

BRITISH STANDARD 4727 : Part 3 : Group 01 : 1971

**GLOSSARY OF
ELECTROTECHNICAL, POWER,
TELECOMMUNICATION,
ELECTRONICS, LIGHTING AND
COLOUR TERMS**

**PART 3. TERMS PARTICULAR TO
TELECOMMUNICATIONS AND ELECTRONICS**

**Group 01. General telecommunication and
electronics terminology**

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Group 01. General telecommunication and
electronics terminology

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UDC 001.4 : [621.3 + 628.9 + 535]

THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee and the Telecommunication Industry Standards Committee, was published under the authority of the Executive Board on 20th August, 1971.

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SBN: 580 06744 0

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The following BSI references relate to the work on this standard:
Committee references ELE/TLE/1 ELE/TLE/1/4

CO-OPERATING ORGANIZATIONS

The Electrical Industry Standards Committee and the Telecommunication Industry Standards Committee, under whose supervision this British Standard was prepared, consist of representatives from the following Government departments and scientific and industrial organizations:

- | | |
|---|---|
| Associated Offices' Technical Committee | Engineering Equipment Users' Association |
| *Association of Consulting Engineers | *Institution of Electrical Engineers |
| Association of Manufacturers of Domestic Electrical Appliances | *Institution of Electronic and Radio Engineers |
| Association of Mining Electrical and Mechanical Engineers | Institution of Production Engineers |
| Association of Supervisory and Executive Engineers | *Lighting Industry Federation Limited |
| *British Broadcasting Corporation | *Ministry of Defence |
| *British Electrical and Allied Manufacturers' Association | Ministry of Defence, Army Department |
| *British Radio Equipment Manufacturers' Association | *Ministry of Defence, Navy Department |
| *British Radio Valve Manufacturers' Association | *Ministry of Public Building and Works |
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| Department of Employment and Productivity | National Physical Laboratory (Ministry of Technology) |
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| *Electronic Engineering Association | *Science Research Council—Radio and Space Research Station |
| *Electronic Valve and Semi-conductor Manufacturers' Association | Scientific Instrument Manufacturers' Association |
| | Society of British Aerospace Companies |
| | South of Scotland Electricity Board |
| | *Telecommunication Engineering and Manufacturing Association |

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- | | |
|---|--|
| Institute of Physics and the Physical Society | Telephone Manufacturers' Technical Development Committee |
| Radio and Electronics Technical Press | |

GUIDE TO THE GLOSSARY

Part 1. Terms common to power, telecommunications and electronics

- Group 01. Fundamental concepts
- Group 02. General technological terminology
- Group 03. Relay terminology
- Group . Measurement terminology*
- Group . Semiconductor terminology*
- Group . Electronic tube terminology*
- Group . Magnetism terminology*
- Group . Radiological terminology*
- Group . Radio interference terminology*
- Group . Integrated electronic circuit terminology*

Titles to any further groups will be added in due course

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Titles to any further groups will be added in due course.

* Not yet published, as at August, 1971.

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Titles to any further groups will be added in due course.

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BRITISH STANDARD GLOSSARY OF ELECTROTECHNICAL, POWER, TELECOMMUNICATION, ELECTRONICS, LIGHTING AND COLOUR TERMS

Part 3. Terms Particular to Telecommunications and Electronics

Group 01. General telecommunication and electronics terminology

FOREWORD

This Group of Part 3 of this British Standard Glossary, prepared under the authority of the Electrical Industry Standards Committee and the Telecommunication Industry Standards Committee, contains terms and definitions relating to general telecommunications and electronics and supersedes the following subsections of BS 204*:

- Subsection 12. General telecommunication terms.
- Subsection 13. Electromagnetic waves, oscillations and pulses.
- Subsection 14. Modulation and detection.
- Subsection 15. Noise and distortion.
- Subsection 31. Terms relevant to valve circuits.
- Subsection 32. Amplifiers, generators, gates and miscellaneous circuits.
- Subsection 523. Communication line characteristics.

This Group of the glossary, taken in conjunction with Group 01, 'Fundamental concepts', and Group 02, 'General technological terms', of Part 1, 'Terms common to power, telecommunications and electronics', also supersedes the following subsections of BS 204:

- Subsection 11. General electrical terms.
- Subsection 33. Networks.

