDI Controller Change messages which are assigned to general-purpose parameters in a *synthesizer* or *effects* unit and allow *real-time* editing of sound quality and effects from a *sequencer*.

sound cutting: See *track laying*.

sound designer: (1) Most commonly, the person who creates special sound effects for film; originally, the person assigned responsibility for the over sound of the film, and who supervises the sound editing and *re-recording*. (2) SoundDesigner™, a popular digital synthesis program.

SoundEdit: A format used on the MacRecorder which became a standard for exchanging 8-bit mono or stereo sound files at four sampling rates from 5.5kHz to 22.255kHz; compression is available for mono files at 3:1, 4:1. 6:1, and 8:1. Newer SoundEdit software supports 16-bit sounds with sampling rates up to 64kHz.

sound field: The area and/or pattern of air pressure disturbance caused by the *compression* and *rarefaction* of energy in the *AF* band.

Soundfield microphone: An extension of *MS* recording for *ambisonic* recording. This technique captures and reproduces true surround-sound, with height information as well as 360˚ horizontal imaging, as opposed to the artificial spatial position of various cinema surround systems. This is accomplished by six separate capsules which allow separate recording of left-right, front-rear, and up-down sound sources. Most use of these microphones is for stunningly accurate stereo recording.

sounding: The act of recording sound on a mag *release print*.

sound intensity: Defined as a measure of the net flow of acoustic energy in a *sound field*. The units are *watts* per square meter, and because the energy moves in a particular direction, sound intensity is a vector quantity, i.e., it has magnitude and direction. Sound intensity is not able to be measured directly, and it should not be confused with *SPL* which is what a sound level meter measures.

Sound Manager: A part of the Mac operating system that handles audio functionality such as input, mixing, and playback. Currently the Sound Manager supports only mono or stereo recording and playback at 16-bit, 48kHz resolution. Most Mac audio cards do not use Sound Manager for this reason, achieving both increased *bit-depth* and *sampling resolution*. See also *WAV/multi-WAV drivers*.

S

sound module: See *tone module.*

sound-on-sound: The same as *overdubbing.*

sound pressure level (SPL): The *amplitude* of an acoustic wave stated in dB that is proportional to the logarithm of its *acoustic intensity.* A sound wave progressing through air causes the instantaneous air pressure at any given point to vary above and below the barometric pressure in accordance with the *waveform* of the sound. This variation in pressure is used as a quantitative measure of the strength of the sound, and is called *sound pressure.* This is the quantity which a pressure microphone measures, and if it is expressed on a dB scale and referenced to a pressure of 20 μpascals, it is called the sound pressure level. The amplitude dynamic range of human hearing goes from 0dB, or 10^{-16} watt/sq.cm., the upper threshold of human hearing to 130dB or 10^{-4} watt/sq.cm., the threshold of pain, a factor of 10^{13} in range.
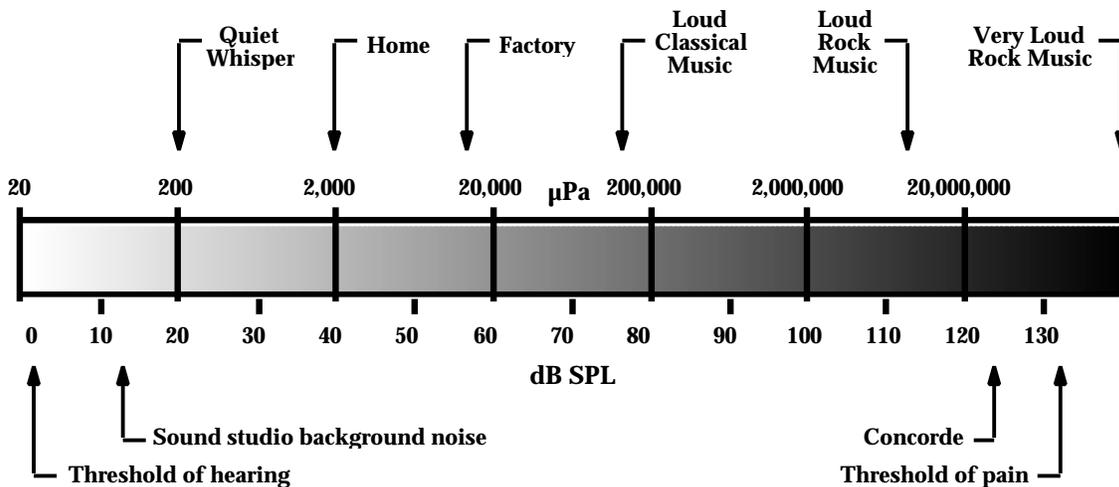
sound quality: The *timbre* of the sound, modified by the following parameters:

Sound Quality	Technical Term	Parameter
Overall Timbre	Harmonic Content	Oscillator Waveform
Brightness	Amplitude of HF Harmonics	Filter Rolloff
Tone Changes	Dynamic Filtering	VCF Envelope
Volume Changes	Dynamic Amplitude	VCA Envelope
Vibrato	Pitch Modulation	LFO to Pitch
Tremolo	Amplitude Modulation	LFO to VCA
Pitch	Frequency	Oscillator Tuning
Note Start Speed	Attack Time	VCA Envelope: Attack
Note Stop Speed	Release Time	VCA Envelope: Release
Percussiveness	Attack Treatments	VCA Envelope: Decay

sound reader: A magnetic *playback head* mounted either directly on a *sync block*, or on a freestanding metal base with alignment rollers. Used by film editors to check synchronization of all effects and music, they slowly hand-crank the *workprint* and various rolls of magnetic film through a sync block on the editing bench. Signal from the sound reader is amplified by a *squawk box.*

S

sound reinforcement: The general term for a sound system designed to amplify the voice and/or music to improve its intelligibility to an audience. A sound reinforcement system always consists of at least one microphone and associated preamps, control console, amplifiers and loudspeakers. Often abbreviated *SR*.

