

## FASCICLE III.4

### **Recommendations G.700 to G.795**

### **GENERAL ASPECTS OF DIGITAL TRANSMISSION SYSTEMS; TERMINAL EQUIPMENTS**

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## SECTION 7

### GENERAL ASPECTS OF DIGITAL TRANSMISSION SYSTEMS; TERMINAL EQUIPMENTS

#### 7.0 General

#### Recommendation G.700

#### FRAMEWORK OF THE SERIES G.700, G.800 AND G.900 RECOMMENDATIONS

*(former Recommendation G.701 of Volume III of the Yellow Book)*

SECTION 7 — *General aspects of digital transmission systems; terminal equipments*

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**VOCABULARY OF DIGITAL TRANSMISSION AND MULTIPLEXING,  
AND PULSE CODE MODULATION (PCM) TERMS**

**1 Introduction**

This Recommendation provides a vocabulary of terms and definitions that are appropriate to digital and pulse code modulation multiplexing and transmission systems.

A small number of the terms in the Recommendation are duplicated in Recommendation I.112. References to these definitions are given in parenthesis as an aid to ensuring consistency between the two Recommendations in the event of future amendments.

According to the conventions applied in this Recommendation any term in common usage, but whose use is deprecated in the sense defined, is shown after the recommended term as in the following example: “2026 controlled slip [slip]”.

Where a truncated term is widely used in an understood context the complete term is quoted following the colloquial form, for example: “1007 circuit, telecommunication circuit”.

Furthermore, any term which is in general use in addition to the principal term is shown after the principal term as in the following example: “6002 timing recovery (timing extraction)”.

In the interest of standardization in the drafting of documents the following abbreviations are recommended:

kbit/s,

Mbit/s,

Gbit/s.

To avoid misinterpretation of the use of the point (.) and the comma (,) in different languages to separate the whole and decimal parts, it is recommended that the use of decimals should be avoided wherever possible. For example, “2048 kbit/s” is preferred to “2.048 Mbit/s” or “2,048 Mbit/s.”

Annex A to this Recommendation contains an alphabetical list of all of the terms defined in this Recommendation.

**2 Vocabulary of digital transmission and multiplexing and pulse code modulation terms (PCM)**

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- 2.1 General
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## Annex A — Alphabetical List

### 2.1 *General*

1001      **signal** [102]

*F:*    *signal*

*S:*    *señal*

A physical phenomenon one or more of whose characteristics may vary to represent information.

1002      **analogue signal** [103]

*F:*    *signal analogique*

*S:*    *señal analógica*

A signal one of whose characteristic quantities follows continuously the variations of another physical quantity representing information.

1003      **discretely-timed signal** [104]

*F:*    *signal (temporel) discret*

*S:*    *señal discretamente temporizada*

A signal composed of successive elements in time, each element having one or more characteristics which can convey information, for example, its duration, its waveform and its amplitude.

1004      **transmission** [106]

*F:*    *transmission*

*S:*    *transmisión*

The action of conveying signals from one point to one or more other points.

*Note 1* — Transmission can be effected directly or indirectly, with or without intermediate storage.

*Note 2* — The use of the English word “transmission” in the sense of “emission” is deprecated.

1005      **channel, transmission channel** [108]

*F:*    *voie, voie de transmission*

*S:*    *canal, canal de transmisión*

A means of unidirectional transmission of signals between two points.

*Note 1* — Several channels may share a common path; for example each channel may be allocated a particular frequency band or a particular time slot.

*Note 2* — The term may be qualified by the nature of the transmitted signals, by the bandwidth, by the digit rate, or by an arbitrary designation.

*Note 3* — See also Recommendation I.112, Term 414, access channel.

1006      **telecommunication** [110]

*F:*    *télécommunication*

*S:*    *telecomunicación*

Any transmission and/or emission and reception of signals representing signs, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

*F:* circuit, circuit de t'el'communications

*S:* circuito, circuito de telecomunicaci'on

A combination of two transmission channels permitting bidirectional transmission of signals between two points, to support a single communication.