The terms and definitions are in close agreement with the corresponding terms in the latest edition of the International Electrotechnical Vocabulary prepared by the International Electrotechnical Commission (IEC).

In this new glossary a number of significant changes have been introduced. It has been decided to combine into one glossary the subjects previously covered by BS 204, BS 205†, BS 233‡ and BS 1611§ glossaries. The glossary is divided into four main Parts, each of which is further subdivided into groups. Each group will comprise the terms and definitions used in a particular branch of electrical engineering and will be issued individually as soon as it is completed. This arrangement makes it possible to add new groups, or revise existing groups, at any time without affecting the remainder of the glossary.

The four main Parts of the glossary are as follows:

- Part 1. Terms common to power, telecommunications and electronics.
- Part 2. Terms particular to power engineering.
- Part 3. Terms particular to telecommunications and electronics.
- Part 4. Terms particular to lighting and colour.

* BS 204, 'Glossary of terms used in telecommunication (including radio) and electronics'.

† BS 205, 'Glossary of terms used in electrical engineering'.

‡ BS 233, 'Glossary of terms used in illumination and photometry'.

§ BS 1611, 'Glossary of colour terms used in science and industry'.

As groups of terms within the new framework are published, the corresponding parts of the British Standard glossaries mentioned above will be withdrawn. Ultimately the new glossary will replace these standards completely and they will then be withdrawn.

Fundamental and general terms common to power, telecommunications and electronics, respectively form the first two groups of Part 1. General terms particular to Part 2 and Part 3 similarly form the first groups to their respective Parts. The specialist groups contain only the terms and definitions relating to their subject.

As far as has been practicable all terms and definitions established in current usage and within the scope of this glossary have been included. Experience has shown that it is rarely possible to replace, or even to modify, a well established term no matter what the logical or aesthetic shortcomings of that term may be. Current usage has therefore been accepted as the authority for terms and their meanings except where there has been a very good reason for doing otherwise, as, for example, where terms have been considered to be fundamentally wrong, ambiguous, superfluous or in need of standardization. Where two or more synonymous terms are in use those which are deprecated are omitted from the body of the text but are entered in the alphabetical index with a cross reference to the standard term. In cases where it was felt that the time was not yet right to deprecate a synonym, preferred terms are given first and other terms are printed in less prominent type to indicate the intention to deprecate them in the course of time. Where synonyms are considered of equal value they are shown in the same type.

Where terms are used with somewhat different meanings in different branches of electrical engineering, appropriate definitions are given in the groups of the glossary corresponding to these branches. Such a definition, when taken out of the context of its group, should always be quoted with a preamble indicating its proper context.

It is to be noted that the given definition of a term represents the generally accepted meaning of that term. Under no circumstances should it be regarded as taking the place of a specification.

An effort has been made to arrange the terms in a logical order proceeding from the general to the specific and from the whole to the part and placing allied terms in proximity within a subsection or section of the group. Each term has assigned to it a Part number (one digit) and a Group number of two digits followed by a space and four digits, the first digit of which represents the section, the second digit the subsection and the last two digits the place within the subsection.

A general view of the arrangement of the group in the glossary can be obtained from the Guide to the Glossary. An alphabetical index of the terms of the group is provided at the end to facilitate reference to particular terms. For simplicity, only the last four digits of a term's number are quoted in the index. It is recommended that the user of any group of the glossary should consider the group in association with the groups covering general or fundamental terms within the Part, for Parts 2 and 3, and also together with Groups 01 and 02 of Part 1.

In this glossary round brackets () enclose words or phrases which are not part of the term or definition and can be omitted without affecting the meaning.

Square brackets [] enclose words which may replace a preceding part of an expression. The limiting sign ⌈ indicates, if necessary, how many of the preceding words are replaced.

301 1 GENERAL

No.	Term	Definition
301 1001	telecommunication	Any transmission, emission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical, or other electro-magnetic systems.
301 1002	telephony	A system of telecommunication set up for the transmission of speech or, in some cases, other sounds.
301 1003	telegraphy	A system of telecommunication which is concerned in any process providing transmission and reproduction at a distance of documentary matter, such as written or printed matter, or fixed images, or the reproduction at a distance of any kind of information in such a form.
301 1004	private-wire circuit; leased circuit	A circuit placed at the exclusive permanent disposal of a renter.
301 1005	part-time ⌈ private-wire [leased] circuit	A circuit placed at the exclusive disposal of a renter for pre-arranged periods.