Sound Resource Format: A Macintosh file format, usually abbreviated *SND*, which tends to be used for small, short sound effects, such as beeps and clicks. They were originally used for system sounds. *AIFF* and *QuickTime* formats are more commonly used to record narration or music, especially on larger files.

sound stage: A theatrical stage for filming that is specially treated for the simultaneous recording of dialogue and/or music. A sound stage must have a low *NC curve* and a low *reverberation time*, and the cameras and other equipment used must be specially designed for quiet operation. This is not the same as a *re-recording stage*.

sound stripe: A narrow strip of magnetic material applied to one edge of motion picture film for recording of the *film soundtrack*, in the manner of a tape recorder. 70mm release prints of motion pictures exclusively use magnetic soundtracks, as do some 35mm prints. Compare with *SVA*. See *stripe*.

sound synthesis: The process of electronically creating a sound with an *oscillator*. Types of sound synthesis include *additive synthesis*, *subtractive synthesis*, *sample (playback) synthesis*, *FM synthesis*, **and** *physical modeling synthesis*, *VPM*.

sound system equalization: The equalization of a *sound reinforcement* system, either to increase its amount of gain before *feedback*, or to make its overall *frequency response* more *linear*.

soundtrack: See *film soundtrack*.

source track: Audio input into the *mixdown* process. (1) Generically refers to the music contained in a film, although it literally means the entire audio portion of a film, video or television production, including effects and dialog. (2) Also refers to the physical space on film that contains the audio information.

SOX: Start Of eXclusive. A MIDI message used to indicate the start of a System-Exclusive message.

spaced microphone recording: *Stereo* recording techniques including *Decca trees*, *binaural*, *binaural synthesis*, *spaced pair*, etc. which produce a large difference signal between the left and right channels. Spaced pairs should be placed directly in front of the sound source with a spacing of between one-half and one-third the width of the actual sound stage. Contrast with *coincident pair*.

S

spaced pair: A *stereo* microphone technique where two or more microphones are pointed directly at the source, separated by two feet or more, according to the width of the *sound stage*. Depending on the mic-to-source distance, this method can provide an extremely wide (occasionally exaggerated) stereo perspective. (It is possible to move one mic forward a bit to equalize balance without sacrificing phase or stereo *image*.) While spaced mics produce the widest stereo image, they can suffer poor *mono compatibility*. The use of more than two microphones is called a *spaced array*. Spaced microphone techniques can use either *omnidirectional* microphones or *directional microphones*. **See** *coincident pair*, *near-coincident pair*, *spaced microphone recording*, *Faulkner array*.

spacer: Plastic tape in different colors used to separate sections of film or magnetic tape, used for the purposes of identification or protection. See also *leader*.

S/PDIF: Sony/Philips Digital Interface Format. A consumer standard, similar to the professional *AES/EBU* standard, for encoding digital audio. Given the international standard number IEC-958, S/PDIF was originally designed to be the standard for transmitting audio data between CD players and DAT players, at a time when DAT was thought to be the next consumer audio recording medium. The data transmission is the same as AES/EBU: four times the sample rate. S/PDIF uses either standard *unbalanced* coaxial cable and *phono jacks*, or fibre optic cable and a connector called a *Toslink*, usually at -10dB. Note that the coax is not an RCA audio cable, but a video-grade cable: the impedance on this cable is 75   , and that S/PDIF carries the *SCMS* copy code. S/PDIF is a *self-clocking* scheme. The EIAJ has adopted S/PDIF as CP-340 Type II.

speaker simulator: The sound produced by guitar and, to a lesser extent, bass amplifiers is dramatically affected by the actual loudspeaker cabinet through which the amplifier is played. This is due to the speaker itself which does not reproduce high-end frequencies well. A speaker simulator emulates the frequency response of a conventional loudspeaker cabinet and is typically built in as a part of a *DI* box, combining the elements of the DI with the simulator.

Speakon: See *Neutrik*.

spectral gain intermodulation: The misuse of a (manual) *compressor*, set to high ratios and fast attack and release constants, producing loss of *transients*, loss of high-end, and other undesirable effects such as a kick drum *ducking* the vocals. The remedy for spectral gain intermodulation is to set a low threshold to bring low signals up, but also to be less extreme in the ratio, attack, and release settings. See also *breathing*.

spectral recording (SR): See Dolby SR™.

spectrum: The range of *frequencies* present in a *waveform*, such as an audio signal. When a time-varying signal is subjected to frequency analysis, it is transformed from the time domain to the frequency domain. The frequency-domain representation of the signal is called the *spectrum*, and the time domain representation is called the *waveform*. The two quantities contain the same information, and one can be converted into the other by a mathematical operation of the Fourier transform. *Spectrum analysis*, *frequency analysis*, and *Fourier analysis* are synonymous.

spectrum shifter: See *frequency shifter*.

