This glossary of electronic terms was designed to be used in conjunction with the articles in this issue. Definitions were prepared with the assistance of Milton Babbiti, Composer, and James Seawright, Technical Supervisor, the Electronics Music Center of Columbia and Princeton Universities, and H. Emerson Meyers, Professor of Music and Director of the Electronic Music Contests. The Centests University. Music Laboratory, The Catholic University of America, Washington, D.C. Recommended source book for electronic farminology: The Audio Cyclopedia by Roward M. Tremaine, Indianapolis, Indiana: Howard W. Sama, 1959. Distributed by Bobbe-Merrill, Indianapolis.—Ed. Indianapolis.-

essession. The study of production, transmission, and reception of sounds. Psychoacoustics deals with the

amplities. A device used to increase the power, voltage,

or current of a eignal.

compliants. Usually accusted with loudness; it refers to the modernm value of a power, voltage, or current during a simple cycle of a wave.

amplitude meditables. The petrodic variation of ampli-tude, or the process by which this is schleved. It refers to the alteration of signal amplitude to affect recent to the antennant of squict ampliance in according to the feature of a tremole whose periodicity and amplitude alternations are exactly controlled by studio equipment, accing computer. A computer in which computation is

affected by measuring and processing physical priorlives such as voltagas, whereas in digital computers, numbers or riumerical representations are manipuicred to allest computation. The enalog computer deals with continuously variable information rather ihen wiin digital information.

access tage. A magnetic tape on which information is stored in continuous form se magnetic densities. The common tapo used in a tapo recorder le en anciog une.

Those emplicade characteristics having to do with the beginning of a sound or signal (sometimes

called prowth).

wako gansenio:. Strictly apasking, an electronic device that produces complex (that is, consinusoids) sig-mais at frequencies between 20 and 20,000 dz. The familic oscillator and generator are frequently used interchangeably, but correct usage is that oscillator refers to a generator of sine waves, whereas generator refers to a device that produces other than sine

audio cyclilator. A device that produces sinusoids? signote at frequencies between 20 and 20,070 Hz, no melty for purposes of sound synthesis or testing, other spectrum. The entire range of oscillations the

audio caestinii. cen be heard by the human ear. The extreme limits of human hearing are about 20-20,000 Hz.

bend-offsination (reject) filter. A filter that stienuates a perfecient band of frequencies, white permitting other frequencies to pass and be heard. (See, filter.)

Dend-pace filter. A filter that attenuable all but a par-soular band of frequencies. The opposite of a band-offmination filter. (Sec. filter.)

binary input languago. A two-character language used news manus managerages in two-distributed tempology states to convoy instruction to electronic equipment. A convenient language to use since the two characters may be represented by the two states of a switch (on or off), the prevence or absence of a hole in a paper tape, but no on.

paper tape, and no on central rapes and no on central representation. A microphone that must be placed in physical contact with a vibrating body (violin, guiar, cymbal, and the like), thereby transforming vibrations into electrical algasis.

Observation. The process by witch digitally alored information is transformed into analog information or vice varae.

decay. Those amplitude characteristics having to do

with the ending of a sound or signal, good together the world be sound or signal information is stored in discrete, numerical form (se differentiated) algiasi tape.

from statiog tape). drift. Any gradual, unintentional shifting away from a desired value due to equipment shortcomings. In electronic music, reference is generally to oscillate: frequency drift.

electronic and selection of sounds usually statement and selection of sounds usually statement and the selectronic selectronic

interruption of a signal, observed a particular interruption of a signal, observed sealed. A term covering the whole field of elementarity produced sounds, whether they represent sould experiments, sound effects, or music, examplesse, Those characteristics of simplifude that determine

readings. These measurements of anymeter production the the growth and decay of a signed. The confours of a sound or sounds include such variables as rate of attack time, attack height, frequency, timbre, sustain lave, rate of initial decay, and also the rate of final decay.

equalizar. A device for increasing or decreasing algori strongth in selected perilons of the audible spathtum. Certain frequencies may be strengthened in empil-tude white others may be diministrad. (See, Flatcher-Munson curve.) orsion head of a tape recorder that

erases previously recorded material on the tape prior to its passing the record head.

single, perceptually separable musical entity

In all of the dimensione; this is, pitch, duration, toud-ness, timbre, and so ch. Seoffsauk. The reaction of the output or part of the out-put of an empiliying device upon the injuri to secure

either reinforcement (positive feedback) or reduction (negative feedback) of the original input. The term. as community used in electronic music, refers to the prodice of sending a portion of the playback signal from a tope recorder back around to the input write the machine is running in the second more. The playback signal is re-recorded and spain played back, and so on, but often at an interval of time conresponding to the distance between the record and playback heads, and the speed of the bape. The effect is that of a sories of echoes of the original sound, either dying away or increasing to an avalanche of sound, depending on the loop gain of the feedback system.