No.	Term	Definition
301 1006	audio frequency	A frequency within the range audible to the normal human ear.
301 1007	telephone frequency; voice frequency	An audio frequency within the band of frequencies effectively transmitted by a given telephone channel, not taking account of any frequency changing.
301 1008	sub-audio frequency	A frequency below the range audible to the normal human ear. NOTE. This concept should not be confused with 'sub-telephone frequency'.
301 1009	sub-telephone frequency	A frequency below the telephone frequency band. NOTE. This concept should not be confused with 'sub-audio frequency'.
301 1010	super-audio frequency	A frequency above the range audible to the normal human ear. NOTE. This concept should not be confused with 'super-telephone frequency'.
301 1011	super-telephone frequency	A frequency above the telephone frequency band. NOTE. This concept should not be confused with 'super-audio frequency'.
301 1012	radio frequency	Any frequency at which electromagnetic radiation is useful for telecommunication.
301 1013	fundamental frequency	A frequency the value of which is the highest common factor of harmonically related frequencies in a complex oscillation.
301 1014	instantaneous frequency	<i>Of an oscillation (not necessarily sinusoidal).</i> The rate of change of phase, expressed in radians per second, divided by 2π
301 1015	circuit	A region of electrical action where such action takes place essentially along a path and can be uniquely specified in terms of time and a single dimension. NOTE. In contradistinction, an 'electric field' implies action which can only be specified uniquely in terms of time and two or three dimensions.
301 1016	circuit (with specified function)	A number of elements connected together for the purpose of carrying a current. When they form a closed path through which a current can circulate the circuit is said to be closed, and when the path is not closed the circuit is said to be open. NOTE 1. A circuit having a definite function may be specified according to the function (example: calling, speaking, feeding, etc.). NOTE 2. By common usage, the term is also employed to designate an aggregation of paths or a specified part of a complete path.
301 1017	telecommunication circuit	A means of both-way communication between two points, comprising associated 'go' and 'return' channels.
301 1018	channel	A means of one-way transmission. NOTE. Several channels may share a common path as in carrier systems; in this case each channel is allotted a particular frequency band which is reserved for it.
301 1019	carrier channel	A channel in a carrier system on symmetrical or coaxial pairs or wave-guides or in any extension of such a system over radio links. It occupies a defined frequency band and is available for utilization by a modulated carrier wave.
301 1020	time-derived channel	Any of the channels obtained from multiplexing a channel by time-division.
301 1021	baseband	The band of frequencies which is modulated on to, or recovered from, the carrier in a wideband radio relay system, and which is occupied by television, multi-channel telephony, telegraphy or similar signals and any pilot or other associated signals.
301 1022	wideband channel; broadband channel	(These are relative terms not amenable to exact definitions. Where the meaning is not clear from the context, the terms should be defined for the specific usage by indicating the bandwidth.)

No.	Term	Definition
301 1023	transmission units	The expression in transmission units of a ratio of two quantities of a similar nature is given by a number proportional to the logarithm (to a specified base) of this ratio followed by a name (considered as the name of the transmission unit used), indicating the base chosen; the factor of proportionality between the number and the logarithm depends upon the base chosen and the nature and the quantities concerned.

NOTE 1. In principle, the simple indication of a number of transmission units (whatever be the unit used) is insufficient to indicate the kind of quantity concerned; it is desirable, therefore, to specify these quantities.

This condition is satisfied when a ratio is concerned which has received a name and a precise definition and when the correct name of the ratio is indicated.

It is assumed that, unless otherwise stated in one form or another:

(1) an expression in nepers corresponds to a ratio of currents or voltages (or of other quantities of an analogous nature such as, for example, acoustic pressures or acoustic velocities);

(2) an expression in decibels corresponds to a ratio of powers (real or apparent).

NOTE 2. Certain quantities which can be given in the form of current ratios are more elegantly expressed as impedance ratios of numerically equal value. These quantities can be expressed in transmission units by application of the same formulae as those for current ratios.

301 1024 bel; decibel

Transmission units giving the ratio of two powers. The number of bels is equal to the logarithm to the base ten of the power ratio.