S

speed: Called out by the production sound mixer on-location, indicating to the camera crew and others that the audio recording chain is now recording.

spill: See *leakage*.

spiral: The widely separated grooves that follow the last selection on a record, leading the stylus quickly toward the center groove. Also called the *tail-out* on mastering lathe controls. The less-widely separated grooves preceding the first selection on a record are called the *lead-in*.

splice: The joint made between two pieces of magnetic tape or motion picture film in the process of editing. Or, the point in audio or screen time at which this joint occurs.

split-band: The analysis or processing of a signal by separating its frequency spectrum into discrete regions, or *bands*. See *split-band coding, split-band compression*.

split-band coding: A *transform* encoding/decoding technique where the signal is split into a number of independent bands, used to take advantage of the spectral redundancies within the audio spectrum. A type of split-band encoding is *sub-band coding*.

spilt-band compression: Compression where different sections of the audio *spectrum* are compressed separately. With a wideband compressor, if there is a dominant portion of the spectrum, no matter how small, it affects the whole waveform. With split-band devices, the greatest effect is with high ratios, where the effect is more like localized limiting. Split-band compressors are similar to *multiband audio processors* in the first stage of audio processing.

split console: A *mixer* where the monitor section is actually another complete mixer; the re-cording input and monitoring functions are entirely separate. The structure of a split console is: input channels, groups, tape monitor channels, and stereo output. This type of design quickly becomes unwieldy as the number of tracks increases, and performing simple functions such as *bounce-downs* often requires external signal patching to re-route monitor returns through input channels and on to the *group sends*. The opposite of an *in-line* mixer.

split feed: (1) The process of routing the same signal to two or more separate outputs, modules, or devices. (2) The actual device that allows the signal to be routed to more than one destination. Also called a *Y-connector*.

split keyboard: A single keyboard is divided electronically to act as if it were two or more separate ones, separated into *zones* at a *split point* or points. The output of each note range is routed into a separate signal path in the keyboard's internal sound producing circuitry or transmitted over one or more separate MIDI channels. Applications include playing a bass sound with the left hand while playing a piano sound with the right.

split point: Where two keyboard zones adjoin, but do not overlap, on a *split keyboard*, the division between them is called the split point. Where the *zones* overlap, they are called *layers*.

split reel: A film reel that can be separated into two separate flanges, so that the film itself, wound on a plastic core, can be stored without reels. Used constantly in editing pictures and magnetic film.

S

split surrounds: Also known as *stereo surrounds*. A term used to refer to the Dolby 70mm sound format that gives two surround channels (LR, RR) on a mono-surround-compatible print. Also indicates the use of separate surround speakers in any sound format which have two (or more) discrete surround tracks.

SPP: See *Song Position Pointer*.

spot-erase: To erase a very small segment of recorded tape, on one track or all. Most accurately done by slowing down the tape by *varispeed*, enabling the engineer to *punch-in* and *-out* at exact points marked on the tape itself.

spotting: Used in film scoring, the process of identifying the specific scenes on film where music *cues* will take place, including information on length and style. Also, the act of reviewing the film with the director to determine work that will be needed on the *soundtrack*.

spring reverb: An electromechanical *effects* device that uses springs to simulate natural room or hall reverberation. Spring reverbs work basically like *plate reverb* systems, but are much smaller and produce an inferior effect. A *transducer* sets up vibrations in the spring which rattles back and forth, extracted by a pick-up at the other end. The character of a particular spring reverb unit is fixed (other than wet/dry balance), but can be optimized for the sound source at the design stage by careful choice of the number, length, diameter, and compliance of the spring(s). Also called a *spring-line reverb.*

square wave: A square wave is a periodic *waveform* which consists of a *fundamental* and all odd-numbered *harmonics*. The harmonics gradually decrease in amplitude as frequency rises, and they are in *phase* with the fundamental. The square wave is a good test signal because it exercises the device at many frequencies at the same time, as does music. Also called a *pulse wave.* See *duty cycle*, Appendix C.

squawk box: A small table-top amplifier and speaker used for playback of magnetic film passing through a *sound reader.* The poor sound quality is reflected in the name of the device. See *bench.*

SR: Used as an abbreviation for (1) *sound reinforcement* or (2) *spectral recording.* See *Dolby-SR, Dolby SR.D.*

S.R.: Senza Repeats, as in "play from the sign without repeats," written D.S. (S.R.).

SR noise: See *biased noise.*

SR.D: See Dolby SR.D™.

SSL: (1) Solid-State Logic, circuitry composed of only *solid-state* components, as opposed to vacuum-tube devices. (2) A company which makes large, expensive mixers.

staccato: Italian for "short." Used to indicate that notes should have a short duration and be detached as widely as possible from one another. The opposite of *legato.*

staff: See *stave.*

S

stage: (1) In an electronic device, when a signal is repeatedly amplified, any portion of the circuit in which an increase in amplification is achieved. In a mixer, for instance, there is generally a stage or *buffer* after each *fader* or *pot,* providing a light load to the fader and a constant *impedance* to the next *stage* or device. (2) A *dubbing stage.*

stage box: See *snake.*

stage monitor: A wedge-shaped *loudspeaker* placed on the stage close to the musicians in a live or broadcast performance. It allows them to hear the *monitor mix,* e.g., the bass player may particularly need to hear the drum part.

stage sync: How well in sync the *Foley* or *ADR* is when it is recorded.

stampers: Used to press plastic *CDs* , the stamper is a negative copy mold made from the *glass master* where the pits are reversed into spikes.

standard operating level: A *reference level* by which various pieces of equipment can be adjusted to produce identical output levels or meter readings. In professional recording, standard operating level is defined as 0VU=+4dBm. In broadcasting, 0VU=+8dBm. See *line-level.*

stand-by mode: See *auto-input.*

standing wave: An acoustical *resonance* in a room caused by parallel wall surfaces, also called a *room mode* or an *eigentone.* Any set of parallel walls will establish a series of standing waves, the lowest one of which has the wall spacing as a half-wavelength. The sound waves interfere with one another to produce a series of places where the *SPL* is high and another series of places between then where the SPL is very low, as if the sound wave were stationary between the two surfaces. See also *room mode, quarter-wavelength rule.*

star network: A type of *MIDI network* in which a master unit is directly connected to all devices in the system, instead of linking them in a *serial* topology. This obviates the need for MIDI Thrus, but requires the use of a device that has a number of *parallel* MIDI sockets.