Million. A device that permits the selective transmission of certain frequencies of the imput signal by the attenuation of undealred frequencies. (See, band-pass

filter, band-allmination filter.)

Theicher-Bussen curve. A diagram of equal confoura-that displays the relationship between intensity and loudness (perceived intensity) at varying (sinusoidal) frequencies. A group of sensitivity curves made of the human ear showing its characteristic for different intensity levels between the throatest of beauty and intensity levels between the threshold of hearing and the threshold of feeling.

lleur-track taps. Recording taps on which four separate sound paths can be utilized at the same time for recording and playback, (See, quarter track recorder.) frequency. Vibrations per second of a signal. The fre-quency of a signal usually determines its pitch.

frequency countier. A device that measures the fre-quency of a signal by literally counting the individual oscillations that occur during a precisely determined

time interval. frequency recodulation. The periodic variation of signal frequency affecting pitch. (See, amplitude modula-

ion.) Grequency shift. A change in frequency of an input

signal accomplished by a multiplier-type modulator or frequency shifter (Klangumvandler).

gain. A quartity expressing the degree of amplifica-tion of an amplifier or device. Gain may be positive or negative, although nagedive gain is usually ferred to as loss.

gets. A device for controlling the amplitude (loudness) of a signal path. Voltage-controlled amplifiers are sometimes called gates.

sometimes called gales
holf-track recorder. A tape recorder that records and
plays on half of a one-fourth-frich magnetic tape.
Two-track or stereo recorders are sometimes referred to se "half-track" if the which of each channel
is actually one helf of the tape which. Canerally,
however, half-track recorders are monaural.
half-track hosde. The heads on a half-track tape re-

corder.

harmentic. An overtone, or frequency component pres-ent in complex sounds. The frequency of a harmonic is an integral multiple of the fundamental frequency, which is the lowest frequency partial present in a given sound. All hermonics are necessarily partials. Herz. A term used internationally in piece of "cycles per second." Herz (Hz) derives from the mame of

the German scientist Heinrich Rudolph Hertz, who was first to detect, create, and messure electro-

magnetic waves. Input A signal fed into a circuit or device

imput language. The code employed to convey instrucflors when programing an electronic device. An en-ceding language such as Fortran or Cobol.

jack. A plug in type terminal such as is found on tole phone switchboards. A socker-type connector

which temperary connections may be made with patch cords.

bay panels. A device for punching information on computer date cards.

Changierisannoide. A successing of musical aventa usually burker different instrumental distance spac-ciated with each event. The use of distance as the primary compositional material; timbro used themsil-

Karenamensior. A ring modulation lite dayloo (see below) in which one sat of regulant frequencies to suppressor

Energy commeller. A device for continuously varying properties of sound. As manufactured by the R. Mong Company, Imperiors are moved along yold contact wires to very stockidal current.

e varietorn le (usually periodicelly) veriet. (See, amplitude modulation; dec, freguency modulation.) monitor. A device used for checking audic signals,

monition. A device used for creating usually during the recording process, rausigne concrete. Music that is constructed from recorded sound sources, other than purely shortwards.

hanga.

ariango. maisa. Hedesired cound. (See, white noise.) esallisten. (See, surfo escillator, risc, audio genera-

coefficiency. An instrument that reproduces on the acreen of a cathoda-ray tube a graphical representation of algusta as voltages with respect to time. Used to determine emplitude, frequency, and other form characteristics.

Auth insequences and other out of a circuit of devices, parameter. A variable quantity that can be measured, partial. A frequency component, not inscensarily har-

morticity related to other components, paged count. A cord with a plug of both ands used to assisting a temporary composition between two jacks,

assumes a semparary correction powers are jacks, result the maximum value of amplitude, or a momentary value considerably higher than the average, permutation. The alteration or changing of variation in country a province

sounde or structures. which succession. The consecutive counting of two or

more tenss. potentiares. A device used for the oracles measura-ment of voltages by comparison of an unknown volt-age with a reference voltage. Often commonly used to denote a volume control on sucho equipment (ab-breviated "put"). programme. The directions for the sequential behavior

prosperiment the terroriting of the progression of the electronic system, periodicity a compular, punches paper tago progressor. An instrument that stores information by making of coded holes in a paper taps.

quarter-track recorder. A tape recorder that uses egree-reson resonance. A super content with a vider of the specific respective processing. Starse recording requires simultaneous recording on two of the four tracks. Many "four-track" recorders about properly of rape for each recording on two of the four tracks, almultaneous recording on two of the four tracks, almost countract, recorders should properly be called quarter-track, as a four-track swomine must be capable of simultaneous use of all four tracks on When. taus.

epending basid. An disctromegnade transducar used to implent magnetized patterns on recording laps.

