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The VU meter—short for “volume unit meter”—is a device used to measure the average level of audio signals in terms of their loudness. It visually indicates the intensity of sound in decibels (dB) on a scale, providing real-time feedback to audio engineers, producers, and anyone involved in the audio process. The classic VU meter looks like a moving needle on a dial, often with a scale ranging from -20 to +3 dB (with 0 dB representing the “0 VU” reference point). Some modern digital VU meters use a digital bar graph display, but the principle remains the same: the VU meter’s primary purpose is to show how loud the audio is at any given moment. LED VU meters work based on the same principle as traditional analog VU meters: they measure the average loudness of an audio signal over time, providing a visual representation of how strong the signal is. However, instead of using a moving needle, LED meters use multiple LEDs (usually red, yellow, or green) arranged in a row. LM3914 IC LED 1k & 33k Ohm Resistor Amplifier circuit Connector LED VU meters are widely used in various audio applications, including: Audio Recording and Mixing: In recording studios, LED VU meters are used on mixing consoles, audio interfaces, and recording software to monitor and control the levels of the audio being processed. Live Sound Systems: For live sound engineers, LED VU meters are essential for ensuring proper signal levels, preventing distortion, and balancing the mix during a performance. Broadcasting: Radio and TV stations use LED VU meters to maintain consistent audio levels during broadcasts, ensuring that sound is clear and within acceptable levels. Home Audio Systems: Many modern home stereo systems and audio receivers come with built-in LED VU meters, allowing users to visually monitor their audio levels while listening to music. Audio Level Indicator – VU Meter Audio Level Indicator – VU Meter No project is complete without the right tool and materials. That’s why our sponser JLCPCB stepped into provide essential material for the project. JLCPCB is a leading provider of high quality printed circuit board and PCB assembling services. Simply head over to JLCPCB, Upload your gerber file, select specification and just place your order. JLCPCB PCB Fab & Assembly from $2! Sign up to Get $80 Coupons Sign Up to Get $80 New User Coupons. How To Order PCB The LM3914 is a voltage level indicator IC that can drive an array of LEDs in a bar graph or LED display configuration. The IC provides a linear response, meaning the LED brightness or number of lit segments increases in direct proportion to the input voltage. The LM3914 is designed to operate with a single power supply and is optimized for driving LEDs with minimal external components. Key features of the LM3914 include: 10-step LED driver: It can control up to 10 LEDs to display a range of values. Linear output: The LED array lights up in a smooth, linear progression as the input voltage increases. Low power consumption: The LM3914 is designed to work efficiently, consuming minimal power when driving the LEDs. Selectable display modes: You can configure the LM3914 to display the input signal in bar graph mode (where multiple LEDs light up gradually) or LED display mode (where only one LED lights up at a time). Internal reference voltage: The IC has an internal voltage reference, making it simple to set up without the need for external reference circuitry. The LM3914 operates by comparing an input voltage (V_in) to a reference voltage (V_ref) and lighting up a series of LEDs in proportion to the input voltage level. The IC divides the input voltage range into 10 equal steps, lighting one LED for each step. LED Bar Graph Mode: In this mode, the LEDs light up sequentially from left to right as the input voltage increases. LED Display Mode: Here, only the highest LED corresponding to the input voltage level lights up. This mode provides a “step-by-step” display, where only one LED is on at a time. To get started, you would connect the input signal (for example, an audio signal or voltage to monitor) to the LM3914’s input pin (pin 5). The IC then compares this voltage to an internally set reference, lighting the appropriate number of LEDs. The LM3914 is a 10-pin IC. Here’s the pinout for the LM3914: Pin 1 (REF OUT): Output of internal voltage reference. Pin 2 (Ref Adj): Pin for adjusting the reference voltage. Pin 3 (V–): Negative power supply connection. Pin 4 (Pin 9 of LED Display): Control pin for LED output (base of transistor). Pin 5 (V_in): Input voltage to be displayed. Pin 6 (Display Mode Control): Mode control (bar graph or LED display). Pin 7 (LED cathode): Negative side of LEDs. Pin 8 (V+): Positive power supply. Pin 9 (LED Anode): Positive side of LEDs. Pin 10 (LED Anode): Additional LED pin or output. The IC takes the voltage at the input pin (Pin 5) and compares it to an internal reference voltage. The number of LEDs that light up depends on the relative value of the input voltage to the reference. The LM3914 is versatile and can be used in a variety of applications where a visual representation of an analog signal is needed. Some of the most common uses include: Audio Level Indicators (VU Meters):The LM3914 is often used in audio applications to create LED VU meters, where the input is the audio signal, and the LEDs represent the loudness of the audio in real-time. This is especially popular in mixing consoles, home audio systems, and sound equipment. Battery Level Indicators:It can be used in battery-powered devices to show the charge level of a battery. As the battery discharges, fewer LEDs will light up, indicating the remaining power. Temperature Indicators:In conjunction with a temperature-to-voltage conversion circuit (e.g., a thermistor or thermocouple), the LM3914 can be used to display the temperature with a corresponding LED readout. Voltage Level Indicator:You can use the LM3914 to monitor the voltage in a circuit. As the voltage increases or decreases, the LEDs will show a visual representation of the voltage level. Signal Strength Indicators:The LM3914 can be used in communication systems to show the strength of a radio or other signal. This is particularly