Start: A MIDI System real-time message which causes a device to start playing the current *song.* Usually only implemented by sequencers and drum machines. See *Stop.*

start bit: In *serial* data transmission, the use of an extra bit to precede the data bits which serves to alert the receiving device, preparing it for data to follow. See *stop bit.*

Start menu: The main menu in a Windows™ system, used to access applications, files, and control panels. This is the equivalent of the Apple (🍎) menu on a Mac.

static: Any dynamic, high-frequency, intermittent *noise* is called static. Static is distinct from continuous noises, such as *hum* or buzz.

static signal processing: Signal processing in which the nature of the input signal has no effect on the type or amount of processing applied to it, as opposed to *dynamic signal processing.*

status byte: A MIDI message byte that defines the meaning of the data bytes that follow it. MIDI status bytes always begin with a 1 (hex 8-F) and are numbered 128 or greater, while data bytes always begin with a 0 (hex 0-7). The status byte determines what type of instruction is described by the message, and is usually followed by one or more data bytes.

S

stave: Also called a *staff*. In notated music, the group of five horizontal lines upon and in-between which notes are written. The lines and spaces represent increasing *pitch* from bottom to top. The precise correspondence between line and pitch is determined by the *clef* which is found at the beginning of every stave. The stave will occasionally have short *leger lines* added above or below when needed for notes that fall outside of the range of the stave. It is common to group staves of simultaneous parts into a *score* by joining them with a vertical line at the left edge of the page and often by linking their bar lines.

steering: See *Dolby Motion Picture 4:2:4*.

stem: Usually used to indicate the inputs to the final mixdown, being comprised of the *DME* tracks. By inference, the many individual tracks which create each of the dialog, music, and effects portions of the soundtrack would be leaves(?), and the final, mixed and edited DME inputs for each soundtrack are the stems.

step input: A method of loading events (such as notes) into a sequencer's memory one event at a time. Common step values are sixteenth- and eighth-notes. After each entry, the *SPP* will advance one step then stop, awaiting new input, as opposed to recording while the clock is running, called *real-time input*. **Also called** *event editing, step recording, step-mode,* **and** *step-time*.

step recording: See *step input*.

step-time: See *step input*.

stereo bar: A mounting for a pair of microphones on a single microphone stand.

stereoizing: Audio signal processing to turn a track recorded in *mono* into a realistic *stereo* field. In an analog world, stereoizing is accomplished by remixing the mono track with a copy of itself, and panning the output channels hard left and hard right, with slightly different EQ on each channel to widen the image. In a digital environment, it is typically accomplished by overdubbing the mono channel with a copy of itself, and running each channel through a reverb, each set with a slightly different delay. In the analog case, this results in only a slight improvement in spreading the *stereo image*; with *DSP*, it is possible to use complicated combination of reverb and other *psychoacoustic* effects to get a fairly realistic stereo image. See also *double-tracking*.

stereo link switch: A control on a dual-channel *compressor* or other effects device that sums the *side-chain* inputs together, then controls both channels from the same side-chain. This is to ensure that both channels of a stereo signal are subjected to exactly the same amount of gain reduction or other processing so as not to shift the stereo *image*.

stereo optical print: There are two tracks on 35mm stereo optical prints, referred to as *Lt –Rt*, on which are *matrixed* four channels of information. The 4:2 *encoding* is done during the print mastering, with the 2:4 decoding occurring at playback (at the theater). All of the stereo optical prints: Dolby Stereo (A-Type), Dolby-SR, DTS Stereo, and Ultra-Stereo occupy the same area as standard mono optical prints. The degree of *mono compatibility* is mix-dependent.

S

35mm Stereo

Optical
Sound Track
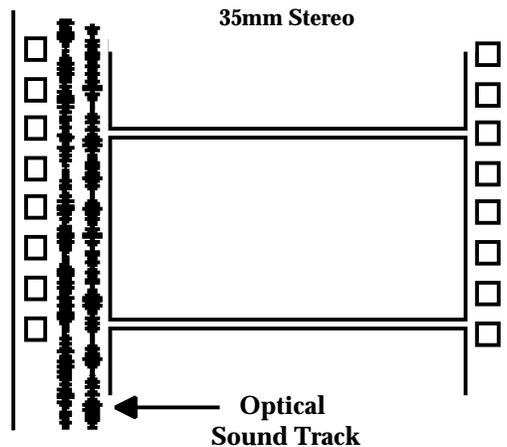
stereophonic: From the Greek meaning "solid sound," referring to the construction of believable, solid, stable sound images. This has come to mean any sound system with two loudspeakers. However, it precisely refers to a sound system which provides the listener with an illusion of directional realism, regardless of how many *channels* are used. For example, the use of a *reverberation* effect with strong *early reflections* and a fairly fast *decay* are an effective way of creating a wide *stereo spread* from a *mono* source, such as a voice or instrument which has been recorded with a single microphone.