The playback head "resda" the results of such ar-

rangements.
raversaretism. Repetitions of sound that are so closely spaced in time that they cannot be distinguished in-dividually. The effect produced by radiiptic over-lapping school in a room or concert half. (See, seno.)

reverbaration unit. A device that artificially produces effect of reverberation upon signals cha through it

ng madession. An analog multiplier circuit used to combine signals in such a way that the output con-sists of sums and differences of all the input frequency components.

serviceth ware. A signal consisting of a fundamental frequency and all harmonics, with the intensities of the harmonice inversely related to frequency, (See, waveform.)

delayed by an interval of time corresponding to the distance helps of time corresponding to the distance helpseen the recording and playback heeds. and the speed of the tape. If it is desired to record a signal of a second track while listering to the first track as a guide for synchronization it will be found that the time datay error to about one-tenth of a that the time datay error to about one-tenth of a second (at 10 tps.) and the second track will be out of synchronian by that amount, in order to avoid this, circuits have been developed to allow the playback from the first track (or any track) to be made from the recording head, by using it as a playback head. The sound head will then be synchronius with the recording of another signal on another track, as the record heade are all in line vertically with each other. Of course there are problems in so using the second head as a playback head; only in the linest reachines to the signal quality usable at all for other then the original on anyther the series are the original or all for other then the original quality usable at all for other then the original guality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality usable at all for other then the original quality and the original quality or the original quality and the original quality or the original quality and the original quality or the original quali negameer. A cevice that is used to produce a preset votage sequence for the purpose of controlling a sories of events with votage-controlled equipment. algebra, Electrical-scalege of sound, algebrases. The source of sound; an oscillator or, even a lago moorder in a very general scale.

frequency oscillation.

frequency rectilation.

Noval. Pressure weves of a frequency audiols by the
frumen car. The proporties of sound are frequency,
simplificially duredon, and timbre or severenm. When
frequency of vibradon is requier or siziale, pitch re-

respective where unstable, notice training a second sig-session-seasons, if method of researching a second sig-nal on top of a previously recorded track of a base. The erase hand of the laps recorder must be disconnected or disabled to prevent erasure of the first results are usually quite poor in terms of signal auslity.

were. The pariodic compression and ransfaction of the almosphoro of mequencies discurdicts to the human ear.

course. The entity that auppties signals.

enses the energ that approve eigence. Xecture. A frequency representation of the (audio) signal which plots emphiscle against frequency; the SERVICE TRUSH. convenien from the waveform to the spectrum representation is achieved mathematically by a Foundar maneformatica.

The connection of two segments of magnetic anilica. taps, usually with the help of special splicing tape that is adhered to the glossy back curface.

ware week. A signal consisting of a fundamental fre-quency and oil odd-numberod harmoules with the intensities of the harmonies inversely related to tro-

quancy.
Stranguston. That portion of a sound or signal that lacks significant pencalved variations.

agreementation. Coordinating with report to time one act of events with scudier. Application. A system of electronic instruments for the

executive and control of source.

hape deck. The tope transport and heads portion of a teps reconict. Sometimes preemplifiers are included, but not power emplifiers and speakers usually present in porteble machines.

ent in portable resolvines, the personal resolving to in-present of decrease performance speed without alter-ing pitch. The reverse operation is also possible and pitch may be altered without altering seems. These-color. There is a list complex thereign of the relative amplitudes and frequencies of the fre-quency components.

tibre modulation. The alternation of the amplitudes and frequencies of trequency companents to affect percaivad tona-colur.

Overtones (harmonics) kataism systems. tarily present, usually during the stirck of a sound.

tarity present, usually during the street of a soutie. (See, straidy-state.)
transister. A double made from semiconductor materials that can act as an electrical insulator or overductor, depending on the electrical charges placed upon it. Transisters are used in amplification and 
pecilistion as a submittate for vacuum tubos. 
various speed unit. A device used to control the speed 
of a tape recorder rector. Professional tape recorders 
are driven by a synchronous motor whose speed is 
dependent on the frequency of the AC power to it. 
Beat variates seemed units consist of an escilistor that