useful in radio transmitters, receivers, and monitoring equipment. Audio Visualizers and Light Effects:In creative applications, the LM3914 can be used to create visual effects, such as synchronized LED displays in audio visualizers, light shows, or interactive art installations. Simple to Use: The LM3914 requires very few external components to get started. It simplifies the process of building LED level indicators. Low Power Consumption: The IC is designed to be power-efficient, making it suitable for battery-powered projects. Versatile: The IC can drive up to 10 LEDs, and you can cascade multiple ICs to drive more LEDs if needed. Adjustable Reference Voltage: You can adjust the reference voltage (with the REF ADJ pin) to change the range of input voltages that the IC can display. Easy Mode Switching: You can easily switch between bar graph and LED display modes, depending on how you want to visualize the input signal. In a world where security is becoming more important every day, building your own electronic password-based lock is not just a rewarding project — it’s also a practical one. In … A Dimmer is an electronic device that uses PWM signals to control the speed and direction of a motor. It works by varying the width of the pulses to adjust … Have you ever wished your dustbin could open its lid automatically when you come near? In this DIY project, I’ll show you how to build a simple yet effective Smart … The VU meter was developed by broadcasters like NBC, CBS, and Bell Labs in the year 1939. These meters support standardize transmissions over telephone lines so-called as standard meters in the audio industry. These meters are designed to measure typical sound levels to signify the way human ears notice volume. The rise time and fall time of these meters are 300 milliseconds. The ideal audio level of this meter is approximately 0 volume unit and frequently referred to as “0dB”. These meters don’t work with fast transient sounds but work with incessant sounds. This article discusses an overview of the VU meter and its working. What is a VU Meter? Definition: A VU or volume unit meter is one kind of an audio metering device. This meter is mainly designed to measure the volume of an audio signal by visually. In audio equipment, this device displays the level of a signal. So these meters are used in consumer audio devices for aesthetics and utility purposes. VU Meter VU meter working principle is, a VU meter is a simple voltmeter that uses a simple signal and displays it through 300 ms of an attack & release time. The slow attack time permits the quick transients to acquire once it registers the signal & displays its reading. What is a VU Meter used for? These meters are used for operating systems like reproduction and sound recording. To determine the signal level for avoiding overloading, distortion, and noise are used. So these meters measure power levels in audio frequency signals by using special ballistics. For complex waveforms like speech, these meters read among the values of average & peak of a complex wave. VU meters have a dynamic characteristic that estimates the human ear response. Once a waveform of speech is applied to this meter, then the movement will specify peaks & valleys within the signal. VU Meter Circuit Diagram The LED VU Meter using LM3914 and LM358 are discussed below. This circuit can be designed by using two op-amps like LM3914IC and LM358IC. Circuit Diagram using LM3914 IC The circuit diagram of the VU meter using LM3914 IC is shown below. By using this circuit, the level of the signal in the audio device can be displayed like a stereo system, the audio level of CD, etc. This circuit uses an audio amplifier to generate an analog signal to drive 10 LEDs depending on the audio signals. This circuit can be built with two modes of displays like DOT & BAR. The selection of these modes can be done by using a switch S1. In Dot mode, a single LED can be moved from top to bottom whereas, in BAR mode, all the LEDs will be turned ON serially. VU Meter Circuit Diagram using LM3914 IC The IC used in the circuit is a voltage level sensor that plays an essential role to drive all the LEDs at the output. According to the DC voltage, the LEDs will be turned ON and OFF at pin5 of the IC. This circuit operates with 9v to 12v DC however this IC also works with the voltages which range from 3v to 25v DC. Circuit Diagram using LM358 IC This circuit can be built with IC LM 358. The required components of this circuit are LM358 ICs, resistors, audio jack, aux cable, variable resistor, power supply, jumper wires, LEDs. A voltage comparator is one kind of operational amplifier and also known as an op-amp. When the voltage at the input of the non-inverting terminal is high compare with the inverting terminal, the comparator output will be high. Similarly, once the voltage at the input of the inverting terminal is high compare with the non-inverting terminal, then the comparator output will be low. The IC LM358 is a Dual op-amp including low noise. It includes two separate voltage comparators. This is a general IC and it can be used in different modes such as summer, comparator, integrator, amplifier, differentiator, inverting & non-inverting modes, etc. This circuit can be designed with a number of dual op-amps like the LM358 IC, where each IC includes two comparators within it. The main function of this comparator is to compare the voltage signal of audio through a reference voltage. In this meter, the adjustment of the reference voltage at the non-inverting terminal of the op-amp can be done using a voltage divider circuit. So the designing of this can be done by using resistors and a pot. Here, the resistor used at each comparator is the 1k resistor. The main benefit of the variable resistor or potentiometer is that we don’t have to modify the resistor values in the circuit to change the reference voltage for every comparator. As an alternative, we can regulate it through a single POT. In this circuit, the LEDs which are connected in the circuit are in reverse logic that means LEDs negative terminals are associated with the o/p of the comparators. Thus, when the output of the comparator is high, then the LED will be turned OFF. Similarly, when