

“Frontmatter”

Electrical Engineering Dictionary.

Ed. Phillip A. Laplante

Boca Raton: CRC Press LLC, 2000

Product Manager: *Karen Feinstein*
Project Editor: *Ibrey Woodall*
Packaging design: *Jonathan Pennell*

These files shall remain the sole and exclusive property of CRC Press LLC, 2000 Corporate Blvd., N.W., Boca Raton, FL 33431. The contents are protected by copyright law and international treaty. No part of the *Electrical Engineering Dictionary CRCnetBASE* CD-ROM product may be duplicated in hard copy or machine-readable form without prior written authorization from CRC Press LLC, except that the licensee is granted a limited, non-exclusive license to reproduce limited portions of the context for the licensee's internal use provided that a suitable notice of copyright is included on all copies. This CD-ROM incorporates materials from other sources reproduced with the kind permission of the copyright holder. Credit to the original sources and copyright notices are given with the figure or table. No materials in this CD-ROM credited to these copyright holders may be reproduced without their written permission.

WARRANTY

The information in this product was obtained from authentic and highly regarded sources. Every reasonable effort has been made to give reliable data and information, but the publisher cannot assume responsibility for the validity of all materials or the consequences of their uses.

© 2000 by CRC Press LLC

No claim to original U.S. Government works
International Standard Book Number 0-8493-2170-0
International Standard Series Number 1097-9568

dewar a vacuum insulated, cryogenic radiation insulated, low conduction heat loss vessel for cryogenic fluids. A dewar is used for keeping material, chiefly liquids, cold or hot. The common thermos bottle is an example of a dewar. In the accelerator business dewars are often used to store large quantities of cryogenic liquids.

DF See [dissipation factor](#).

DFB laser See [distributed feedback laser](#).

DFD See [displaced frame difference](#).

DFT See [discrete Fourier transform](#).

Dhrystone See [Dhrystone benchmark](#).

Dhrystone benchmark synthetic benchmark program consisting of a representative instruction mix used to test the performance of a computer. Does not compute anything in particular. Another synthetic benchmark is the Whetstone benchmark.

DIAC a two-terminal AC device that, once gated on by sufficient forward voltage, permits the flow of current until reverse biased. It is often used as a trigger device to drive the gate of other power electronic devices.

Diac's delta function See [delta function](#).

diagnostic (1) one of a set of tests to run through a system that determines whether the system is functioning correctly.

(2) pertaining to the detection and isolation of faults or failures. For example, a diagnostic message, a diagnostic manual.

diagonal clipping distortion that occurs in an AM demodulator (usually associated with diode detection), where the capacitor discharge time constant is set too long for the detector to accurately follow fast changes in the AM signal envelope. Sometimes referred to as "failure to follow distortion," diagonal clipping can also occur in AM modulators

when the intelligence bandwidth exceeds that of the modulator.

diagonal dominance a measure of the amount of interaction that exists between variables in a multi-input-multi-output (MIMO) system. It is quantified by Gershgorin circles or bands that are often plotted on an inverse Nyquist array (or INA) diagram that shows the frequency response matrix of the system in a graphical form. Its practical significance relates to the fact that a diagonally dominant system can be controlled by multiple single variable controllers, whereas a nondominant process might require sophisticated and costly multivariable techniques for effective control. See also [inverse Nyquist array](#).

diamagnetic materials with magnetization directed opposite to the magnetizing field, so that the permeability is less than one; metallic bismuth is an example.

die an individual MMIC circuit or subsystem that is one of several identical chips that are produced after dicing up an MMIC wafer.

dielectric (1) a medium that exhibits negligible or no electrical conductivity and thus acts as a good electrical insulator.

(2) a medium characterized by zero conductivity, unity relative permeability, and a relative permittivity greater than one. Also known as an insulator.

Dielectrics are usually used to separate two conducting bodies such as to form a capacitor.

dielectric constant (1) a quantity that describes how a material stores and dissipates electrical energy.

(2) ratio of the electrical capacity of a condenser, which has a given material as the dielectric, to the capacity of an identical condenser, but with air as the dielectric.

(3) permittivity of a medium normalized to the permittivity of free space; a measure

of the response of a dielectric to an applied electric field.

(4) an electric property of an insulator or semi-conducting material, which describes how differently electric fields will behave inside of the material as compared to air. As an example, $\epsilon_r = 12.9$ for GaAs as compared to $\epsilon_r = 1$ for air. In integrated circuits, an effective dielectric constant (ϵ_{eff}) is used, since the electric fields supported by the signals traveling through the conductors on the circuit flow through both air and the insulator or semiconductor simultaneously.

dielectric discontinuity interface between two media with different dielectric permittivity properties.

dielectric medium medium that is polarizable but relatively nonconducting.

dielectric resonator an unmetallized dielectric object of high dielectric constant and high quality factor that can function as an energy storage device.

dielectric resonator [stabled] oscillator (DRO) a dielectric resonator is a cylindrically shaped piece of material, or “puck,” that has the properties of having low-loss resonant frequencies that are determined primarily by the size of the cylinder. Placing a dielectric resonator near a microstrip line can form a resonant circuit that will frequency stabilize a voltage-controlled oscillator.

dielectric resonator antenna (DRA) an antenna where a dielectric resonator is used as the radiation element.

dielectric slug tuner system of two movable dielectric pieces of material placed on a transmission line for the purpose of matching a wide range of load impedances by means of placing the dielectrics in proper positions.

dielectric step discontinuity the junction between different dielectric waveguides.

dielectric waveguide a waveguide that relies on differences in permittivity among two or more materials to guide electromagnetic energy without the need for ground planes or metallic strips. Such guides of rectangular, circular, elliptical, and other cross sections are made of dielectric materials and used for transmitting signals. Transmission is accomplished by the total internal reflection mechanism inside the waveguide.

difference amplifier See [differential amplifier](#).

difference engine a mechanical calculator developed by Babbage in 1823.

difference equation the mathematical model of a LTIL discrete time system. See also [discrete time system](#), [LTIL system](#).

difference of Gaussian filter a bandpass filter whose point spread function is the difference of two isotropic Gaussians with different variances. The result is a “Mexican hat” shape similar to the Laplacian of a Gaussian (See Marr-Hildreth operator). Various physiological sensors, including some filters in early vision, appear to have DOG point spread functions.

difference-frequency generation a second-order nonlinear optical process in which two input beams are applied to a nonlinear optical material and an output is produced at the difference of the frequencies of the two input beams.

difference-mode signal if two arbitrary signals v_1 and v_2 are applied to the inputs of a differential amplifier, then the common-mode signal is the arithmetic average of the two signals. That is,

$$(v_1 + v_2)/2$$

differential amplifier an amplifier intended to respond only to the difference be-