stereo spread: Most two-channel stereo recordings are recorded and mixed to produce an impression of diffusion and spread of the sound between the loudspeakers, where the use of artificial *pan* and reverberation produces a pleasing, spacious sound. However, this is not the same as accurate, multichannel *imaging*.

stereo variable area: See *SVA*.

stereo X-Y pair: See *X-Y pair*.

sticky shed syndrome: A problem affecting some types of analog tape where, after a long time in storage, the binder breaks down, causing the oxide to shed. The tape will then start to adhere to the tape heads and guides when played. The usual short-term cure for this is to bake the tape for several hours at 120˚F (50˚C). The long-term cure is to make a new copy as the tape is replayed.

stinger: In a musical score, a short, accented *chord* played to underscore a specific dramatic event on-screen. See *hits*.

STL: Studio-to-Transmitter Link. A broadcast link used to carry audio/video back to the station from a remote site, while the studio personnel is listening off-air. Problematic because of the transmission delays between source and return. See also *OBU*.

stock arrangement: A commercially published arrangement of a song, not a custom-written piece of music or mix.

S

stomp box: A floor unit *effects processor* with built-in footswitches, meant to be patched between a guitar an amplifier.

stop: A lever or similar control that brings into play a particular *timbre* on organs and harpsichords. See *drawbar*, *registration*.

Stop: A MIDI System *real-time* message which will cause a MIDI device to stop playing the current *song*. Usually only implemented by drum machines and sequencers. See *Start*.

stopband: The frequency *band* which is not passed by a *filter*, as opposed to the *passband*. A filter can have more than one stopband, for example a *bandpass filter*.

stop bit: In *serial* data transmission, the use of an extra bit to follow the data bits which serves to alert the receiving device that the flow of data has stopped. See *start bit*.

straight transfer: See *transfer*.

streaming: Transfer of audio or video data in a way that enables multimedia content to be experienced in *real-time* rather than requiring the entire file to download first.

stress bridge: A small capsule within a *breath controller* that functions as a tiny *potentiometer* and produces a varying voltage that is then converted into a *MIDI* data stream.

stretched: A descriptive term for an *encoded* signal, as in a *NR* system. Sometimes used to describe the signal after subsequent decoding. In film, a stretched *transfer* involved making a new recording of an encoded recording without decoding, and then re-encoding the material. In this way, a stretched transfer retains the original noise reduction encoding level. It is not recommended to do the transfer on a decoded version because any response error is multiplied by the *compression ratio*, typically 2:1, of the noise reduction system.

strike: To take down or disassemble a set used in a motion picture, video, or musical performance.

stringendo: Italian for "gradually becoming faster and with increasing tension."

stripe: (1) (*verb*) To record *timecode* on a blank track of audio tape or video tape or *magnetic film*. (2) (*noun*) A timecode and *video black* written to a video tape before any audio or video information is written. (3) *SMPTE timecode* written to unexposed *mag film* where a *frame* in the *leader* is arbitrarily chosen to be 00:00:00:00. Information about reel number, etc., is contained in the *user bits* data area. If the timecode is recorded before any other signals go on the tape, the procedure is known as *prestriping*. Short for *single-stripe*.

striped: *Magnetic film* with one or more stripes of oxide applied longitudinally on the film base. Typically, a "striped" tape refers to a tape which contains only a timecode track. See *striping*; also *film soundtrack*, *single-stripe*.

striping: (1) The process of recording timecode onto a blank tape track. (2) Recording *sync sound* from the edited *video master* onto an external sync recorder, usually to build music and effects tracks, add narration, loop or post-dub some or all of the dialogue, etc. When all the resulting tracks have been re-mixed, the mix is then *re-layed* or *post-striped* onto the *video master*, hopefully still in sync.

S

striping off: Copying a track from a multitrack master, usually to *single-stripe* 35mm mag film to facilitate editing. See *regroup* and *layback*.

stylus: The needle mounted in a *cartridge* on the tone arm of a turntable. It tracks the groove of a vinyl record and its vibrations are converted, by the *transducer* in the cartridge, into an audio signal.

sub-band coding: A type of the *split-band coding* process, where the incoming audio signal is split into a number of independent frequency sub-*bands*, and the accuracy of the *quantization* is varied in each band according to the input signal energy. Critical regions of the audio spectrum can, therefore, be coded more accurately, with quantizing energy being biased toward the high-sensitivity, low-frequency regions. High-energy regions are also coded more accurately than in *PCM* techniques, yielding a lower coding noise platform. See *transform coding*.

sub bass: Frequencies which are lower than the range of the monitors in use, or below the range that a typical monitor can reproduce with fidelity. Sub base is different from infrasonic in that the former applies to the reproduction of low-frequency audio, while the latter refers to the *AF* range itself. In practice, the two terms are often used interchangeably.

subcode: In digital audio systems, particularly *CD* and *R-DAT*, additional data interleaved with the audio information which carries synchronization and user information, such as tags and comments which is independent from the audio data. The three main types of DAT subcodes are Start IDs which mark the beginning of each song, Program Numbers which are the ordinal numbers assigned to each Start ID, and Skip IDs which causes a player to not play the selection whose number is the current Start ID and go to the next Start ID. See also *PQ Codes*.

subframe: In *SMPTE timecode* synchronization, a unit of time smaller than a *frame*, generally $\frac{1}{100}$ th of a frame in length. *Synchronizers* are designed to maintain synchronization to within a small number of subframes. See *frame sync*, *phase sync*.

subharmonic: A *harmonic* lower in frequency than the *fundamental*. Sometimes subharmonics are produced by loudspeakers that have poorly controlled cone resonances. The audible effect is a *distortion* component one octave lower than the input signal frequency.

