

# RADIO DEFINITIONS\*

**"A" Power Supply.** A power supply device providing heating current for the cathode of a vacuum tube.

**Alternating Current.** A current, the direction of which reverses at regularly recurring intervals, the algebraic average value being zero.

**Amplification Factor.** A measure of the effectiveness of the grid voltage relative to that of the plate voltage in affecting the plate current.

**Amplifier.** A device for increasing the amplitude of electric current, voltage or power, through the control by the input power of a larger amount of power supplied by a local source to the output circuit.

**Anode.** An electrode to which an electron stream flows.

**Antenna.** A conductor or a system of conductors for radiating or receiving radio waves.

**Atmospherics.** Strays produced by atmospheric conditions.

**Attenuation.** The reduction in power of a wave or a current with increasing distance from the source of transmission.

**Audio Frequency.** A frequency corresponding to a normally audible sound wave. The upper limit ordinarily lies between 10,000 and 20,000 cycles.

**Audio-Frequency Transformer.** A transformer for use with audio-frequency currents.

**Autodyne Reception.** A system of heterodyne reception through the use of a device which is both an oscillator and a detector.

**Automatic Volume Control.** A self-acting device which maintains the output constant within relatively narrow limits while the input voltage varies over a wide range.

**"B" Power Supply.** A power supply device connected in the plate circuit of a vacuum tube.

**Baffle.** A partition which may be used with an acoustic radiator to impede circulation between front and back.

**Band-Pass Filter.** A filter designed to pass currents of frequencies within a continuous band limited by an upper and a lower critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies outside of that band.

**Beat.** A complete cycle of pulsations in the phenomenon of beating.

**Beat Frequency.** The number of beats per second. This frequency is equal to the difference between the frequencies of the combining waves.

**Beating.** A phenomenon in which two or more periodic quantities of different frequencies react to produce a resultant having pulsations of different amplitude.

**Broadcasting.** Radio transmission intended for general reception.

**By-Pass Condenser.** A condenser used to provide an alternating-current path of comparatively low impedance around some circuit element.

**"C" Power Supply.** A power supply device connected in the circuit between the cathode and grid of a vacuum tube so as to apply a grid bias.

**Capacitive Coupling.** The association of one circuit with another by means of capacity common or mutual to both.

**Carbon Microphone.** A microphone which depends for its operation upon the variation in resistance of carbon contacts.

**Carrier.** A term broadly used to designate carrier wave, carrier current, or carrier voltage.

**Carrier Frequency.** The frequency of a carrier wave.

**Carrier Suppression.** That method of operation in which the carrier wave is not transmitted.

**Carrier Wave.** A wave which is modulated by a signal and which enables the signal to be transmitted through a specific physical system.

**Cathode.** The electrode from which the electron stream flows. (See Filament.)

**Choke Coil.** An inductor inserted in a circuit to offer relatively large impedance to alternating current.

**Class A Amplifier** is an amplifier in which the bias and exciting grid voltages are such that the plate current through the tube flows at all times. The ideal Class A Amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the input signal, and the plate current flows during the 360 electrical degrees of the cycle. The characteristics of a Class A Amplifier are low efficiency and output.

**Class B Amplifier** is an amplifier in which the grid bias is approximately equal to that required to cut off the plate current to approximately zero when no exciting grid voltage is applied, so that the plate current in a tube flows during approximately one-half of each cycle when an exciting grid voltage is applied. The ideal Class B Amplifier is one in which the alternating component of plate current is an exact replica of the input signal for the half-cycle when the grid is positive with respect to the bias voltage, and the plate current flows 180 electrical degrees. The characteristics of a Class B Amplifier are medium efficiency and output.

**Class C Amplifier** is an amplifier in which the grid bias is appreciably more than necessary to cut off the plate current to zero when no exciting grid voltage is present, so that the plate current flows in the tube for appreciably less than one-half of each cycle when an exciting grid voltage is present. At the present time Class C Amplifier application is confined to radio transmission where high plate-circuit efficiency is a paramount requirement and where departures from linearity between input and output are permissible. The characteristics of a Class C Amplifier are high-plate-circuit efficiency and high power output.