The decibel is equal to one-tenth of a bel.

NOTE. If P_1 and P_2 represent two values of power, N the number of bels, n the number of decibels denoting their ratio,

$$N = \log_{10} (P_1/P_2),$$

$$n = 10 \log_{10} (P_1/P_2).$$

When the conditions are such that scalar ratios of currents or voltages (or analogous quantities in other fields) are the square roots of the corresponding power ratios, the number of decibels by which the corresponding powers differ may be expressed by the following formulae:

$$n = 20 \log_{10} (I_1/I_2),$$

$$n = 20 \log_{10} (V_1/V_2),$$

where I_1/I_2 and V_1/V_2 are the given current and voltage ratios respectively.

By extension, these relations between numbers of decibels and scalar ratios of currents or voltages are sometimes applied where these ratios are not the square roots of the corresponding power ratios; to avoid confusion, such use of the word 'decibel' should be accompanied by a specific statement giving in the particular case the quantities concerned (see 301 1023).

301 1025 neper; decineper

Transmission units expressing the ratio of two currents or two voltages (or analogous quantities in other fields, such as two acoustic pressures, etc.).

The number of nepers is equal to the natural logarithm of this ratio. The decineper is one-tenth of the neper.

NOTE. If I_1 and I_2 represent two values of currents, M the number of nepers, m the number of decinepers denoting their ratio,

$$M = \log_e (I_1/I_2),$$

$$m = 10 \log_e (I_1/I_2).$$

Similar relations apply to voltages.

No.	Term	Definition
		When the ratio of powers is the square of the ratio of the corresponding currents (or of voltages), the number of nepers representing the current (or voltage) ratio may be expressed by the following formula: $M = \frac{1}{2} \log_e (P_1/P_2),$ where P_1/P_2 is the ratio of the powers. By extension, this relation between the number of nepers and the ratio of powers is sometimes applied when the ratio is not the square of the ratio of the corresponding currents (or voltages); to avoid confusion, such a use of the word 'neper' should be accompanied by a precise statement giving in the particular case the quantities concerned (see 301 1023).
301 1026	absolute (power) level	The ratio, expressed in units of transmission, of the real (or apparent) power of a signal at a point in a transmission path to one milliwatt (or one millivolt-ampere).
301 1027	absolute voltage level	The expression in units of transmission of the ratio V/V_r , where V represents the r.m.s. value of the voltage at the point in question and $V_r = \sqrt{R/1000}$ (corresponding to 1 mW at that point), e.g. $V_r = 0.775$ V when $R = 600 \Omega$.
301 1028	test level	<i>In a telephone circuit.</i> The absolute level at a point in a circuit when the origin (nominally the 2-wire termination) is energized by means of a generator having a resistance R equal to the nominal impedance at the origin and an e.m.f. equal to $2\sqrt{R/1000}$ V. NOTE. This quantity is generally designated 'level', without qualification. Conversely, when the word 'level' is used without qualification this quantity is understood. Unless otherwise indicated, this quantity is measured at a frequency of 800 Hz.
301 1029	terminated level	The reading of a level-measuring set at a point in a system when terminated at that point by means of a resistance equal to the nominal impedance of the system.
301 1030	through level	The reading of a high-impedance level-measuring set at a point in a system, no correction being made for any difference between the actual impedance of the system and the impedance with respect to which the set is calibrated. NOTE. A through level measured with an instrument calibrated with reference to 600 Ω, for example, is referred to as a '600 Ω through level'.
301 1031	relative (power) level	The ratio, expressed in decibels or nepers, of the real or apparent power of a signal at a point in a transmission path to that at a chosen reference point (generally the origin of the transmission system).
301 1032	insertion loss [gain]	The loss [gain] due to the insertion of a transducer between two impedances Z_E (generator) and Z_R (load). Insertion loss [gain] is the expression in transmission units of the ratio $\frac{P_1}{P_2}$
		where P_1 is the 'apparent power' received by the load Z_R before the insertion of the said transducer and P_2 is the apparent power received by the load Z_R after the insertion of the said transducer. If the number thus obtained is negative, then there is an insertion gain.
301 1033	tapping loss	The ratio expressed in decibels or nepers of the apparent power normally available from a transmission system at a specified point, to that available when an apparatus is connected across the transmission path at some point between the source and the specified point.