the output of the comparator is low then the LED will turn ON. Plugin and Characteristics By the incomparable levelness and faultless ballistic response equal the finest hardware meters. So the plugin from the Waves VU Meter will assist you to maintain suitable gain staging aimed at a pure and expansive mix. The free plugin for VU Meter from Waves can help you to make improved mixes. We can download this free VU Meter plugin from the Waves website. This plugin is available in different formats like AU/ VST/AAX which supports Mac and PC. The characteristics of the VU meter include the following. Reference level Rise time Impedance Frequency response Thus, this is all about an overview of VU meter and how to build a VU meter using LM3914 IC and LM358 IC. The applications of VU meter involves where the change in audio can be observed. It can also display a slight change within the volume of the audio system. These are frequently used in sound systems and recording rooms. Here is a question for you, how to build a VU meter? Audio signal level measurement device An analog VU meter with peak LED A volume unit (VU) meter or standard volume indicator (SVI) is a device displaying a representation of the signal level in audio equipment. The original design was proposed in the 1940 IRE paper, A New Standard Volume Indicator and Reference Level, written by experts from CBS, NBC, and Bell Telephone Laboratories.[1] The Acoustical Society of America then standardized it in 1942 (ANSI C16.5-1942)[2][3] for use in telephone installation and radio broadcast stations. Consumer audio equipment often features VU meters, both for utility purposes (e.g. in recording equipment) and for aesthetics (in playback devices). Surround audio VU meter graphic The original VU meter is a passive electromechanical device, namely a 200 µA DC d'Arsonval movement ammeter fed from a full-wave copper-oxide rectifier mounted within the meter case. The mass of the needle causes a relatively slow response, which in effect integrates or smooths the signal, with a rise time of 300 ms. This has the effect of averaging out peaks and troughs of short duration, and reflects the perceived loudness of the material more closely than the more modern and initially more expensive PPM meters. For this reason many audio practitioners prefer the VU meter to its alternatives, though the meter indication does not reflect some of the key features of the signal, most notably its peak level, which in many cases, must not pass a defined limit. 0 VU is equal to +4 dBu, or 1.228 volts RMS, a power of about 2.5 milliwatts when applied across a 600-ohm load. 0 VU is often referred to as "0 dB".[4] The meter was designed not to measure the signal, but to let users aim the signal level to a target level of 0 VU (sometimes labelled 100%), so it is not important that the device is non-linear and imprecise for low levels[according to whom?]. In effect, the scale ranges from −20 VU to +3 VU, with −3 VU right in the middle (half the power of 0 VU). Purely electronic devices may emulate the response of the needle; they are VU-meters in as much as they respect the standard. In the broadcast industry, loudness monitoring was standardized, in 2009 in the United States by the ATSC A/85, in 2010 in Europe by the EBU R 128, in 2011 in Japan by the TR-B32, and in 2010 in Australia by the OP-59. The original designers of the VU meter were tasked with finding a way to measure complex audio signals with a simple technology. Since a VU meter is a mechanical device, it can never reflect the instantaneous signal peaks of complex audio signals. The designers of the VU meter therefore took a different approach. They created a meter that did not measure peaks, but simply inferred them. A real VU meter has a very specific "ballistic characteristic". This means that it responds to changing audio signals at a very precise speed, rising from no signal to 99% of "0 VU" when a 1 kHz sine wave tone is applied for 300 milliseconds. When using a VU meter, the audio system is calibrated with a sine wave tone at a "reference level" for the system. At the reference level, the VU meter shows "0" for a sine-wave tone, but the engineer must know that, with music or speech, to always infer that peak levels are always between 6 dB and 10 dB higher than the reference level. The usefulness of the VU meter comes from the fact that for most types of audio sources the system engineer can count on these peaks being within this range and can design the audio system with confidence. Good engineering practice is to always build in a little extra "headroom", as it is called, to cover the strange conditions where an audio signal might exceed normal peak levels or the equipment operator fails to adjust the levels correctly. Typically the levels considered when designing systems using a VU meter are: Reference level (typically +4 dBu, valid with tones only); Standard output level (10 dB above reference, typical peak levels); Clip level (6 dB above standard output level, "headroom" to allow for unusual conditions)[5][6] The behaviour of VU meters is defined in ANSI C16.5-1942, British Standard BS 6840, and IEC 60268-17. VU defined: “The reading of the volume indicator shall be 0 VU when it is connected to an AC voltage equal to 1.228 Volts RMS across a 600 ohm resistance (equal to +4 [dBu]) at 1000 cycles per second.”[7][8] Note: The reference above is generally true now and was always true in the recording industry. However in some North American broadcast installations up until late in the 20th century, the Reference level ("0VU") was +8dBm at large studio installations and some used 150 ohm impedance throughout the studio.