Noat veriable spend units consist of an escillator that furnishes a frequency between, roughly, 20 and 40 kiz, and a power empilier that amplifies the signal to a level of 117 volte at a power entition it of drive the motor. Variables of the escillator within this frequency range will affect the speed of the motor over a tirse to one range, usually without ill offects, varies. A variable AC transformer, sometimes used to control the speed of a type reconder motor by reducing the 117-volt line voltage. This method will usually shorten the life of the motor. Vacadam, Developed to the settly 1980's to break down complete vocal quoting life driving intention into district life of information. Most variable speed units consist of an escillator that

complex vecal sounds into digital bits of information for transmission over narrow bandwidths by whe or by radio. Used as a mutation device in alsomeric music composition.

vollage-controlled annihier. An amplifier whose gain may be varied by means of a change in a control voltage. waveform: The shape of a wave in the sense of a graph

ical representation showing variations in emplitude versua time.

versus down. Ye analogy with fight, a signal that may be considered to contain all audible frequencies, with amplitudes randomly distributed. Colored noise, amplitudes randomly distributed. Colored noise, analogously, is noise in which a band (or keeping) of frequencies is suppressed. The audible effect of white noise in like that of enceping steam.

when mose is not have pury event.

we (f) commoder. A device having its appearance of
the letter "f" at the arms and hottom of the scenare three commoders, all contacted in parallel at the
inferention. Should not be used for mixing signals,
but for dividing a signal to sent it to more than one place

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which temporary connections may be made with patch cords.

key punch. A device for punching information on com-

puter data cards.

Klangfarbenmeldie. A succession of musical events usually having different instrumental timbres asso-ciated with each event. The use of timbre as the primary compositional material; timbre used themati-

Kiangumwandier. A ring modulation-like device (see below) in which one set of resultant frequencies is

suppressed.

suppressed.

linear controller. A device for continuously varying properties of sound. As manufactured by the R. A. Moog Company, fingertips are moved along gold contact wires to vary electrical current.

magnetic tape. Iron-oxide-coated plastic tape used in magnetic recordings. Standard widths are one-quarter, one-half, and one inch.

mixer. A device for combining several input signals by algebraically summing their instantaneous amplitudes.

algebraically summing their instantaneous amplitudes. modulation. The process in which a characteristic of

a waveform is (usually periodically) varied. (See, amplitude modulation; also, frequency modulation.) monitor. A device used for checking audio signals, usually during the recording process. musique concrète. Music that is constructed from recorded sound sources, other than purely electronic. mutation. The transformation of sound by radical

change.
noise. Undesired sound. (See, white noise.)
oscillator. (See, audio oscillator; also, audio genera-

cscilloscope. An instrument that reproduces on the screen of a cathode-ray tube a graphical representation of signals as voltages with respect to time. Used to determine amplitude, frequency, and other waveform characteristics.
output. The signal that comes out of a circuit or device.

parameter. A variable quantity that can be measured.

partial. A frequency component, not necessarily harmonically related to other components.

patch cord. A cord with a plug at both ends used to establish a temporary connection between two jacks, usually between an output and an input.

peak. The maximum value of amplitude, or a momen-

tary value considerably higher than the average.

permutation. The alteration or changing of variables in

sounds or structures.

pitch succession. The consecutive sounding of two or

more tones.

more tones.

polentiometer. A device used for the precise measurement of voltages by comparison of an unknown voltage with a reference voltage. Often commonly used to denote a volume control on audio equipment (abbreviated "pot").

programing. The directions for the sequential behavior of an electronic system, particularly a computer.

punched paper tape programer. An instrument that stores information by means of coded hoies in a paper tape.

paper tape.

quarter-track recorder. A tape recorder that uses one quarter (rather than one-half, or all) the width of the tape for each recording. Stereo recording requires simultaneous recording on two of the four tracks.

Many "four-track" recorders should properly be
called quarter-track, as a four-track machine must
be capable of simultaneous use of all four tracks on the tape.

recording head. An electromagnetic transducer used to implant magnetized patterns on recording tape.

The playback head "reads" the results of such ar rangements.

reverberation. Repetitions of sound that are so closely spaced in time that they cannot be distinguished in-dividually. The effect produced by multiple over-lapping echoes in a room or concert hail. (See, echo.)

reverberation unit. A device that artificially produces the effect of reverberation upon signals passed

through it.

ring modulator. An analog multiplier circuit used to combine signals in such a way that the output con-sists of sums and differences of all the input fre-

sists of sums and universities of an tire input frequency components, awtooth wave. A signal consisting of a fundamental frequency and all harmonics, with the intensities of the harmonics inversely related to frequency. (See,

waveform.)