(1) A **Class AB Amplifier** is one in which the bias and exciting grid voltages are such that the plate current flows during appreciably more than 180 electrical degrees yet less than 360 electrical degrees of the cycle. This has also been called "Class A prime." The characteristics of a Class AB Amplifier are efficiency and output intermediate between a Class A and a Class B Amplifier. The idle plate current and attendant dissipation may be made substantially less than is possible with Class A Amplifiers.

(2) A **Class BC Amplifier** is an amplifier in which the bias and exciting grid voltages are such that the plate current flows during less than 180 electrical degrees and yet for a considerable part of the cycle. The characteristics of a Class BC Amplifier are efficiency and output intermediate between a Class B and a Class C Amplifier. Class BC Amplifiers are not in general use.

(3) To denote that grid current does not flow during any part of the input cycle, add the suffix 1 to the letter or letters of the class identification. The suffix 2 is used to denote that grid current flows during some part of the cycle.

**Condenser Loud Speaker.** A loud speaker in which the mechanical forces result from electrostatic reactions.

**Condenser Microphone.** A microphone which depends for its operation upon variations in capacitance.

**Continuous Waves.** Continuous waves are waves in which successive cycles are identical under steady state conditions.

**Conversion Transconductance** is the ratio of the magnitude of a single beat-frequency component ( $I_1 + I_2$ ) or ( $I_1 - I_2$ ) of the output current to the magnitude of the input voltage of frequency  $f_1$  under the conditions that all direct voltages and the magnitude of the second input alternating voltage  $f_2$  must remain constant. As most precisely used, it refers to an infinitesimal magnitude of the voltage of frequency  $f_1$ .

\* Most of these definitions are based on I.R.E. Standards.

**Converter** (generally, in superheterodyne receivers). A converter is a vacuum-tube which performs simultaneously the functions of oscillation and mixing (first detection) in a radio receiver.

**Coupling.** The association of two circuits in such a way that energy may be transferred from one to the other.

**Cross Modulation.** A type of intermodulation due to modulation of the carrier of the desired signal in a radio apparatus by an undesired signal.

**Current Amplification.** The ratio of the alternating current produced in the output circuit of an amplifier to the alternating current supplied to the input circuit for specific circuit conditions.

**Cycle.** One complete set of the recurrent values of periodic phenomenon.

**Damped Waves.** Waves of which the amplitude of successive cycles, at the source, progressively diminishes.

**Decibel.** The common transmission unit of the decimal system, equal to 1/10 bel.

$$1 \text{ bel} = 2 \log_{10} \frac{E_1}{E_2} = 2 \log_{10} \frac{I_1}{I_2}$$

(See Transmission Unit.)

**Detection** is any process of operation on a modulated signal wave to obtain the signal imparted to it in the modulation process.

**Detector.** A detector is a device which is used for operation on a signal wave to obtain the signal imparted to it in the modulation process.

**Diaphragm.** A diaphragm is a vibrating surface which produces sound vibrations.

**Diode.** A type of thermionic tube containing two electrodes which passes current wholly or predominantly in one direction.

**Direct Capacitance (C)** between two conductors—The ratio of the charge produced on one conductor by the voltage between it and the other conductor, divided by this voltage, all other conductors in the neighborhood being at the potential of the first conductor.

**Direct Coupling.** The association of two circuits by having an inductor, a condenser, or a resistor common to both circuits.

**Direct Current.** An unidirectional current. As ordinarily used, the term designates a practically non-pulsating current.

**Distortion.** A change in wave form occurring in a transducer or transmission medium when the output wave form is not a faithful reproduction of the input wave form.

**Double Modulation.** The process of modulation in which a carrier wave of one frequency is first modulated by the signal wave and is then made to modulate a second carrier wave of another frequency.