(CFRB Toronto and CFPL London Canada) This was yet another "standard" established in the early years of audio and the VU meter was altered by changing the series resistors to adjust its sensitivity. This had no effect on the ballistics. [9] The response of a VU meter (black line) compared to instantaneous input level (grey area) of a drum beat. Level is in dB and time is in seconds The rise time, defined as the time it takes for the needle to reach 99% of the distance to 0 VU when the VU-meter is submitted to a signal that steps from 0 to a level that reads 0 VU, is 300 ms. The overshoot must be within 1 to 1.5%. The fall time is the same as the rise time, 300 ms. The level specification is meant at 1000 Hz. The reading should not depart from the reading at 1000 Hz by more than 0.2 dB from 35 Hz to 10 kHz or more than 0.5 dB between 25 Hz and 16 kHz. Note that the specification mentions only sinusoid waveforms. Given the electromechanical principle of the meter, the deviation of the needle is actually approximately proportional to the average of the part of the signal with more than approximately 0.4 V instantaneously because of the two copper-oxide rectifiers always in series, which transfer function curve has a knee around 0.2 V. Signals generally do not have a sinusoidal waveform by far, even if they all fall within the VU-meter bandpass. The reading is the average of the voltage,[10] and is not an indication of the power of the signal, which is proportional to the average of the square of the voltage, or the root-mean-square (RMS) value. As a conventional VU reading, however, it served its purpose as an indication a) of the overall level and dynamics of the signal and b) of the proximity to the maximum admitted level, to the operators of recording and broadcasting equipment. Maintenance staff could also use it as a measurement apparatus, to check for losses in transmissions and level alignment, provided that they used exclusively sine waves as test signals. The VU meter and its attenuator should present a 7,500-ohm impedance to the circuit it is applied to, measured with a sinusoid signal that sets the indicator to 0 dB. Neon bar graph VU meter The VU-meter was originally developed in 1939 by the combined effort of Bell Labs and broadcasters CBS and NBC.[11] In the 1970s–80s, neon-filled, planar dual displays with up to 201 segments per stereo channel[12] were popular among broadcasters as fast bar graph VU meters. The consumer audio industry often uses volume indicators that do not comply with any standard.[13] BBC sound engineers would refer to the VU meter as the "Virtually Useless" meter,[14] preferring the PPM. Academic research has shown that an SVI or VU meter behaves differently to the average value and RMS meters. The ballistics shown by this instrument, in response to signals with a large crest factor, position its readings halfway between both. For example, an increment of 3 dB in the crest factor of an audio signal gives approximately a fall of −3 dB in a RMS meter, −6 dB in an average meter, and −4 dB in a VU meter.[15] Another miniature magnetoelectric meter Audio equipment Crest factor Decibel Loudness monitoring Mixing console Noise pollution Nominal level Peak meter Peak programme meter ^ Chinn, H. A. "A New Standard Volume Indicator and Reference Level" (PDF). ^ McKnight, John. G. (Jay) (2006-07-27). "Some Questions and Answers on the Standard Volume Indicator ("vu meter")" (PDF). Audio Engineering Society. ^ "VU Meters Information". Engineering 360. Retrieved 2017-03-23. ^ VU Meter. ^ Schmid, Hans (January 1976). "Audio, The Stepchild of Television Broadcasting". SMPTE Journal. 85: 6–9. doi:10.5594/J07600. ^ Schmid, Hans (March 1977). "Audio Program Level, The VU Meter, and The Peak Program Meter". IEEE Transactions on Broadcasting. BC-23 (1): 22–26. doi:10.1109/TBC.1977.266233. S2CID 40700960. ^ volume unit or VU ^ [1] Re: -dBm? ^ Source: the author worked on these systems and with the designers in the 1970s ^ Average Voltage Tutorial ^ Robjohns, Hugh (July 2013). "What's the difference between PPM and VU meters?". Sound on Sound. ^ "Plasma Panel Displays - Dual Linear Bar Graph" (PDF). Vishay Dale, Columbus, Nebraska, USA. November 2000. Retrieved 8 March 2014. ^ Meter Madness Archived 2015-04-02 at the Wayback Machine – Mike Rivers. ^ "On audio equipment, sound level meters are sometimes called VU meters. What does VU stand for?". Guardian News and Media Ltd. 2011. Retrieved 8 August 2019. ^ Method to Evaluate the Ballistics of Audio Meters – Victor M. Acuña. Wikimedia Commons has media related to VU meters. AES Pro Audio Reference definition for VU meter A New Standard Volume Indicator and Reference Level by Chinn, Gannett & Morris The Bewildering Wilderness - "Navigating the complicated and frustrating world of audio standards" Audio Level Meters VU Meter Video Q What’s the difference between PPM and VU meters? Software to Design & Print Custom VU Meter Panels VU Meter dBu & dBv Reference Chart Retrieved from " V The symbol for voltage. VA (voltampere) See voltampere. Vactec Electronic Components. The name of a company acquired by EG&G, famous for their optoelectronics family and especially their photocouplers and LDRs which featured prominently in early compressors and limiters. vacuum tube An electron tube where virtually all the air has been removed (creating a vacuum), thus permitting electrons to move freely, with low interaction with any remaining air molecules. [AHD] The first tube was a two-element diode, invented and patented by Ambrose Fleming in 1904, based on the Edison effect. Three years later, in 1907, Lee de Forest developed the first triode (known as the Audion) by adding a grid between the cathode (emitter) and the anode (collector), thus creating the first amplifier since a change of voltage at the grid produced a corresponding (but greater) change of voltage at the anode. valance Theater. A part of the stage draperies, usually ornamental, which hangs in front of the main curtain. valence Chemistry. The combining capacity of an atom or radical determined by the number of electrons that it will lose, add, or share when it reacts with other atoms. [AHD] valiha Musical Instrument. A Madagascar zither-type stringed instrument. values, standard component values Resistors and capacitors. See: Standard Component Values and color-code. valve British term for vacuum tube, popularized because the first tube was known as the Fleming valve named for its inventor Ambrose Fleming. Van de Graaff generator An electrostatic generator using a moving belt and a hollow metal ball. Biggest in the world is at the Boston Museum of Science, built in the 1930s by Dr. Van de Graaff, it uses two 15 feet diameter aluminum balls and can generate 2 million volts. Hit the link for photos and more