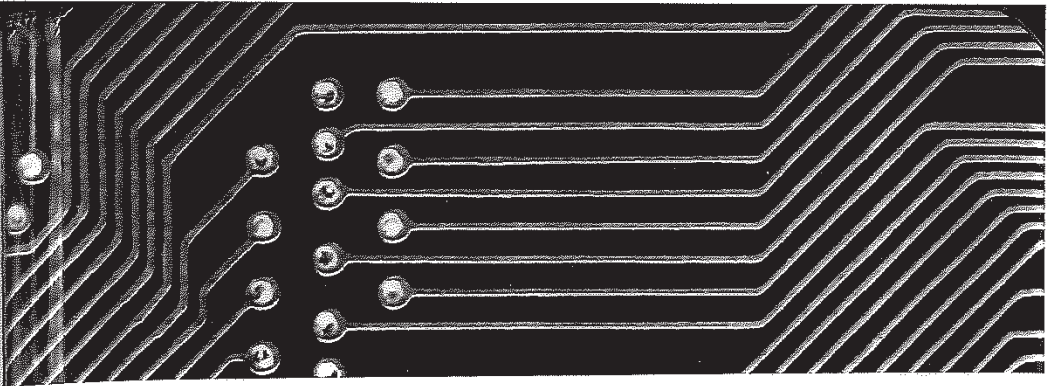


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BOOK**

Dictionary of **ELECTRONICS**



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blocking capacitor A capacitor included in a circuit in order to limit the flow of direct current and low-frequency alternating current while allowing the passage of higher-frequency alternating current. The capacitance is chosen so that there is a relatively small reactance at the lowest frequency at which the circuit is designed to operate.

blocking oscillator A type of oscillator in which blocking occurs after completion of (usually) one cycle of oscillation and lasts for a predetermined time. The whole process is then repeated. Fundamentally it is a special type of squelching oscillator and has applications as a pulse generator and a timebase generator.

Bluetooth A short-range radio communications system, intended to connect devices, for example mobile phones, PDAs, and keyboards, within a few metres of each other. It uses frequency-hopping spread spectrum and operates in the 2.4 GHz ISM band.

BNC connector A type of bayonet locking connector used extensively on modern instruments and equipment. It connects with a quarter-turn twist and completes both the shield (earth) circuit and the inner conductor (signal) circuit simultaneously. It is used for signals up to frequencies in the region of 4000 megahertz and is available in both panel-mounting and cable-terminating varieties.

board Short for printed circuit board.

Bode diagram A diagram in which gain or phase shift in a feedback-control system is plotted against frequency. It is so called because of *Bode's theorem*, which shows the interdependence of phase angle and rate of change of gain of a network at a desired frequency.

Bode equalizer An attenuation equalizer designed so that one simple control varies the amount of equalization in the same proportion for all frequencies within the range.

Bode's theorem Bode diagram.

body capacitance A capacitance caused by the proximity of a human body to a circuit.

bolometer A small resistive element capable of absorbing electromagnetic power. The resulting temperature rise is used to measure the power absorbed.

Boltzmann constant Symbol: k . A fundamental constant having the value $1.380\,658 \times 10^{-23}$ joule per kelvin.

In a system in which n_1 particles have an energy E_1 and n_2 particles have an energy E_2 then

$$n_1 = n_2 \exp[-(E_1 - E_2)/kT]$$

where T is the thermodynamic temperature. This is the *Boltzmann distribution law*.

Boltzmann distribution law Boltzmann constant.

A wide variety of camera tubes is available. The main differences between them are in the target material and the velocity of the electrons used to produce the video signal. *Photoemissive camera tubes* have a target coated with photoemissive material (photoemission). *Photoconductive camera tubes* are coated with material that exhibits photoconductivity. *Low-electron-velocity tubes* are most often used but *high-electron-velocity tubes*, such as the iconoscope, are also produced.

The performance of camera tubes depends very greatly on the scanning system employed. Beam alignment is achieved by using small coils to ensure that the electron beam emerging from the electron gun is central. Deflection of the beam is provided by deflection coils controlling the horizontal and vertical directions. These coils are supplied with a sawtooth voltage causing a linear scan with very rapid return to the start of the scanning position. Focusing coils are also provided to ensure a small cross section when the beam reaches the target; an extra electrode ensures that the beam is essentially perpendicular to the target surface. In low-electron-velocity tubes this electrode decelerates the beam so that it is essentially stationary at the target.

A solid-state camera has also been developed in which the transduction element is an array of charge-coupled devices. This type of camera is very much smaller and lighter than those containing electron tubes and is typically the size of an ordinary hand-held photographic camera.

