APPENDIX VII

Recommended Unit Symbols, SI Prefixes, and Abbreviations

A. *Recommended Unit Symbols*

The following standards provide the recommended abbreviations, symbols, and units for IEEE publications.

IEEE Std 100-1996 *IEEE Standard Dictionary of Electrical and Electronic Terms, Sixth Edition*

IEEE Std 260.1-1993 *American National Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units)*

IEEE Std 280-1985 *American National Standard for Mathematical Signs and Symbols for Use in Physical Sciences and Technology*

IEEE Std 280-1985 (R1997) *IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering*

IEEE Std 315-1975 (R1993) *IEEE Graphic Symbols foe Electrical and Electronics Diagrams (Including Reference Designation Letters)*

(Includes supplement 315A-1986, R1993)

SI 10-1997 *(IEEE/ASTM) Standard for Use of the International System of Units (SI) — The Modern Metric System*

The above standards are all available from IEEE, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331 USA, Telephone +1-800-678-IEEE. Some symbols from these standards are given in Table II of part C of this appendix. Their form is the same for both singular and plural usages, and period is not used in their abbreviations. The distinction between the use of upper-case and lower-case letters should be carefully observed.

When a compound unit is formed by the multiplication of two or more units, its symbol consists of the symbols of the separate units joined by a raised dot; for example, N · m for newton meter. When a compound unit is formed by the division of one unit by another, its symbol consists of the separate symbols either separated by solidus (slant) or multiplied using negative powers; for example, either m/s or $m \cdot s^{-1}$ for meters per second.

TABLE I
SI PREFIXES

Multiple	Prefix	Symbol
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deka	da
10^{-2}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

B. *Recommended SI Prefixes*

Prefixes indicating decimal multiples or submultiples of units and their symbols are given in Table I. Compound prefixes, such as “micromicro” for “pico” and “kilomega” for “giga” are discouraged.

C. *Recommended Abbreviations*

In general, most abbreviations of technical terms are capitalized, but there are notable exceptions such as ac, dc, and rms. In addition to the unit symbols, Table II lists many common technical abbreviations in their standard IEEE editorial forms. Note that *periods are not used* and the abbreviation is the same regardless of whether it is used as a noun or an adjective. An abbreviation that is new or not generally accepted should be defined when first used. In abbreviations involving a person’s name, always capitalize the initial for the person’s name.

TABLE II
ABBREVIATIONS AND LETTER SYMBOLS FOR UNITS

Unit or Term	Abbreviation	Unit or Term	Abbreviation
alternating current	ac	baud	Bd
American wire gauge	AWG	beat-frequency oscillator	BFO
ampere	A	binary coded decimal	BCD
ampere · hour	Ah	bit	b
ampere turn	A	British thermal unit	Btu
amplitude modulation	AM	calorie	cal
antilogarithm	antilog	candela	cd
audio frequency	AF	candela per square foot	cd/ft^2
automatic frequency control	AFC	candela per square meter	cd/m^2
automatic gain control	AGC	cathode-ray oscilloscope	CRO
automatic volume control	AVC	cathode-ray tube	CRT
average	avg	centimeter	cm

TABLE II
(continued)

Unit or Term	Abbreviation	Unit or Term	Abbreviation
circular mil	cmil	kilojoule	kJ
continuous wave	CW	kilometer	km
coulomb	C	kilometer per hour	km/h
cubic centimeter	cm^3	kilovar	kvar
cubic foot per minute	ft^3/min	kilovolt	kV
cubic meter	m^3	kilovoltampere	kVA
cubic meter per second	m^3/s	kilowatt	kW
decibel	dB	kilowatthour	kWh
degree Celsius	°C	lambert	L
degree Fahrenheit	°F	liter	L
degree (plane angle)	...°	liter per second	L/s
degree Rankine	°R	logarithm	log
degree (temperature interval or difference)	deg	logarithm, natural	ln
diameter	diam	low frequency	LF
direct current	dc	lumen	lm
electromagnetic compatibility	EMC	lumen per square foot	lm/ft^2
electromagnetic unit	EMU	lumen per square meter	lm/m^2
electromotive force	EMF	lumen per watt	lm/W
electronic data processing	EDP	lumen second	lm · s
electronvolt	eV	lux	lx
electrostatic unit	ESU	magnetohydrodynamics	MHD
extra-high voltage	EHV	magnetomotive force	MMF
extremely high frequency	EHF	medium frequency	MF
extremely low frequency	ELF	megaelectronvolt	MeV
farad	F	megahertz	MHZ
field-effect transistor	FET	megavolt	MV
foot	ft	megawatt	MW
foot per minute	ft/min	megohm	MΩ
foot per second	ft/s	metal-oxide semiconductor	MOS
foot pound-force	ft · lbf	meter	m
frequency modulation	FM	meter-kilogram-second	MKS
gallon	gal	microampere	μA
gallon per minute	gal/min	microfarad	μF
gauss	G	microgrm	μg
gigaelectronvolt	GeV	microhenry	μH
gigahertz	GHz	micrometer	μm
gram	g	micromho	$\mu\Omega^{-1}$
henry	H	microsecond	μs
hertz	Hz	microwatt	μW
high voltage	HV	mile per hour	mi/h
hour	h	mile (statute)	mi
inch	in	milliampere	mA
inch per second	in/s	milligram	mg
inductance-capacitance	*LC*	millihenry	mH
inertia	$kg \cdot m^2$ *or* $lb \cdot ft^2$	milliliter	ml
infrared	IR	millimeter	mm
inside diameter	ID	millisecond	ms
intermediate frequency	IF	millivolt	mV
joule	J	milliwatt	mW
joule per degree	J/deg	minute (plane angle)	...’
kelvin	K	minute (time)	min
kiloelectronvolt	keV	nanofarad	nF
kilogram	kg	nanometer	nm
kilohertz	kHz	nanosecond	ns
kilohm	kΩ	nanowatt	nW

TABLE II
(continued)

Unit or Term	Abbreviation	Unit or Term	Abbreviation
neper	Np	short wave	SW
newton	N	siemens	S
newton meter	N · m	signal-to-noise ratio	SNR
newton per square meter	N/m^2	silicon controlled rectifier	SCR
ohm	Ω	square foot	ft^2
ounce (avoirdupois)	oz	square inch	in^2
per unit	pu	square meter	m^2
phase modulation	PM	square yard	yd^2
picoampere	pA	standing-wave ratio	SWR
picofarad	pF	television interference	TVI
picosecond	ps	tesla	T
picowatt	pW	thousand circular mils	kcmil
pound	lb	transverse electric	TE
poundal	pdl	transverse electromagnetic	TEM
pound-force	lbf	transverse magnetic	TM
pound-force foot	lbf · ft	traveling-wave tube	TWT
pound-force per square inch	lbf/in^2	vacuum-tube voltmeter	VTVM
pound per square inch§	lb/in^2	var	var
power factor	PF	variable-frequency oscillator	VFO
radian	rad	very high frequency	VHF
radio frequency	RF	volt	V
radio-frequency interference	RFI	voltage controlled oscillator	VCO
resistance-capacitance	*RC*	voltage standing-wave ratio	VSWR
resistance-inductance-capacitance	*RLC*	voltampere	VA
revolution per minute	r/min	watt	W
revolution per second	r/s	watthour	Wh
roentgen	R	watt per steradian	W/sr
root-mean-square	rms	watt per steradian square meter	$W/(sr \cdot m^2)$
second (plane angle)	...”	weber	Wb
second (time)	s	yard	yd

§ Although the use of the abbreviation psi is common, it is not recommended. See pound-force per square inch.