in depth details. van den Hul Phonographs. Dutch company said to make the best phono cartridges ever produced. van der Waals equation An equation of state that relates the pressure, volume, and absolute temperature of a gas taking into account the finite size of molecules, and their intermolecular attraction, having the form $RT = (P + av-2)(v - b)$, where R is the gas constant, T is the absolute temperature, P is the pressure, v is the volume, and a and b are constants. [After Johannes Diderik van der Waals (1837-1923), Dutch physicist.] [AHD] vanity radio Podcasting. Term coined by Errol Smith, cofounder of INA (International Nanocasting Alliance). Vans Warped Tour A touring music festival that travels all over the USA and Canada featuring primarily punk and alternative acts. Van Vliet, Don Musician. Birth name of musician who performed as Captain Beefheart. vaporware Refers to either hardware or software that exist only in the minds of the marketeers. var (volt-ampere reactive) Electric Power Circuits. The unit of reactive power in the International System of Units (SI). The var is the reactive power at the two points of entry of a single-phase, two-wire circuit when the product of the root-mean-square value in amperes of the sinusoidal current by the root-mean-square value in volts of the sinusoidal voltage and by the sine of the angular phase difference by which the voltage leads the current is equal to one. [IEEE] varactor A two-terminal semiconductor device in which the electrical characteristic of primary interest is a voltage-dependent capacitance. [IEEE] Variable-D® Microphones. Registered copyright of Electro-Voice for their broadcast dynamic microphone design that claims to virtually eliminate the proximity effect resulting in a uniform low-frequency response, up-close or at a distance. variable-Q graphic equalizer See proportional-Q graphic equalizer. variac (variable AC) Electronics. A variable transformer used to vary AC voltages. varicap Electronics. A diode used as a variable capacitor. varistor (variable resistor) Electronic Component. A two-terminal semiconductor device having a voltage-dependent nonlinear resistance. [IEEE] VAS (virtual auditory space) Localization. A binaural reproduction technique that allows headphone sound to appear to be coming from any direction. VCA (voltage-controlled amplifier or voltage-controlled attenuator) An electronic circuit comprised of three terminals: input, output and control. The output voltage is a function of the input voltage and the control port. The gain of the stage is determined by the control signal, which is usually a DC voltage, but could be a current signal or even a digital code. Usually found as the main element in dynamic controllers, such as compressors, expanders, limiters, and gates. See THAT Corporation's VCA History. VCR (videocassette recorder) A magnetic tape recorder for recording and playback of video programs. "The first VCR was made in 1956 and was the size of a piano." (Snapple Real Fact #180) VCXO (voltage-controlled crystal oscillator) A crystal-based oscillator whose frequency is controllable by an external voltage. V-DOSCA trademark of L-Acoustics, the "V" refers to the V-shaped acoustic lens configuration employed for their mid and high frequency line array sections. The "DOSC" is a French acronym for "Diffuser d'Onde Sonore Cylindrique"— in English this translates to "cylindrical wave generator," an apt description of the performance of their line arrays. VDT (video display terminal) Computer monitor, or data terminal with a monitor. vector Mathematics. A quantity, such as velocity, completely specified by a magnitude and a direction. vector diagram A drawing that shows the direction and magnitude of a quantity by a vector arrow. See the RaneNote Linkwitz-Riley Crossovers: A Primer. veena Musical Instrument. A stringed instrument of India that has a long, fretted fingerboard with resonating gourds at each end. [AHD] vegetable diode See LEVD. vegetable orchestra See Viennese Vegetable Orchestra. Velcro® (velour + crochet) Named by combining the first syllable of two French words: velour (velvet) and crochet (hook) by inventor George de Mestral, Swiss Engineer, in 1941. He got the idea while removing sticky cockleburs from his dog. He examined one under a microscope and discovered they were covered with thousands of tiny hooks. He then went on to see if he could duplicate the effect to create a fastener. velocimeter Acoustics. A device for measuring the speed of sound in a liquid, usually water. Typically done using two transducers arranged as a transmitting and receiving pair, located a fixed distance apart. A short acoustic pulse is transmitted between the two and the travel time measured. velocity Synthesizers & MIDI. How fast a key is depressed. Used to control loudness or other parameters. velocity microphone See pressure gradient microphone and ribbon microphone. velocity of sound Acoustics. The international standard is 331.45 m/s (1087.42 ft/s) at 0 °C (32 °F) and 0% humidity. For the effects of temperature and humidity see: Bohn, Dennis A. "Environmental Effects on the Speed of Sound," J. Audio Eng. Soc., Vol. 36, No. 4, April 1988, pp. 223-231. vernier calipers An instrument having a fixed and a movable arm on a graduated stock, used for measuring the diameters of logs and similar objects. [AHD] Venn diagrams Mathematics. A logic diagramming system invented by the British logician, John Venn (1834-1923) that uses overlapping circles to represent mathematical sets and their relationships. vented loudspeaker See bass reflex. venu Musical Instrument. A South India bamboo flute and is one of the oldest musical instruments of India. vertical interval time code See time code. vestibular system Hearing. The part of the human ear that senses translational and rotational acceleration of the head, and its orientation with respect to gravity. V Festival Music festival held yearly in the U.K. during August, sponsored by the Virgin Group, hence the "V". VHF See frequency bands. VHS (video home system) Trademark for the most popular video tape format, invented by JVC in 1976. vias (aka feed-through hole) Printed Circuit Boards. A pad with a plated-through hole connecting one