**Dynamic Amplifier.** The RCA Dynamic Amplifier is a variable gain audio amplifier, the gain of which is proportional to the average intensity of the audio signal. Such an amplifier compensates for the contraction of dynamic range required because of recording or transmission line limitations.

**Dynamic Sensitivity of a Phototube.** The alternating-current response of a phototube to a pulsating light flux at specified values of mean light flux, frequency of pulsation, degree of pulsation, and steady tube voltage.

**Electro-Acoustic Transducer.** A transducer which is actuated by power from an electrical system and supplies power to an acoustic system or vice versa.

**Electron Emission.** The liberation of electrons from an electrode into the surrounding space. In a vacuum tube it is the rate at which the electrons are emitted from a cathode. This is ordinarily measured as the current carried by the electrons under the influence of a voltage sufficient to draw away all the electrons.

**Electron Tube.** A vacuum tube evacuated to such a degree that its electrical characteristics are due essentially to electron emission.

**Emission Characteristic.** A graph plotted between a factor controlling the emission (such as the temperature, voltage, or current of the cathode) as abscissas, and the emission from the cathode as ordinates.

**Facsimile Transmission.** The electrical transmission of a copy or reproduction of a picture, drawing or document. (This is also called picture transmission.)

**Fading.** The variation of the signal intensity received at a given location from a radio transmitting station as a result of changes occurring in the transmission path. (See Distortion.)

**Fidelity.** The degree to which a system, or a portion of a system, accurately reproduces at its output the signal which is impressed upon it.

**Filament.** A cathode in which the heat is supplied by current passing through the cathode.

**Filter.** A selective circuit network, designed to pass currents within a continuous band or bands of frequencies or direct current, and substantially reduce the amplitude of currents of undesired frequencies.

**Frequency.** The number of cycles per second.

**Full-Wave Rectifier.** A double element rectifier arranged so that current is allowed to pass in the same direction to the load circuit during each half cycle of the alternating-current supply, one element functioning during one-half cycle and the other during the next half cycle, and so on.

**Fundamental Frequency.** The lowest component frequency of a periodic wave or quantity.

**Fundamental or Natural Frequency** (of an antenna). The lowest resonant frequency of an antenna, without added inductance or capacity.

**Gas Phototube.** A type of phototube in which a quantity of gas has been introduced, usually for the purpose of increasing its sensitivity.

**Grid.** An electrode having openings through which electrons or ions may pass.

**Grid Bias.** The direct component of the grid voltage.

**Grid Condenser.** A series condenser in the grid or control circuit of a vacuum tube.

**Grid Leak.** A resistor in a grid circuit, through which the grid current flows, to affect or determine a grid bias.

**Grid-Plate Transconductance.** The name for the plate current to grid voltage transconductance. (This has also been called mutual conductance.)

**Ground System** (of an antenna). That portion of the antenna system below the antenna loading devices or generating apparatus most closely associated with the ground and including the ground itself.

**Ground Wire.** A conductive connection to the earth.

**Half-Wave Rectifier.** A rectifier which changes alternating current into pulsating current, utilizing only one-half of each cycle.

**Harmonic.** A component of a periodic quantity having a frequency which is an integral multiple of the fundamental frequency. For example, a component the frequency of which is twice the fundamental frequency is called the second harmonic.

**Heater.** An electrical heating element for supplying heat to an indirectly heated cathode.

**Heterodyne Reception.** The process of receiving radio waves by combining in a detector a received voltage with a locally generated alternating voltage. The frequency of the locally generated voltage is commonly different from that of the received voltage. (Heterodyne reception is sometimes called beat reception.)

**Homodyne Reception.** A system of reception by the aid of a locally generated voltage of carrier frequency. (Homodyne reception is sometimes called zero-beat reception.)

**Hot-Wire Ammeter, Expansion Type.** An ammeter dependent for its indications on a change in dimensions of an element which is heated by the current to be measured.

