

Encyclopedia of Electronics

2nd Edition

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Stan Gibilisco

Neil Sclater

Co-Editors-in-Chief

Professional and Reference Books

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SHORT CIRCUIT

A short circuit is a condition that occurs when current is partially or wholly diverted from its normal or proper path. It is called a short circuit because the path of the current is usually shorter than it otherwise would be.

In a 117 V electric system or power supply, a short circuit causes the tripping of a circuit breaker or the blowing of a fuse installed for short-circuit protection (see CIRCUIT BREAKER, FUSE, SHORT-CIRCUIT PROTECTION). In an audio-frequency or radio-frequency system, a short circuit causes a reduction in the level of the signal at the output.

SHORT-CIRCUIT PROTECTION

When a short circuit occurs in the utility lines or in the output of a power supply, overheating will occur unless the circuit is protected. This overheating can damage wiring, transformers, and series-connected resistors and chokes. If the current flow is large enough, fire can result.

The most widely used short-circuit protectors are the circuit breaker and the fuse. These devices open the circuit when the current exceeds a specified level (see CIRCUIT, PROTECTION, FUSE).

Current limiting, also called foldback, is provided in some power supplies to protect the components against a short circuit. The current-limiting circuit inserts an effective resistance in series with the output of the supply. See CIRCUIT BREAKER, CURRENT LIMITING.

SHORT WAVES

The high-frequency band, from 3 to 30 MHz (100 to 10 meters), is called the shortwave band. The wavelengths are not really very short; compared to microwaves, for example, the short waves are extremely long.

The term *shortwave* originated in the early days of radio when practically all communication and broadcasting was done at frequencies below 1.5 MHz (200 meters).

A high-frequency, general-purpose, communications receiver is still called a shortwave receiver. Most shortwave receivers cover the range from 1.5 MHz through 30 MHz. Some also operate in the standard broadcast band at 535 kHz to 1.605 MHz. Shortwave receivers can operate below 535 kHz into the so-called longwave band.

SHOTEFFECT

In a transistor, tube, or any current-carrying medium, the individual charge carriers cause noise impulses as they move from atom to atom. The individual impulses are extremely faint, but the large number of moving carriers results in a hiss that can be heard in any amplifier or radio receiver. This is called shot effect. The noise of shot effect is known as shot-effect noise or shot noise.

Shot-effect noise limits the ultimate sensitivity that can be obtained in a radio receiver. A certain amount of noise is always produced in the front end, or first amplifying stage (see FRONT END). This noise is amplified by succeeding stages along with the desired signals. The amount of shot-effect noise that a receiver produces is

roughly proportional to the current it carries. In recent years, low-current solid-state devices such as the gallium-arsenide field-effect transistor (GaAsFET) have been developed for optimizing the sensitivity of a receiver front end. See also NOISE FIGURE, SENSITIVITY, SIGNAL-TO-NOISE RATIO, THERMAL NOISE.

SHOT-EFFECT NOISE

See SHOT EFFECT.

SHOT NOISE

Shot noise is a term used to describe three different forms of noise.

Whenever current flows, the movement of the electrons or holes causes electrical noise. This is called shot effect, and the noise is known as shot-effect noise or shot noise (see SHOT EFFECT). All semiconductor devices produce this kind of noise; the amount of noise depends primarily on the current at the area of the P-N junction(s) through which the current flows.

In a vacuum tube, noise is produced when the electrons bombard the plate. A smaller amount of noise also results from electrons striking the screen grid in a pentode or tetrode tube. This noise is called shot noise.

Whenever an electric spark occurs, an electromagnetic field is produced. Some appliances and all internal-combustion engines with spark plugs produce noise, called impulse noise or sometimes referred to as shot noise. See also IMPULSE NOISE.

SHUNT

The term *shunt* refers to a parallel connection of one component across another component or group of components. When one component is placed across another for a specific purpose, the inserted component is called a shunt.

A shunt can be any type of component. Examples of shunts include bypass capacitors, bleeder resistors, diode limiters, and various types of voltage regulators. Shunting resistors or coils are often used in ammeters to increase the indicated current range. See also PARALLEL CONNECTION, SHUNT RESISTOR.

SHUNT REGULATOR

A shunt regulator is a voltage-regulation circuit connected in parallel with the output of a power supply. Various types of transistors and tubes can be used as shunt regulators. In low-current power supplies, Zener diodes provide shunt regulation. See also OVERVOLTAGE PROTECTION, POWER SUPPLY, REGULATION, ZENER DIODE.

SHUNT RESISTOR

The current-indicating range of an ammeter can be increased by placing small-value resistors across the coil of