layer to another. vibraphone Musical Instrument. A percussion instrument similar to a marimba but having metal bars and rotating disks in the resonators to produce a vibrato. Also called vibraharp. [AHD] vibration Any time-varying oscillation about a state of equilibrium. vibration acceleration Acoustics. The rate of change of speed and direction of a vibration, in a specified direction. The frequency bandwidth must be identified. Unit: meter per second squared. Unit symbol: m/s2 [Harris] vibration meter An apparatus for the measurement of displacement, velocity, or acceleration of a vibrating body. [Harris] vibration transducer A device which converts shock or vibratory motion into an electrical (or optical, or mechanical) signal that is proportional to a parameter of the experienced motion. [Harris] vibrato A tremulous or pulsating effect produced in an instrumental or vocal tone by minute and rapid variations in pitch. [AHD] [Think: frequency modulation as in fast pitch changes.] vibroacoustics Fluids. The study of coupled fluid and structural waves in fluid-loaded structures. [Morfey] vibroacoustics therapy The practice of using audio sound waves to create vibrations that are applied to the human body. Said to create physiological and psychological change through vibrations. Victor Shorten form for The Victor Talking Machine Company (1901-1929). The company was named "The Victor" in honor of legal victories by founder Eldrige R. Johnson and Emile Berliner over Zonophone and others concerning their rights to patents on and distribution of their products. Victrola The copyrighted name given to the line of internal horn phonographs made by the Victor Talking Machine Company. videoconferencing Video and audio communication held by two or more people over a distance using a codec at either end and linked by digital networks (T-1, ISDN, etc.). Contrast with teleconferencing. viella Musical Instrument. French name for hurdy-gurdy. Viennese Vegetable Orchestra Music. Innovative (to say the least!) Austrian ensemble that plays nine different instruments carved and peeled from ordinary garden vegetables, played by three men and six women. vihuela Musical Instrument. A Spanish guitar-like stringed instrument. The modern Mexican vihuela is played in mariachi groups. Villari effect See: magnetostriction. Villchur, Edgar M. (1917-2011) American inventor, entrepreneur, educator, audio pioneer, who cofounded Acoustic Research in 1952, with Henry Kloss. Best known for inventing the acoustic-suspension loudspeaker. [Ref: "Problems of Bass Reproduction in Loudspeakers," Jour. Audio Engineering Society, vol. 5, no. 3, July 1957, pp. 122-126, and "Commercial Acoustic Suspension Speaker, " AUDIO, July, 1955.) VI meter (volume indicator) See: VU meter vinyl Common name for LP phonograph records. Hit the link to read its fascinating history. Also rock vinyl history. And here for DJ vinyl history right from the very beginning of records - fascinating. viol Musical Instrument. Any of a family of stringed instruments, chiefly of the 16th and 17th centuries, having a fretted fingerboard, usually six strings, and a flat back and played with a curved bow. [AHD] viola Musical Instrument. 1. A stringed instrument of the violin family, slightly larger than a violin, tuned a fifth lower, and having a deeper, more sonorous tone. 2. An organ stop usually of eight-foot or four-foot pitch yielding string like tones. [AHD] violet noise See noise color. violin Musical Instrument. A stringed instrument played with a bow, having four strings tuned at intervals of a fifth, an unfretted fingerboard, and a shallower body than the viol and capable of great flexibility in range, tone, and dynamics. [AHD] Extremely old, the first four-string violin was build by Andrea Amati in 1555. virginal Musical Instrument. A small, legless rectangular harpsichord popular in the 16th and 17th centuries. Believed so called, because commonly used by young ladies. [AHD] virgule Printing. A diagonal mark (/) used especially to separate alternatives, as in and/or, to represent the word per, as in miles/hour, and to indicate the ends of verse lines printed continuously, as in Old King Cole/Was a merry old soul. [AHD] virtual auditory space See: VAS. Virtual Studio Technology See: VST. virus A self-replicating program released into a computer system for mischievous reasons. Once triggered by some preprogrammed event (often time or date related), the results vary from humorous or annoying messages, to the destruction of data or whole operating systems. Bad bad. viscous damping Physics. The energy dissipation that occurs when a part of a system or an element is resisted by a force whose magnitude is proportional to the velocity of the element but is in the opposite direction from that of the velocity. [Harris] visual microphone "When sound hits an object, it causes small vibrations of the object's surface. We show how, using only high-speed video of the object, we can extract those minute vibrations and partially recover the sound that produced them, allowing us to turn everyday objects—a glass of water, a potted plant, a box of tissues, or a bag of chips--into visual microphones." [from the MIT Abstract description. Fascinating; hit the link and check it out.] VITC (vertical interval time code) See time code. Vitruvius Pollio, Marcus (circa 1st century BC) Very early Roman architect who worked with amphitheater acoustics and developed an analogy between sound in air and waves on water. Vivid Sydney From website: "Vivid Sydney is a unique annual event of light, music and ideas, featuring many of the world's most important creative industry forums, a mesmerizing free public exhibition of outdoor lighting sculptures and installations, a cutting-edge contemporary music program and the spectacular illumination of Sydney's iconic architecture including the sails of Sydney Opera House." VJ (video jockey) Term coined by the MTV generation for jocks that present music videos on television or nightclubs or parties. [Or for us old farts: V-J Day, the date of Allied victory over Japan, World War II, August 15, 1945.] Compare with DJ and KJ. Vladimir Baranoff Rossine (1888-1944) Russian artist and inventor whose Optophonic Piano was an