**Indirectly Heated Cathode.** A cathode of a thermionic tube, in which heat is supplied from a source other than the cathode itself.

**Induction Loud Speaker** is a moving coil loud speaker which the current which reacts with the polarizing field is induced in the moving member.

**Inductive Coupling.** The association of one circuit with another by means of inductance common or mutual to both.

**Interelectrode Capacitance.** The direct capacitance between two electrodes.

**Interference.** Disturbance of reception due to strays, undesired signals, or other causes; also, that which produces the disturbance.

**Intermediate Frequency, in Superheterodyne Reception.** A frequency between that of the carrier and the signal, which results from the combination of the carrier frequency and the locally generated frequency.

**Intermodulation.** The production, in a non-linear circuit element, of frequencies corresponding to the sums and differences of the fundamentals and harmonics of two or more frequencies which are transmitted to that element.

**Interrupted Continuous Waves.** Interrupted continuous waves are waves obtained by interruption at audio frequency in a substantially periodic manner of otherwise continuous waves.

**Kilocycle.** When used as a unit of frequency, is a thousand cycles per second.

**Lead-In.** That portion of an antenna system which completes the electrical connection between the elevated outdoor portion and the instruments or disconnecting switches inside the building.

**Linear Detection.** That form of detection in which the audio output voltage under consideration is substantially proportional to the modulation envelope throughout the useful range of the detecting device.

**Loading Coil.** An inductor inserted in a circuit to increase its inductance but not to provide coupling with any other circuit.

**Loud Speaker.** A telephone receiver designed to radiate acoustic power into a room or open air.

**Magnetic Loud Speaker.** One in which the mechanical forces result from magnetic reactions.

**Magnetic Microphone.** A microphone whose electrical output results from the motion of a coil or conductor in a magnetic field.

**Master Oscillator.** An oscillator of comparatively low power so arranged as to establish the carrier frequency of the output of an amplifier.

**Megacycle.** When used as a unit of frequency, is a million cycles per second.

**Mercury-Vapor Rectifier.** A mercury-vapor rectifier is a two-electrode, vacuum-tube rectifier which contains a small amount of mercury. During operation, the mercury is vaporized. A characteristic of mercury-vapor rectifiers is the low-voltage drop in the tube.

**Microphone.** A microphone is an electro-acoustic transducer actuated by power in an acoustic system and delivering power to an electric system, the wave form in the electric system corresponding to the wave form in the acoustic system. This is also called a telephone transmitter.

**Mixer Tube** (generally, in superheterodyne receivers). A mixer tube is one in which a locally generated frequency is combined with the carrier signal frequency to obtain a desired beat frequency.

**Modulated Wave.** A modulated wave is a wave of which either the amplitude, frequency, or phase is varied in accordance with a signal.

**Modulation** is the process in which the amplitude, frequency, or phase of a wave is varied in accordance with a signal, or the result of that process.

**Modulator.** A device which performs the process of modulation.

**Monochromatic Sensitivity.** The response of a phototube to light of a given color, or narrow frequency range.

**Moving-Armature Speaker.** A magnetic speaker whose operation involves the vibration of a portion of the ferromagnetic circuit. (This is sometimes called an electromagnet or a magnetic speaker.)

**Moving Coil Loud Speaker.** A moving coil loud speaker is a magnetic loud speaker in which the mechanical forces are developed by the interaction of currents in a conductor and the polarizing field in which it is located. (This is sometimes called an Electro-Dynamic or a Dynamic Loud Speaker.)

**Mu-Factor.** A measure of the relative effect of the voltages on two electrodes upon the current in the circuit of any specified electrode. It is the ratio of the change in one electrode voltage to a change in the other electrode voltage, under the condition that a specified current remains unchanged.

**Mutual Conductance.** (See Grid-Plate Transconductance.)

**Oscillator.** A non-rotating device for producing alternating current, the output frequency of which is determined by the characteristics of the device.

**Oscillatory Circuit.** A circuit containing inductance and capacitance, such that a voltage impulse will produce a current which periodically reverses.