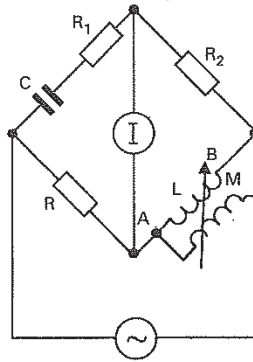
image dissector.

Campbell bridge An a.c. bridge that is used to measure a mutual inductance, M , by comparison with a standard capacitance, C . The resistances R_1 and R_2 are varied until null deflection is obtained on the indicating instrument I (see diagram). At balance

$$L/M = (R + R_1)/R$$

$$M/C = RR_2$$

where L is the self-inductance of the coil AB .



Campbell bridge

capacitance Symbol: C ; unit: farad. The property of an isolated conductor or a set of conductors and insulators whereby it stores electric charge. A charge of Q coulombs

will increase the voltage of an isolated conductor by V volts. The capacitance is defined as the ratio Q/V and is determined by the size and shape of the conductor. It is constant for a given isolated conductor.

If the isolated conductor is placed near a second conductor or a semiconductor but is separated from it by air or some other insulator, the system forms a $\triangleright$ capacitor. An electric field is produced across the system and the potential difference between the conductors is determined by this field. The capacitance, C , is defined as the ratio of the charge on either conductor to the potential difference between them. $\triangleright$ mutual capacitance; impedance; series; parallel.

capacitance integrator $\triangleright$ integrator.

capacitance strain gauge *Syn. for* variable capacitance gauge. $\triangleright$ strain gauge.

capacitance-voltage curves (C-V curves) Curves demonstrating the relationship between the junction capacitance and applied voltage of a $\triangleright$ p-n junction diode or a $\triangleright$ metal-semiconductor junction diode (a Schottky diode). These curves are used to analyse the material structure of the diode; in particular the potential barrier height of the junction can be found, and also the variation with depth of the majority $\triangleright$ carrier concentration within the $\triangleright$ semiconductor, known as the doping profile.

capacitive coupling $\triangleright$ coupling.

capacitive feedback $\triangleright$ feedback.

capacitive load $\triangleright$ leading load.

capacitive reactance $\triangleright$ reactance.

capacitive tuning $\triangleright$ tuned circuit.

capacitor A component that has an appreciable $\triangleright$ capacitance. It consists of an arrangement of at least two conductors or semiconductors separated by a $\triangleright$ dielectric (an insulator). The conductors or semiconductors are known as *electrodes* or *plates*. The value of the capacitance of a given device depends on the size and shape of the electrodes, the separation between them, and the relative $\triangleright$ permittivity of the dielectric. Most types of capacitor have a value, which may be variable, determined by the geometry of the device. Some capacitors however have a value that is also a function of the voltage across the device or of the operating frequency. The dielectric material may be solid, liquid, or gaseous. $\triangleright$ ceramic, chip, electrolytic, metallized film, metallized paper, mica, MOS, and plastic-film capacitors; varactor.

capacitor microphone *Syn.* electrostatic microphone. A type of microphone in which a diaphragm forms one plate of a capacitor. Variations of sound pressure cause movements of the diaphragm and these alter the capacitance. Corresponding changes in potential difference across the capacitor are thus produced.

capacity 1. $\triangleright$ channel capacity; memory capacity. 2. *Obsolete syn. for* capacitance.

capture ratio $\triangleright$ cochannel rejection.

converted into a pulse, and these pulses are then electronically counted. **2. Syn. digital counter.** Any electronic circuit that counts electronic pulses.

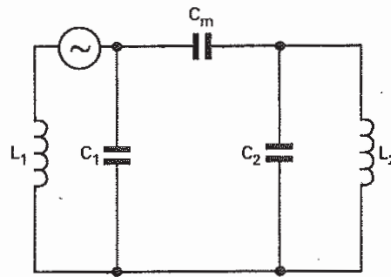
In both cases, the average rate of occurrence of events counted is the *count rate*. The *counter lag time* is the delay between the primary event and the occurrence of the count. The *resolving time* is the minimum time between the occurrence of successive primary events that can be successfully counted.

counter/frequency meter An instrument that can be used as a counter or frequency meter by counting the number of events or periods occurring in a given time. It contains a frequency standard, usually a piezoelectric oscillator. The time between events may also be counted by comparing the number of standard pulses occurring in the same time as a given number of cycles of the frequency standard.