early color-organ. VLAN (Virtual Local Area Network) A network of devices (computers) that look like they are connected to the same network but, in fact, they are physically located on different LANs. VLSI (very-large-scale integration) Refers to the number of logic gates in an integrated circuit. By today's standards, a VLSI device could contain up to one million gates. VO (voiceover) See: voiceover. vocal cords See: vocal folds. vocal folds "Fold of tissue in the larynx whose vibrations creates the periodic sound present in the voiced sounds of speech." [Bregman] Either of two pairs of bands or folds of mucous membrane in the throat that project into the larynx. The lower pair vibrate when pulled together and when air is passed up from the lungs, thereby producing vocal sounds. The upper, thicker pair are not involved in voice production. [AHD] Voca People Music. An international vocal theater performing group consisting of vocal sounds, a cappella singing and beatboxing. vocoder (voice coder) 1. Invented by Homer Dudley (no fooling) in 1936 at Bell Labs, and called a "phase vocoder." It was an electronic device for analyzing and synthesizing, or generating artificial speech. Homer Dudley was the first person to recognized that the basic information rate of speech is low and that if you broke it down into its basic components, these could be transmitted over a quite narrow bandwidth, and then reconstructed at the receiving end. Thus was born the speech synthesizer. The vocoder principal is based on determining the formants, or vowel sounds, of the speech signal, along with its fundamental frequency and any noise components such as plosive sounds (a speech sound produced by complete closure of the oral passage and subsequent release accompanied by a burst of air, as in the sound (p) in pit, or (d) in dog), hisses, or buzzes. Typically this is done by using two sets of filter banks — one for analysis and one for synthesis -- and an "excitation analysis" block. The analysis filter bank is much like those used in real-time analyzers. The audio is presented to a bank of parallel connected bandpass filters, whose output levels are converted into DC voltage levels proportional to the signal passing through each bandpass filter. This captures the formant information. The excitation analysis block determines and codes the fundamental frequency and noise attributes. Reconstruction occurs by using the encoded DC levels, mixed with the excitation block output, to gate each output bandpass filter, which are then summed together to recreate a facsimile of the original speech signal. Early pictures and audio samples (from Prof. Edward A. Lee, UC Berkeley). 2. Once vocoder basics were established, they found new uses in electronic music applications. The MI (musical instrument) vocoder uses speech input to modulate another music instrument signal so that it "talks." Use of vocoders peaked in the '70s after being popularized by such notables as Wendy Carlos, Alan Parsons and Stevie Wonder. This vocoder version has two inputs, one for the vocal microphone and one for another instrument. Talking or singing into the microphone modulates or superimposes vocal characteristics onto the other instrument. Compare with talk box. VoFi (voice-over-IP-over-Wi-Fi) The technology that allows normal telephone calls to be made over the Internet. voice Music. a. Musical sound produced by vibration of the human vocal cords and resonated within the throat and head cavities. b. The quality or condition of a person's singing: a baritone in excellent voice. c. A singer: a choir of excellent voices. d. One of the individual vocal or instrumental parts or strands in a composition: a fugue for four voices; string voices carrying the melody. Also called voice part. [AHD] Synthesizers. Playing two or more patches at the same time. voice box Popular term for the human larynx: "The part of the respiratory tract between the pharynx and the trachea, having walls of cartilage and muscle and containing the vocal cords enveloped in folds of mucous membrane." [AHD]. voice coil See loudspeaker. voiced Linguistics To pronounce with vibration of the vocal cords. Music a. To provide (a composition) with voice parts. b. To regulate the tone of (the pipes of an organ, for example). 4. To provide the voice for (a cartoon character or show, for example): The animated series was voiced by famous actors. [AHD] voiced bilabial fricative A speech sound. See fricative and link. voiceless dental fricative A speech sound. See fricative and link. voice lift Sound Reinforcement. Increasing the loudness level (and intelligibility) of a voice signal. Particularly in classroom situations, where it is generally better to outfit the teacher with a wireless headset than to have them speak without amplification. Voice of the Theater® Loudspeaker. Famous motion picture theater sound system by Altec, designated the A-4, it replaced the Shearer Horn as the dominate theater loudspeaker system in the '40s. voiceover 1. The voice of an unseen narrator, or of an onscreen character not seen speaking, in a movie or a television broadcast. 2. A film or videotape recording narrated by a voiceover. [AHD] Common examples of voiceovers include cartoon characters, documentary videos of all types, computer software tutorials, audio books, and automated telephone messages. VoIP (voice over Internet protocol) The technology that allows you to transmit voice conversations (i.e., the ability to make telephone calls) and send faxes over a data network using the Internet Protocol. Think, voice email. volatile Refers to a memory device that loses any data it contains when power is removed from the device. Examples would include static and dynamic RAMs. Volkman, John E. (1905-1980) American engineer who, in the '30s, was the first to use EQ in motion picture theater sound systems. volt Abbr. E, also V. The International System unit of electric potential and electromotive force, equal to the difference of electric potential between two points on a conducting wire carrying a constant current of one ampere when the power dissipated between the points is one watt. [After Count Alessandro Volta.] [AHD] Volta, Count Alessandro (1745-1827) Italian physicist who invented the battery (1800). The volt is named in his honor. [AHD] voltage Electromotive force or potential difference, usually expressed in volts. [AHD] voltage follower See buffer amplifier. Voltaire Pen name of François Marie Arouet. 