Sub ID#1, **Sub ID#2**: In MIDI, two data bytes which follow a Universal System-Exclusive data byte in *a system-exclusive* message which define the type of message. A Sub ID#1 value of 1 indicates MTC and bay be followed by a Sub ID#2 value of 1 for a Full Message, or 2 (User Bits), or 15 (Set-Up). A Universal non-real-time Sub ID#1 value of 5, on the other hand, indicates a *sample dump* and may be followed by a Sub ID#2 value of 1 for a Multiple Loop Points message or 2 for a Loop Points Request.

subito: Italian for "suddenly," as in *subito f*, suddenly loud.

submaster: (1) A control on a *mixer* that controls the level of a group of signals, sometimes called a *group master*. Several submasters may be fed into a master control for final level control of the console output signal. The use of submasters makes it easier to handle a large number of input signals. See *gang*. (2) Any tape used in the making of a master tape, but representing an earlier generation number of some or all of the material included in the final master.

S

submix: The mixture of signals fed into a *submaster* control in a recording or sound reinforcement console. The submix is usually a mix of signals that remains constant over a period of time, and it is convenient to control it as a single signal. Also called *submix bus*, *subgroup*, or *mix group*.

subsonic: Literally, "under sound." Subsonic actually means "slower than sound." The proper term for a signal having frequencies below the human hearing range is *infrasonic*.

subtractive synthesis: The technique of arriving at a desired *timbre* by filtering *waveforms* rich in harmonics. Subtractive synthesis is the type generally used on analog synthesizers. This works well on good analogue synthesizers, but when used on samples, reducing the number of harmonics usually just makes the sound flat and lifeless. Also called *analog synthesis*. See *additive synthesis*, *sound synthesis*.

subwoofer: A special type of loudspeaker designed to reproduce low frequency signals only, usually a band approximately 10-150Hz.

sum: The addition of several audio signals or variants of the same audio signal. This is normally achieved at the inputs of an amplifier in a *mixer*.

summing amplifier: See *combining amplifier*.

Super 35: A widescreen film format that makes use of the full width of the 35mm film frame, including the area normally occupied by the optical soundtrack. Therefore, there can never be any 35mm *EK neg* prints made from a Super 35 negative, requiring an *interpositive* from the full-aperture original negative to be enlarged to an *anamorphic internegative*, where the resulting *aspect ratio* is 2.4:1.

Super-Bit Mapping™ (Direct™): A type of *dithering* method for encoding *DSD*-format audio information for playback on standard (16-bit) CDs. Developed by Sony, the new version of SBM, SBM Direct accepts a DSD input signal (16-bit *PCM*) and produce an output encoding with a (claimed) 20-bit resolution through a one-pass *noise-shaping/decimating* process which uses a very complex *FIR* reconstruction filter. SBM Direct is being developed by Sony in an effort to make their *SACD* format successful against *DVD-A*, as SACD players will offer playback of conventionally recorded CDs with enhanced audio quality. See also *HDCD*.

supercardioid microphone: A variation on the *cardioid* microphone pick-up pattern which is most sensitive at the front and sides, while rejecting sounds entering 135°-225° to the rear. The supercardioid has a *unidirectional* pattern narrower than a cardioid, but wider than a *hypercardioid*. Also called a *cottage loaf mic* in the UK. See *directional microphone*.

Super Clock: Digidesign's proprietary version of *word clock*, used as a *master clock* for all Digidesign interfaces. Super Clock runs at 256 times the *sample rate*; word clock runs at the sample rate.

supervising sound editor: The person responsible for the sound editorial process on a film, including dialog, *Foley*, and sound effects.

supply motor: In a tape transport, the motor that establishes proper tape tension on the supply side of the capstan and drives the fast rewind mode. Also called the *rewind motor*.

S

supraaural: Literally, "on top of the ear." This term refers to headsets that rest on the outer ear. They are necessarily light in weight and do not exclude external sounds very well. The opposite of *circumaural*.

surround channel: A single audio channel that feeds multiple speakers, either on the walls of a theater, or in a home surround system. In practice, any format which does not have *spilt surrounds* will be used for *ambient* sound only.

surround-sound: Multichannel sound that is reproduced through three or more loudspeakers above or behind, as well as in front of, the listener. See *5.1*, *7.1*, *Dolby Surround-sound*, *Logic 7*, *AC-3*, *THX*, *transaural audio*.

surround tracks: In 35mm and 70mm projection from *release prints* with magnetic sound, one or two of these tracks is amplified through speakers mounted at the sides, rear or on the ceiling of the auditorium in order to produce *surround-sound*.

sustain: (1) The third of the four segments in an *ADSR* envelope. The sustain portion of the envelope begins when the *attack* and *decay* portions have run their course, and continues until the key is released. The sustain control is used to determine the *level* at which the envelope will remain until the note is released. While the attack, decay, and release controls are *rate controls*, the sustain control is a *level control*. (2) A pedal fitted to pianos and some percussion instruments, such as the vibraphone, that is used to prevent notes from being damped, thus lengthening their decay time, and therefore, not a true (infinite) sustain. A pedal offering a similar function is often available for synthesizers where, of course, an infinite sustain can be achieved on some voices. (3) A MIDI Controller Change message assigned to the parameter in a synthesizer which reproduces the function described in *sustain*(2).

sustain loop: A loop which cycles during the sustain segment of an *envelope* before the rest of the sample plays. See also *release loop*, *loop*.

sustain pedal: The electronic equivalent of a piano's damper pedal. In most synthesizers, the sustain pedal latches the envelopes of any currently playing or subsequently played notes at their sustain levels, even if the keys are lifted. Compare with *sostenuto pedal*.