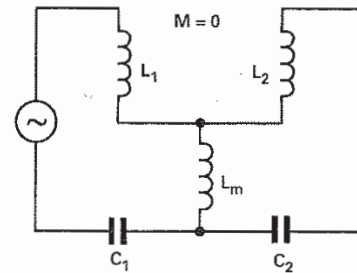
counter lag time ➤ counter.

count rate ➤ counter.

coupling The interaction between two circuits so that energy is transferred from one to the other. In *common-impedance coupling* there is an impedance common to both circuits (Figs. a, b).



a Capacitive coupling



b Inductive coupling

The impedance may be a capacitance (*capacitive coupling*), a capacitance and a resistance (*resistance-capacitance coupling*), an inductance (*inductive coupling*), or a resistance (➤direct coupling). The impedance may be a part of each circuit or connected between the circuits. In *mutual-inductance coupling* the circuits are coupled by the mutual inductance, M , between the coils L_1 and L_2 (Fig. c). The coils used are often those of a transformer. The use of two separate coils between amplifier stages rather than a transformer is termed *choke coupling*. *Mixed coupling* is a combination of mutual-inductance coupling and common-impedance coupling.

The *coupling coefficient*, K , is defined as

$$K = X_m / \sqrt{(X_1 X_2)}$$

where X_m is the reactance common to both circuits and X_1 and X_2 are the total reactances, of the same type as X_m , of the two circuits. For Fig. a:

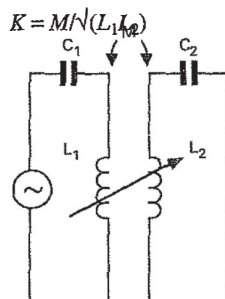
coupling coefficient

$$K = L_m / \sqrt{(L_1 + L_m)(L_2 + L_m)}$$

For Fig. b:

$$K = -C_m / \sqrt{(C_1 + C_m)(C_2 + C_m)}$$

For Fig. c:



c Mutual-inductance coupling

The current in the secondary circuit depends on the degree of coupling and the frequency. *Critical coupling* occurs when $KQ = 1$, where Q is the $\triangleright$ Q factor of the circuit. A single peak occurs at the resonant frequency of the circuit and the current has its optimum value. *Overcoupling* occurs when $K > 1/Q$; the current has two side peaks with a dip at the resonant frequency. *Undercoupling*, when $K < 1/Q$, produces a smaller central peak than the optimum.

Band-pass $\triangleright$ filters often employ overcoupling, in order to pass a narrow band of frequencies, followed by undercoupling, to compensate for the central dip. In a $\triangleright$ tuned circuit, the bandwidth passed varies with frequency. This may be overcome by employing mixed coupling using a capacitance with the mutual inductance to give a constant bandwidth for a range of frequencies.

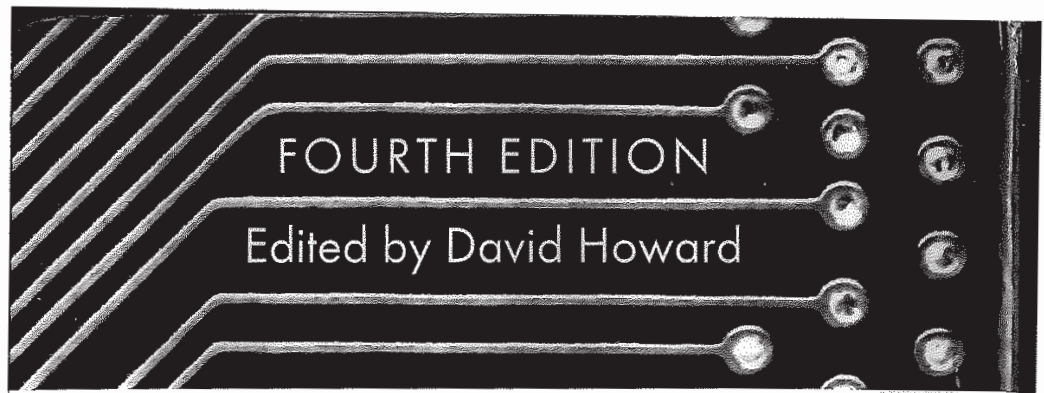
Cross coupling is unwanted coupling between communication channels, circuits, or components, particularly those with a common power supply. The removal of unwanted signals, especially those due to cross coupling, is called *decoupling*. It is usually achieved using a series $\triangleright$ inductance or a shunt $\triangleright$ capacitor.

coupling coefficient $\triangleright$ coupling.

coverage area The area around a telecommunication-system transmitter within which the signal from the transmitter is considered to be useable for that system.

CPU Abbrev. for central processing unit.

CPW Abbrev. for coplanar waveguide.



The Penguin Dictionary of Electronics is packed full of information on and authoritative definitions of the terms and abbreviations used in this complex subject as it moves into the twenty-first century – from *address bus* and *daisy chaining* to *squelch circuit* and *wobulator*. Fully revised and updated for its fourth edition, it is the ideal source of information for those who need to understand electronics and its applications, whether students and teachers, technologists and technicians, or computer and audio engineers.

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