waveform.)
Sel-sync. In a normal, three-head, multi-track tape recorder, the signal played back during monitoring is
delayed by an interval of time corresponding to the
distance between the recording and playback heads,
and the speed of the tape. If it is desired to record a
signal on a second track while listening to the first
track as a guide for synchronization it will be found signal on a second track while listening to the first track as a guide for synchronization it will be found that the time delay error is about one-tenth of a second (at 15 ips.) and the second track will be out of synchronism by that amount. In order to avoid this, circuits have been developed to allow the playback from the first track (or any track) to be made from the recording head, by using it as a playback head. The sound heard will then be synchronous with the recording of another signal on another track, as the record heads are all in line vertically with each other. Of course there are problems in so using the other. Of course there are problems in so using the second head as a playback head; only in the finest machines is the signal quality usable at all for other than the crudest guide to synchronization. The term Sel-sync\* refers to such a system.

equencer. A device that is used to produce a preset voltage sequence for the purpose of controlling a of events with voltage-controlled equipment.

signal. Electrical analog of sound.
signal generator. The source of sound; an oscillator or,

signal generator. The source of sound; an oscillator or, even a tape recorder in a very general sense. sine wave. The waveform corresponding to a single frequency oscillation.

sound. Pressure waves of a frequency audible by the human ear. The properties of sound are frequency, amplitude, duration, and timbre or waveform. When frequency of vibration is regular or stable, pitch resuits; when unstable, noise results.

sound-on-sound, A method of recording a second signal on top of a previously recorded track of a tape. The erase head of the tape recorder must be disconnected or disabled to prevent erasure of the first signal during the process of recording the second. The results are usually quite poor in terms of signal quality. quality.

of the atmosphere at frequencies discernible to the

source. The entity that supplies signals.

spectrum. A frequency representation of the (audio) signal which plots amplitude against frequency; the conversion from the waveform to the spectrum representation is achieved mathematically by a Fourier transformation.

splice. The connection of two segments of magnetic tape, usually with the help of special splicing tape

that is adhered to the glossy back surface. square wave. A signal consisting of a fundamental frequency and all odd-numbered harmonics with the intensities of the harmonics inversely related to fre-

quency, steady-state. steady-state. That portion of a sound or signal that lacks significant perceived variations.

synchronization. Coordinating with regard to time one

set of events with another.

synthesizer. A system of electronic instruments for the

production and control of sound.

tape deck. The tape transport and heads portion of a tape recorder. Sometimes preamplifiers are included, but not power amplifiers and speakers usually present in portable machines.

mpophone. A device used in tape recording to in-crease or decrease performance speed without altercrease or decrease performance speed without alter-ing pitch. The reverse operation is also possible and pitch may be altered without altering speed. timbre. Tone-color. Timbre is the complex function of the relative amplitudes and frequencies of the fre-

quency components.

timbre modulation. The alteration of the amplitudes and frequencies of frequency components to affect per-

ceived tone-color. transient overtones. Overtones (harmonics) momentarily present, usually during the attack of a sound. (See, steady-state.)

transistor. A device made from semiconductor mate-

rials that can act as an electrical insulator or con-ductor, depending on the electrical charges placed upon it. Transistors are used in amplification and oscillation as a substitute for vacuum tubes.

variable speed unit. A device used to control the speed of a tape recorder motor. Professional tape recorders are driven by a synchronous motor whose speed is dependent on the frequency of the AC power to it. dependent on the frequency of the AC power to it. Most variable speed units consist of an oscillator that furnishes a frequency between, roughly, 30 and 40 Hz, and a power amplifier that amplifies this signal to a level of 117 volts at a power sufficient to drive the motor. Variation of the oscillator within this frequency range will affect the speed of the motor over a three to one range, usually without ill effects.

variac. A variable AC transformer, sometimes used to control the speed of a tape recorder motor by reducing the 117-volt line voltage. This method will usually shorten the life of the motor.

wocoder. Developed in the early 1950's to break down complex vocal sounds into digital bits of information for transmission over narrow bandwidths by wire or by radio. Used as a mutation device in electronic music composition.

voltage-controlled amplifier. An amplifier whose gain may be varied by means of a change in a control voltage.

waveform. The shape of a wave in the sense of a graph ical representation showing variations in amplitude versus time.

white noise. By analogy with light, a signal that may be considered to contain all audible frequencies, with amplitudes randomly distributed. Colored noise, analogously, is noise in which a band (or bands) of frequencies is suppressed. The audible effect of white noise is like that of escaping steam.

wye (Y) connector. A device having the appearance of the letter "Y"; at the arms and bottom of the stem are three connectors, all connected in parallel at the intersection. Should not be used for mixing signals, but for dividing a signal to send it to more than one place.

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