SVA: Stereo Variable Area. A motion picture sound system consisting of two closely spaced optical *variable-area* soundtracks on 35mm film. Dolby improved this format with their *Dolby-A compander* system to improve the *SNR*, as well as employing *Scheiber matrixing* to synthesize a third (center) and fourth (surround) channel for surround-sound applications. Most modern movies with stereo soundtracks employ the Dolby SVA system. See *snake track*.

swarf: See *chip*(1).

sweep: To vary a parameter or signal in *real-time*, such a smoothly varied sine wave from low to high frequency to measure the *frequency response* of a device.

sweep EQ: See *parametric equalizer*.

sweetening session: A recording session in which a previously made recording is augmented by the addition of other instruments. See also *overdub*.

sweet spot: The optimum position for a microphone to be placed in front of an instrument or for a listener to sit, relative to near-field, or other area-focused, monitors.

S

swell pedal: A foot-operated control for synthesizers and electric organs that adjusts volume, hence allowing the sound to "swell." Originally, a mechanical device on a pipe organ with a similar purpose.

Swelltone™: A brand of *dubbing theater* speaker system.

swept filter: A type of filter where the frequency of the filter can be controlled electronically, rather than being manipulated by the user. An example of a swept filter is where a *LFO* could be used to sweep the filter frequency up and down, or an *envelope* could be generated to shape the filter sweep.

switched controller: A type of Controller Change message which is used to induce some kind of change between only two conditions, e.g., *sustain pedal* On or Off. As opposed to a *continuous controller.*

sync: Synchronization. (1) The process of time-locking a number of normally independent and free-running systems. Where one of these is a tape recorder, the term *tape sync* is used: one track of the tape is used to carry a *sync track* which is used to provide timing for the other devices. Two devices are said to be "in sync" when they are locked together with respect to time, so that the events generated by each of them will always fall into predictable time relationships. See also *SMPTE timecode, crystal sync, sel-sync, jam sync.* (2) The operating mode of tape recorders that uses the *sel-sync* process of playback. (3) In a synthesizer with two or more oscillators, the ability to lock the frequency of the *slave,* to a *master.* This has the effect of eliminating the *beating* which can occur if one is slightly out of tune with respect to the other. If the slave's frequency is adjusted higher than the master, there will be no actual change in frequency, but an alteration in the *harmonics,* giving the composite sound a different *timbre.* This is most effective if the frequency of the slave is modulated constantly, perhaps with an *envelope generator,* to produce a distinctive kind of wailing sound.

sync block: A device used in editing to keep film and sprocketed soundtracks in sync. It can have two or more gangs of sprocketed wheels that rotate in unison and a counter that displays a *feet/ frame* count from a selected starting point. Also called a *synchronizer.*

sync head: See *sel-sync*(2).

synchronization: (1) The precise alignment of picture and sound during projection and playback such that visual and audio events will be reproduced with the same time relationships they had when originally captured to tape. (2) The process by which this is achieved.

synchronizer: A separate device that reads *timecodes* recorded on two or more devices, compares the timecodes, and adjusts the machines' read/replay/write positions and speeds based on the results of that comparison.

Synclavier: The trade name of one of the earliest commercially available computer music instruments, implementing a type of *FM synthesis.* Sequencing and *monophonic* sampling facilities (at a sampling rate of 50kHz) were soon added. The sampler was expanded into a full hard-disk recording unit which coined the name *Direct-to-Disk.* Towards the end of its development, a Synclavier was an integrated system with ninety-six *voices,* sequencing, and multi-track hard-disk recording, aimed at post-production and other professional users.

S

sync-lock: Sync-lock, also called *phase-lock,* emulates the old *control track* or *pilot tone* method of synchronization. The system reads the timecodes, synchronizes the transports, and takes any deliberate offsets into account. Once the system is locked, the *slaves* only use the speed information that is derived from the timecode. Specific timecode addresses are ignored. This method allows the tape machines to stay locked even if the timecode relationships change. See *chase-lock.*

sync mark: A mark that the editor places on the head *leaders* for the *workprint* and each track of edited *magnetic film.* These generally put all tracks in *editorial sync* with one another so that they will maintain synchronization when reproduced on *dubbers* equipped with synchronous motors. The editor may also place a similar set of markings on the tail leaders of all reels of picture and magnetic film, to check that there has been no slippage in projection or playback.

sync master: See *sync reference.*

sync mode: See *sel-sync*(1).

syncopation: In music, the placing of accents on normally unaccented parts of the bar. The effect is usually to anticipate the main beats. See *upbeat, downbeat.*

syncope: A term used to refer to the unnecessary proliferation of tied notes that can occur when a notation module in a sequencer program reflects every rhythmic nuance of the performance data. The problem can often be ameliorated by an option which quantizes only the appearance of the notated music.