No.	Term	Definition
301 1034	transducer loss [gain]	The loss [gain] of a transducer inserted between two impedances Z_E (generator) and Z_R (load). Transducer loss [gain] is the expression in transmission units of the ratio $\frac{P_{\max.}}{P}$ where $P_{\max.}$ is the maximum real power that the generator Z_E is able to provide * at the load Z_R and P is the real power that the generator Z_E provides to the load Z_R through the said transducer. If the number thus obtained is negative, then there is a transducer gain. * This maximum real power is obtained by inserting between the generator (Z_E) and the load (Z_R) an ideal transducer; that is to say, in annulling first the reactance in each direction and then introducing an ideal transformer of optimum ratio.
301 1035	transmission loss; loss	The reduction of power between two points 1 and 2 at which the power is respectively P_1 and P_2 , expressed by the ratio $\frac{P_1}{P_2}$ in transmission units.
301 1036	gain	The increase in power between two points 1 and 2 at which the power is respectively P_1 and P_2 , expressed by the ratio $\frac{P_2}{P_1}$ in transmission units.
301 1037	return current [voltage]	<i>Due to an impedance irregularity in a transmission system. A current [voltage] wave reflected from the point of irregularity, which may combine with the forward transmitted wave in such a manner as to cause variations in the steady-state characteristics of the system.</i>
301 1038	return loss	The modulus of the reciprocal of the reflection coefficient (see 301 4017).
301 1039	regularity return-loss	A measure of the regularity of a line structure, the line being terminated in an impedance which simulates infinite-line conditions. Quantitatively, it is equal to the ratio $(Z_b + Z_a) / (Z_b - Z_a)$ expressed in decibels or nepers, in which Z_a is the impedance of the line and Z_b is the corresponding impedance value of the best smooth curve that can be drawn, without inflections, through the impedance/frequency characteristic of the line.
301 1040	terminal return-loss	The value of the return loss at the terminal of a trunk telephone line when it is terminated by circuits in the local network up to and including the subscriber's telephone. Quantitatively, it is equal to the ratio $(Z_b + Z_a) / (Z_b - Z_a)$ expressed in decibels or nepers, in which Z_a and Z_b will have various meanings as set out in the notes to 'reflection coefficient'. If the trunk telephone line terminates in a 2-wire amplifier or a 4-wire terminating set, the terminal return-loss will be a balance return-loss (see 301 4017).
301 1041	balance return-loss	The value of the return loss at a hybrid coil or a 4-wire terminating set. It is determined by the degree to which the impedance of the balancing network simulates that of the line or apparatus. If the impedance of the terminated line or apparatus is Z_a and that of the network is Z_b , the balance return-loss is quantitatively equal to $20 \log_{10}(Z_b + Z_a) / (Z_b - Z_a)$ decibels or $\log_e (Z_b + Z_a) / (Z_b - Z_a)$ nepers.
301 1042	effective cut-off frequency	The frequency at which the transmission of power falls by a specific amount below that at a particular reference point in the transmission band.
301 1043	effective bandwidth	The width of the band of frequencies within which the performance with respect to some characteristic falls within specific limits.