**Pentode.** A type of thermionic tube containing a plate, a cathode, and three additional electrodes. (Ordinarily the three additional electrodes are of the nature of grids.)

**Percentage Modulation.** The ratio of half the difference between the maximum and minimum amplitudes of a modulated wave to the average amplitude, expressed in per cent.

**Phonograph Pickup.** An electromechanical transducer actuated by a phonograph record and delivering power to an electrical system, the wave form in the electrical system corresponding to the wave form in the phonograph record.

**Phototube.** A vacuum tube in which electron emission is produced by the illumination of an electrode. (This has also been called photo-electric tube.)

**Plate.** A common name for the principal anode in a vacuum tube.

**Power Amplification** (of an amplifier)—The ratio of the alternating-current power produced in the output circuit to the alternating-current power supplied to the input circuit.

**Power Detection.** That form of detection in which the power output of the detecting device is used to supply a substantial amount of power directly to a device such as a loud speaker or recorder.

**Pulsating Current.** A periodic current, that is, current passing through successive cycles, the algebraic average value of which is not zero. A pulsating current is equivalent to the sum of an alternating and a direct current.

**Push-Pull Microphone.** One which makes use of two functioning elements 180 degrees out of phase.

**Radio Channel.** A band of frequencies or wavelengths of a width sufficient to permit of its use for radio communication. The width of a channel depends upon the type of transmission. (See Band of Frequencies.)

**Radio Compass.** A direction finder used for navigational purposes.

**Radio Frequency.** A frequency higher than those corresponding to normally audible sound waves. (See Audio Frequency.)

**Radio-Frequency Transformer.** A transformer for use with radio-frequency currents.

**Radio Receiver.** A device for converting radio waves into perceptible signals.

**Radio Transmission.** The transmission of signals by means of radiated electromagnetic waves originating in a constructed circuit.

**Radio Transmitter.** A device for producing radio-frequency power, with means for producing a signal.

**Rectifier.** A device having an asymmetrical conduction characteristic which is used for the conversion of an alternating current into a pulsating current. Such devices include vacuum-tube rectifiers, gas rectifiers, oxide rectifiers, electrolytic rectifiers, etc.

**Reflex Circuit Arrangement.** A circuit arrangement in which the signal is amplified, both before and after detection, in the same amplifier tube or tubes.

**Regeneration.** The process by which a part of the output power of an amplifying device reacts upon the input circuit in such a manner as to reinforce the initial power, thereby increasing the amplification. (Sometimes called "feedback" or "reaction.")

**Resistance Coupling.** The association of one circuit with another by means of resistance common to both.

**Resonance Frequency** (of a reactive circuit)—The frequency at which the supply current and supply voltage of the circuit are in phase.

**Rheostat.** A resistor which is provided with means for readily adjusting its resistance.

**Screen Grid.** A screen grid is a grid placed between a control grid and an anode, and maintained at a fixed positive potential, for the purpose of reducing the electrostatic influence of the anode in the space between the screen grid and the cathode.

**Secondary Emission.** Electron emission under the influence of electron or ion bombardment.

**Selectivity.** The degree to which a radio receiver is capable of differentiating between signals of different carrier frequencies.

**Sensitivity.** The degree to which a radio receiver responds to signals of the frequency to which it is tuned.

**Sensitivity of a Phototube.** The electrical current response of a phototube, with no impedance in its external circuit, to a specified amount and kind of light. It is usually expressed in terms of the current for a given radiant flux or for a given luminous flux. In general the sensitivity depends upon the tube voltage, flux intensity, and spectral distribution of the flux.

**Service Band.** A band of frequencies allocated to a given class of radio communication service.

**Side Bands.** The bands of frequencies, one on either side of the carrier frequency, produced by the process of modulation.

**Signal.** The intelligence, message or effect conveyed in communication.

**Single-Side-Band Transmission.** That method of operation in which one side band is transmitted, and the other side band is suppressed. The carrier wave may be either transmitted or suppressed.