sync pop: A single film frame of 1kHz used a guide to synchronize the sound and picture. The pop on the track negative creates a visual guide for the negative cutter who uses it to make a printing start mark. The pop occurs two seconds before the first frame of the picture, and thus corresponds to the "2" frame on the SMPTE Universal leader. On standard film *leader*, the number at the pop is "3" because it counts down in actual film footage.

sync pulse: (1) The output of a *clock* used to keep synchronous devices, such as tape and video recorders, in synchronization. (2) The signal recorded by the *sync head* of a *Nagra,* derived from the camera motor through a sync cable, or from the Nagra's own *crystal sync* generator. See *FM sync.*

sync reference: The *sync pulse* output by the sync master device, used by the *synchronizer* as the reference signal for all *interlocked* devices in the recording and/or playback *chain.* The sync master may come from *house sync* or some other source which generates the *master clock.*

sync sound: A soundtrack recorded for motion picture where the audio elements are recorded synchronously with the picture. The opposite of *wild sound.*

sync tone: (1) In electronic drum machines and sequencers, a *bi-phase modulated square wave* generated in the machine. This can be recorded onto tape, and when played back into the machine, will sync its signal output with the tape. Analogous to *MTC* and *SMPTE timecode,* but differing in the frequencies and word lengths that various manufacturers use in their machines. (2) The 60Hz *pilot tone* that motion picture cameras send to the *Nagra* or other sync recorder, and that controls the playback speed during transfer so that the *magnetic film* will sync with the *workprint.*

S

sync track: A *sync tone* reference signal recorded onto magnetic tape or *magnetic film*.

sync word: At the end of every 80-bit *SMPTE timecode* word is a 16-bit sync word. The sync word provides direction and *sync-lock* speed information, and marks the end of each timecode word. The bits are: 0011 1111 1111 1101.

synthesis: The process of electronically creating sounds on a synthesizer. The word synthesis has the implication of combining separate elements into a new whole, and is therefore, not necessarily to denote "synthetic" as in artificial. See *sound synthesis*.

synthesizer: A musical instrument that generates sound electronically and is designed according to certain principles developed by Robert Moog and others in the 1960s. A synthesizer is distinguished from an electronic piano or electronic organ by the fact that its sounds can be programmed by the user, and from a *sampler* by the fact that the sampler allows the user to make digital recordings of external sound sources. Synthesizers, particularly if provided with *MIDI* software and hardware, need not have a keyboard, and most need to be connected to amplification equipment if they are to be heard. See also *master keyboard*, *tone module*.

syntonic comma: The error arising in any *just intonation*, due to the fact that the *octave* is incompatible with the simple frequency ratios of the *intervals* of the *diatonic scale*. If ƒ is the frequency of the *tonic* C, the first *sixth* produces A, with a frequency of $\frac{5}{3}$ƒ. In going to D, an interval of a *fourth* is required, and this is a frequency ratio of $\frac{4}{3}$, so its frequency will be $\frac{1}{3}$ of A, which is $\frac{5}{3}$ of ƒ, or $\frac{4}{3} \times \frac{5}{3}$ƒ, which is $\frac{20}{9}$ƒ. The descending *fifth* gives G, at a frequency of $\frac{2}{3} \times \frac{20}{9}$ƒ $= \frac{40}{27}$ƒ. The last fifth results in the tonic, C, with a frquency of $\frac{2}{3} \times \frac{40}{27}$ƒ $= \frac{80}{81}$ƒ. This discrepancy is called the syntonic comma, and is equal to about one-fourth of a *half-step*. It results in the fact that, after the above simple five-*chord* progression, the tonic is no longer at the same frequency at which it started. Intervals of major *thirds* are not commensurate with a perfect fifth, the difference being the syntonic comma. The following integer equation must, therefore, be false for all integers:

$$\frac{X^n}{Y} f = 2^m f$$

where X, Y, n, and m are integers, and ƒ is the frequency of the tonic. The left-hand side represents successive steps of musical intervals, and the right-hand side represents *octave* transpositions. It can be shown that this equation can never be satisfied. See also the *diatonic comma*.

System-Common: A type of MIDI data used to control certain aspects of the operation of the entire MIDI system. System-Common messages include *Song Position Pointer* (SPP), Song Select, Tune Request, and End-of-System-Exclusive (*EOX*).

System-Exclusive (sys-ex or SysEx): System-Exclusive is designed to be an open-ended part of the MIDI specification, defined to enable the transmission of the entire memory contents of a synthesizer over a MIDI cable. This transmission is often called a *bulk dump*. Sys-ex commands are strings of numbers, usually written in hexadecimal format, that carry information to a MIDI device, specific to the manufacturer and particular model. In other words, that device, exclusively, will respond to the commands, and all other MIDI devices ignore them. Sys-ex data is used most commonly for sending patch *parameter* data to and from an *editor/librarian* program, but other types of data such as the contents of tuning tables are transferred in this way as well. See *SDS*, *SMDI*.

S

system message: A general term for MIDI messages with status byte values of 240 and above, intended for all devices on a *MIDI network*, irrespective of any *channel* assignments. It includes System-Common, System-Exclusive, and System Real-Time message types. See *MIDI.*

System Real-Time: A type of MIDI data that is used for timing reference. Because of its timing-critical nature, a System Real-Time byte can be inserted into the middle of any multi-byte MIDI message. System Real-Time messages include *MIDI Clock*, *Start*, *Stop*, *Continue*, *Active Sensing*, **and** *System Reset.*

System Reset: A System Real-Time message which causes a MIDI device to reset to its default condition, i.e., its settings when first powered-up. This will usually involve silencing all voices, resetting the display to the opening page, etc.