

SYMBOLOLOGY

NOTE: This list includes terms used more or less frequently throughout the preceding pages, some of them in special senses. It omits familiar conventional symbols such as A (amperes), Hz (cycles/sec), π (3.1416), and Ω (ohms). Specific references, where given, are to modules where the symbol is first, or characteristically, used. Such physical quantities as voltage, current, etc., are described by lower-case symbols when circuit variables, upper case when constants or magnitudes.

SYMBOL	TERM	UNITS	EXPLANATION
A	Gain		Operational Amplifier open-loop voltage gain
A_0	Gain		Same, at DC
B	Booster Amplifier Normalized Bandwidth Bias Supply	Hz (cps) Radians/sec	See I.8
C	Capacitance, capacitor	Farads	Often with identifying subscripts e.g. C_1, C_2
C_c			Compensating capacitor
C_L			Capacitance of load, or capacitor that is part of load
C_s			Stray capacitance (general); capacitance from negative summing point to common
C_{STD}			Standard capacitance or capacitor
CME	Common-mode error	Volts	The effective offset voltage appearing between the amplifier input terminals as a consequence of the voltage level of the positive input (Common-mode voltage)
$CMRR$	Common-mode rejection ratio		$\frac{ CMV }{ CME }$
CMR		Decibels	The logarithmic form of $CMRR$. $CMR = 20 \log_{10} CMRR$
CMV	Common-mode voltage	Volts	See Nomenclature
D	Diode		
E	Voltage	Volts	DC reference voltage level, or effective reference voltage level
E_B			Power supply or zener diode breakdown voltage
E_b			Power supply or battery
E_{bb}			Battery terminal voltage
E_{in}			DC input signal level
E_n, E_0	Voltage, constant	Volts	DC null (or error) voltage

SYMBOL	TERM	UNITS	EXPLANATION
E_R			Generally, the voltage across a resistor
E_r, E_{REF}			Reference or bias
E_{RESET}			Level at which an initial condition is set
E_s			Generally, the reference level around which a signal varies
E_Z			Voltage across a Zener diode
e	Signal voltage	Volts	Output of operational circuit. Rarely e_o (never e_0) in Philbrick Literature
e_0, e_1, e_2			Input signal, also e_{in}, e_s
e_A, e_B			Signal voltages at points A and B in a circuit (to ground)
e_g			Signal generator output voltage Gate logic input
e_i, e_j			Two signal voltages in a numbered series
e_{LG}			AC signal voltage introduced by power line coupling to or from ground (see I.28)
e_N			Noise voltage source
e_n			Null voltage of an Operational Amplifier (error voltage)
f	Frequency	Hertz (cps)	
f_H	Frequency, high		The frequency at which amplifier open-loop gain is unity gain-bandwidth product product (see also ω_H)
G	Conductance	mho, \bar{u}	
HQG	High Quality Ground		Signal ground; reference for lowest-level signal in the system (as opposed to chassis ground, earth, or power common)
I	DC current	Ampere	

SYMBOL	TERM	UNITS	EXPLANATION
I_A, I_B	Current	(Amperes)	Bias or reference current into or out of amplifier input terminal
I_o			Offset current
I_{oA}, I_{oB}			Offset currents associated with amplifier input terminals
I_{ss}			Idling current or steady-state component of current
i			Signal current; also the dynamic component of current; usually with identifying subscripts
i_D			Diode current
i_{in}			Input current
i_L			Load current
i_M, I_M			Meter current
i_{NA}, i_{NB}			Noise current associated with amplifier input terminals
i_s			Signal current
j	$\sqrt{-1}$		Imaginary term operator in a complex expression (mathematical "i")
K, k	Arbitrary constants		(Often with subscripts)
k	Boltzmann's Constant	Joule degree K	1.38054×10^{-23}
M	Meter		
P	Potentiometer		
p	Heaviside operator	sec^{-1}	$py \equiv \frac{dy}{dt}, \frac{1}{p}y = \int ydt$
Q	Quality factor		Of a circuit or component; specifically the ratio of energy storage to energy dissipation therein. ($Q = \frac{1}{2}\zeta$) Also, charge (i.e., on a capacitor) (coulombs)
q	Charge	Coulomb	For example, charge of an electron
R	Resistance, resistor	ohms Ω	Usually with identifying subscripts
R_A, R_B			Input resistance, terminal A, terminal B to power common
R_{AB}			Input resistance, terminal A to terminal B
R_{be}			Base-emitter resistance of a transistor (sometimes r_{be})
R_i			Internal resistance, of an Operational Amplifier output circuit
R_{in}			Input circuit resistance or resistor
R_L			Resistive component of load
R_m			Meter resistance
R_s			Source resistance
R_{STD}			Standard (or reference) resistance or resistor
R_x			Unknown resistor or resistor to be measured

SYMBOL	TERM	UNITS	EXPLANATION
S	Switch		
T	Absolute temperature Time Constant RC	Degrees K Seconds	Sometimes θ ($^{\circ}\text{C}$)
t	Time	Seconds	
V	Voltmeter		
V, v	Voltage	Volts	(See also E or e)
V_o			Offset voltage
V_{oB}			Offset voltage between amplifier input terminals
V_d			Junction voltage drop
V_f, v_f			Diode forward drop
X_c	Capacitive reactance	ohms Ω	
Y	Admittance	mhos \mathfrak{U}	The inverse of impedance, $Y = G + jB$ (for continuous sine waves)
Z	Impedance	ohms Ω	$Z = R + jX$ (for continuous sine waves)
Z_A, Z_B			Input impedance, terminal A to ground, terminal B to ground
Z_{AB}			Input impedance, terminal A to terminal B
Z_{AG}, Z_{BG}			Input impedance to ground, same as Z_A, Z_B
Z_f			Generally, feedback impedance
Z_{in}			Generally, input impedance
Z_L			Load impedance
Z_{REF}			Reference impedance or Z_{STD} , Standard impedance
Z_{ω_0}			Impedance at ω_0 i.e., at center frequency
α	Noise components, resistance ratio		
β	Feedback divider ratio Transistor current gain		Complex attenuation of feedback paths
$\Delta e, \delta e$	Null or error voltage		
ϵ	Base of natural logarithms		
θ	Phase angle	Degrees or radians	
Φ	Philbrick		Leadership in feedback technology
ρ	Ratio		Fractional rotation of a potentiometer or rheostat
τ	Time interval, or time constant		
ϕ	Phase, phase shift		Also angle of phase shift
ω	Angular frequency	Radians/sec	$\equiv 2\pi f$
ω_C	Critical frequency		Or cutoff frequency: ω_{CU} and ω_{CL} are upper and lower cutoff frequencies
ω_H	Upper radian frequency		$2\pi f_H$ see f_H
ω_0	Center frequency		$\omega_0 = \sqrt{\omega_{CU} \omega_{CL}}$