**Static.** Strays produced by atmospheric conditions.

**Static Sensitivity of a Phototube.** The direct current response of a phototube to a light flux of specified value.

**Stopping Condenser.** A condenser used to introduce a comparatively high impedance in some branch of a circuit for the purpose of limiting the flow of low-frequency alternating current or direct current without materially affecting the flow of high frequency alternating current.

**Strays.** Electromagnetic disturbances in radio reception other than those produced by radio transmitting systems.

**Superheterodyne Reception.** Superheterodyne reception is a method of reception in which the received voltage is combined with the voltage from a local oscillator and converted into voltage of an intermediate frequency which is usually amplified and then detected to reproduce the original signal wave. (This is sometimes called double detection or superionic reception.)

**Swinging.** The momentary variation in frequency of a received wave.

**Telephone Receiver.** An electro-acoustic transducer actuated by power from an electrical system and supplying power to an acoustic system, the wave form in the acoustic system corresponding to the wave form in the electrical system.

**Television.** The electrical transmission of a succession of images and their reception in such a way as to give a substantially continuous reproduction of the object or scene before the eye of a distant observer.

**Tetrode.** A type of thermionic tube containing a plate, a cathode, and two additional electrodes. (Ordinarily the two additional electrodes are of the nature of grids.)

**Thermionic.** Relating to electron emission under the influence of heat.

**Thermionic Emission.** Electron or ion emission under the influence of heat.

**Thermionic Tube.** An electron tube in which the electron emission is produced by the heating of an electrode.

**Thermocouple Ammeter.** An ammeter dependent for its indications on the change in thermo-electro-motive force set up in a thermo-electric couple which is heated by the current to be measured.

**Total Emission.** The value of the current carried by electrons emitted from a cathode under the influence of a voltage such as will draw away all the electrons emitted.

**Transconductance.** The ratio of the change in the current in the circuit of an electrode to the change in the voltage on another electrode, under the condition that all other voltages remain unchanged.

**Transducer.** A device actuated by power from one system and supplying power to another system. These systems may be electrical, mechanical, or acoustic.

**Transmission Unit.** A unit expressing the logarithmic ratios of powers, voltages, or currents in a transmission system. (See Decibel.)

**Triode.** A type of thermionic tube containing an anode, a cathode, and a third electrode, in which the current flowing between the anode and the cathode may be controlled by the voltage between the third electrode and the cathode.

**Tuned Transformer.** A transformer whose associated circuit elements are adjusted as a whole to be resonant at the frequency of the alternating current supplied to the primary, thereby causing the secondary voltage to build up to higher values than would otherwise be obtained.

**Tuning.** The adjustment of a circuit or system to secure optimum performance in relation to a frequency; commonly, the adjustment of a circuit or circuits to resonance.

**Vacuum Phototube.** A type of phototube which is evacuated to such a degree that the residual gas plays a negligible part in its operation.

**Vacuum Tube.** A device consisting of a number of electrodes contained within an evacuated enclosure.

**Vacuum-Tube Transmitter.** A radio transmitter in which vacuum tubes are utilized to convert the applied electric power into radio-frequency power.

**Vacuum-Tube Volt-Meter.** A device utilizing the characteristics of a vacuum tube for measuring alternating voltages.

**Voltage Amplification.** The ratio of the alternating voltage produced at the output terminals of an amplifier to the alternating voltage impressed at the input terminals.

**Voltage Divider.** A resistor provided with fixed or movable contacts and with two fixed terminal contacts; current is passed between the terminal contacts, and a desired voltage is obtained across a portion of the resistor. (The term potentiometer is often erroneously used for this device.)

**Wave, a.** A propagated disturbance, usually periodic, as an electric wave or sound wave.

**b.** A single cycle of such a disturbance, or

**c.** A periodic variation as represented by a graph.

**Wavelength.** The distance traveled in one period or cycle by a periodic disturbance.