1694-1778. French philosopher and writer whose works epitomize the Age of Enlightenment, often attacking injustice and intolerance. He wrote Candide (1759) and the Philosophical Dictionary (1764). [AHD] voltampere (VA) The product of rms voltage and rms current in an electronic circuit. It is the unit of apparent power in the International System of Units (SI). Volterra, Vito(1860 - 1940) Italian mathematician and physicist, whose original work on partial differential equations and the equation for cylindrical waves is most relevant to pro audio research. Volumax CBS trademark for a broadcast limiter invented by Emil Torick in the '50s to replace the transmitter watch engineer. volume Sound 1. The amplitude or loudness of a sound. 2. A control, as on a radio, for adjusting amplitude or loudness. [AHD] VOM (volt-ohm-milliammeter) A portable test instrument for measuring voltage (volts), resistance (ohms) and current (amperes). Also see VTVM. voodoo boilers A kit of drums. [Decharne] vote "The instrument and symbol of a freeman's power to make a fool of himself and a wreck of his country." — Ambrose Bierce. VOTT See: Voice of the Theater. vowels "The voiced sounds of speech that are combined with consonants to form syllables. Examples are 'ah', 'oo', and 'ee'." [Bregman] VOX (voice operated exchange) Also called voice operated relay, originally a tape recorder feature where speech starts the recording process and silence stops it. However it is not restricted to tape recorders, for instance, cellular phones use VOX to save battery life, and teleconferencing systems use it to determine the number of active mics. See NOM. VPN (virtual private network) A secure Internet connection using encryption and tunneling protocols to create a safe connection, or tunnel, to a private network. [Intel glossary] VPR Alliance (Vertical Powered Rack Alliance) API Audio's program of standardization for 500 Series module manufacturers. VR (virtual reality) VRAS (variable room acoustic system) An EAE system developed by Meyer and LCS Audio. VRML (virtual reality modeling language) A method for describing interactive 3D scenes delivered across the internet. In short, VRML adds 3D data to the Web. At on time heavily supported by Silicon Graphics (SGI) workstations, competing with Sun's Java loaded workstations. vroom The loud, roaring noise of an engine operating at high speed. [AHD] VSL (Video-SL) Serato's software add-on to its Scratch Live system that allows DJs to manipulate video along with music using vinyl emulation control records. VST (Virtual Studio Technology™) A trademark of Steinberg for their interface standard for integrating software plug-ins with audio editors. VSWR (voltage standing-wave ratio) Electronics. A waveguide mode: it is the ratio of the magnitude of the transverse electric field in a plane of maximum strength to the magnitude at the equivalent point in an adjacent plane of minimum filed strength. (IEEE) For pro audio it shows up in qualifying coax cables, where it is a measure of return loss. It is a measure of the reflected energy from a transmitted signal, and is affected by such factors as poor connectors, connections, cable defects and abuse. [Technically it should be SWR as there is only one SWR, not one for voltage and another for current.] VTVM (vacuum tube voltmeter) Antiquated term for a test instrument measuring voltage, resistance and current, constructed using vacuum tubes, which required plugging it into an AC voltage source, thus not portable. Characterized by having very high input impedance (compared to the standard VOM) that allowed more precise measurements. Replaced today by solid-state DMM (digital multimeter). Vulcan Harp Fictional musical instrument popularized by Mr. Spock in the Star Trek TV series. vulcanize To improve the strength, resiliency, and freedom from stickiness and odor of (rubber, for example) by combining with sulfur or other additives in the presence of heat and pressure. [AHD] After the Roman mythology god of fire and metalworking, Vulcan. Vulcanized fiber See fishpaper. vulgar fractions Chiefly British term for common fractions, although sometimes used to mean improper fractions (those with a larger numerator than denominator). (Word History: Vulgar is an example of pejoration, the process by which a word develops negative meanings over time. The ancestor of vulgar, the Latin word vulgris (from vulgus, "the common people"), meant "of or belonging to the common people, everyday," as well as "belonging to or associated with the lower orders." Vulgris also meant "ordinary," "common (of vocabulary, for example)," and "shared by all.") [AHD] VU meter (volume unit) The term volume unit (originally called VI or volume indicator; now archaic usage) was adopted to refer to a special meter whose response closely related to the perceived loudness of the audio signal. It is a voltmeter with standardized dB calibration for measuring audio signal levels, and with attack and overshoot (needle ballistics) optimized for broadcast and sound recording. Jointly developed by Bell Labs, CBS and NBC, and put into use in May, 1939, VU meter characteristics are defined by ANSI specification "Volume Measurements of Electrical Speech and Program waves, " C16.5-1942 (which is know incorporated into IEC 60268-17). 0 VU is defined to be a level of +4 dBu for an applied sine wave. The VU meter has relatively slow response. It is driven from a full-wave averaging circuit defined to reach 99% full-scale deflection in 300 ms and overshoot not less than 1% and not more than 1.5%. Since a VU meter is optimized for perceived loudness it is not a good indicator of peak performance. Contrast with PPM. vuvuzela (aka lepatata) Musical Instrument. A trumpet-shaped horn indigenous to South Africa; popular at soccer games. For those who find the sound offensive see: How To Silence Vuvuzela Horns. VXCO (voltage-controlled crystal oscillator A crystal-based oscillator whose center frequency can be varied with an applied voltage.