No.	Term	Definition
301 1044	theoretical cut-off frequency	The frequency at which, disregarding the effects of dissipation, the image attenuation coefficient changes from zero to a positive value or vice versa.
301 1045	phase delay	The time equal to the phase shift (expressed in radians) between two points between which there is propagation, divided by the angular frequency (in radians per second).
301 1046	group delay	The time of propagation between two points of a certain point (for example the crest) of the envelope of a wave. For a given frequency it is equal to the first derivative of the phase shift measured in radians, between these points, with reference to the angular frequency expressed in radians per second.
301 1047	group delay characteristic	A graph of $\frac{d\beta}{d\omega}$ for the transmission path over the range of frequencies of interest where β is the insertion phase shift (expressed in radians) at a certain frequency and ω the angular velocity (expressed in radians per second). If $\frac{d\beta}{d\omega}$ is constant over the band of frequencies required for a particular waveform, the envelope of the waveform is transmitted without distortion and the time of propagation of a characteristic feature of the wave envelope (e.g. the crest) is equal to the group delay.
301 1048	group velocity; envelope velocity	The velocity of propagation of beats produced by the superposition of two or more plane sinusoidal waves of slightly different frequencies, propagated freely in the same direction. The group velocity as thus defined is equal to the first derivative of the frequency with respect to the reciprocal of the wavelength. NOTE. The group velocity differs from the steady-state velocity of a sinusoidal wave only when the latter varies with frequency.
301 1049	propagation coefficient	The natural logarithm of the vector ratio of the steady-state amplitudes of a wave at a specified frequency, at points in the direction of propagation separated by unit length. (1) In the case of a uniform line, the line is assumed infinite in length or terminated by a network simulating infinite line conditions. (2) Of a coil-loaded line, the natural logarithm of the vector ratio of the amplitudes of a wave at a specified frequency, at points similarly situated with respect to the loading coils, divided by the length of line separating these points, the line being assumed infinite in length or terminated by a network simulating infinite-line conditions.
301 1050	attenuation coefficient	The real part of the propagation coefficient. NOTE. This coefficient determines the change of magnitude of the voltages or currents.
301 1051	phase change coefficient	The imaginary part of the propagation coefficient. NOTE. This coefficient determines the change of phase of the voltages or currents.
301 1052	crosstalk	The unwanted transfer of energy from one circuit, called the 'disturbing' circuit, to another circuit, called the 'disturbed' circuit.
301 1053	echo	An electric, acoustic or electromagnetic wave which arrives at a given point, after reflection or indirect propagation, with sufficient magnitude and delay for it to be perceptible at the given point as a wave distinct from that directly transmitted.

No.	Term	Definition
301 1054	crosstalk attenuation	The ratio, usually expressed in decibels, of the apparent power at a sending point of a disturbing channel, to the apparent power arriving at a receiving point of the disturbed channel via a crosstalk path under specified terminated conditions.
301 1055	Q-(quality) factor; Q	A measure of the relationship between stored energy and rate of dissipation in certain types of electric elements, structures or materials. The Q of a magnetic or dielectric material at any frequency is equal to 2π times the ratio of the maximum stored energy to the energy dissipated in the material per cycle. NOTE. In an oscillatory circuit in resonance, the Q-factor is the quotient of the potential difference across the terminals of the circuit divided by the assumed e.m.f. applied in series with the circuit.
301 1056	dissipation factor	The reciprocal of the Q -factor.
301 1057	stability	The maximum amount of gain, in addition to the working gain, that can be introduced at any point equally and simultaneously in the two directions of transmission without causing singing, or, for a circuit fitted with an anti-singing device, without causing perceptible signal mutilation.
301 1058	available power	The maximum power obtainable from a given source by suitable adjustment of the load.
301 1059	feedback	The return of energy from one point in a system to an earlier point.
301 1060	negative feedback	Feedback tending to decrease the output.
301 1061	positive feedback	Feedback tending to increase the output.
301 1062	singing point	<i>In the case of a long distance circuit and its balancing network.</i> The balance return loss at the frequency at which it is possible to effectively maintain oscillation in a feedback circuit of specified make-up and characteristics, comprising a differential arrangement (bridge or terminating unit) to which the line and balancing network are connected.
301 1063	singing	<i>In a transmission system.</i> An unwanted self-sustained oscillation.
301 1064	modulated wave	A wave, some characteristic of which varies in accordance with the value of a modulating wave.
301 1065	modulating wave	A wave which causes a variation of some characteristic of the carrier.
301 1066	modulation	A process by which certain characteristics of one wave are modulated or modified in accordance with a characteristic of another wave or signal.
301 1067	demodulation	A process by which an output wave is obtained having the characteristics of an original modulating wave or signal. NOTE. This process is the reverse of modulation.
301 1068	carrier; carrier wave	1. The wave which is intended to be modulated. 2. <i>In a modulated wave.</i> The carrier frequency spectral component.
301 1069	carrier frequency	The frequency of the carrier wave.
301 1070	modulation index	<i>In angle modulation, with a sinusoidal modulating wave.</i> The ratio of the frequency deviation to the frequency of the modulating wave.
301 1071	modulation factor	<i>Of an amplitude modulated wave.</i> The ratio of the difference between the maximum and minimum amplitudes of the wave to the sum of these amplitudes. NOTE. The modulation factor is usually expressed as a percentage.
301 1072	amplitude modulation; A.M.	Modulation in which the amplitude of a carrier is the characteristic varied.