*Note 1* — If the telecommunication is by nature unidirectional (for example: long distance television transmission), the term “circuit” is sometimes used to designate the single channel providing the facility.

*Note 2* — In a telecommunication network, the use of the term “circuit” is generally limited to a telecommunication circuit directly connecting two switching devices or exchanges, together with associated terminating equipment.



*Note 3* — A telecommunication circuit may permit transmission in both directions simultaneously (duplex), or not simultaneously (simplex).

*Note 4* — A telecommunication circuit that is used for transmission in one direction only is sometimes referred to as a unidirectional telecommunication circuit. A telecommunication circuit that is used for transmission in both directions (whether simultaneously or not) is sometimes referred to as a bidirectional telecommunication circuit.

1008      **interface** [408]

*F:*    *jonction* (interface)

*S:*    *interfaz*

The common boundary between two associated systems.

2.2      *Digital signals*

2001      **digit**

*F:*    *élément numérique*

*S:*    *dígito*

A member selected from a finite set.

*Note 1* — In digital transmission, a digit may be represented by a signal element, being characterized by the dynamic nature, discrete condition and discrete timing of the element, for example it may be represented as a pulse of specified amplitude and duration.

*Note 2* — In equipment used in digital transmission, a digit may be represented by a stored condition being characterized by a specified physical condition, for example it may be represented as a binary magnetic condition of a ferrite core.

*Note 3* — The context of the use of the term should be such as to indicate the radix of notation. (The meaning of “digit” in Notes 1, 2 and 3 translates into French as “élément numérique”.)

*Note 4* — In telephone subscriber numbering, a digit is any of the numbers 1, 2, 3 . . . 9 or 0 forming the elements of a telephone number (Recommendation Q.10 [1]). (This meaning of “digit” translates into French as “chiffre”.)

2002      **binary figure**

*F:*    *chiffre binaire*

*S:*    *cifra binaria*

One of the two figures (that is, 0 or 1) used in the representation of numbers in binary notation.

2003      **binary digit** (bit)

*F:*    *élément binaire*

*S:* *dígito binario* (bit)

A member selected from a binary set.

*Note 1* — Bit is an abbreviation for binary digit.

*Note 2* — In the interest of clarity, it is recommended that the term “bit” should not be used in two-condition start-stop modulation instead of “unit element”.

## 2004      **octet**

*F:* *octet*

*S:* *octeto*

A group of eight binary digits or eight signal elements representing binary digits operated upon as an entity.

2005      **code word [character signal]**

*F:*    *mot de code [signal de caract`ere]*

*S:*    *palabra de c´odigo [se˜nal de car´acter]*

A set of signal elements representing the quantized value of a sample in PCM.

*Note* — In PCM, the term “PCM word” may be used in this sense.

2006      **digital signal [105]**

*F:*    *signal num´erique*

*S:*    *se˜nal digital*

A discretely timed signal in which information is represented by a number of well-defined discrete values that one of its characteristic quantities may take in time.

*Note* — The term may be qualified to indicate the digit rate, for example: “140 Mbit/s digital signal”.

2007      **signal element**

*F:*    *´el´ement de signal*

*S:*    *elemento de se˜nal*

A part of a digital signal, characterized by its discrete timing and its discrete value, and used to represent a digit.

2008      **digit position**

*F:*    *position d’un ´el´ement de signal; position d’un ´el´ement num´erique*

*S:*    *posici´on de d´ıgito*

The position in time or space into which a representation of a digit may be placed.

2009      **n-ary digital signal**

*F:*    *signal num´erique n-aire*

*S:*    *se˜nal digital n-aria*

A digital signal in which each signal element has one of n permitted discrete values.

2010      **redundant digital signal**

*F:*    *signal num´erique redondant*

*S:*    *se˜nal digital redundante*

The signal that is produced by encoding a given signal in accordance with a redundant line code.

*F:* signal *n*-aire redondant

*S:* señal *n*-aria redundante

A digital signal whose elements can assume  $n$  discrete states where the average equivalent binary content per signal element is less than  $\log_2 n$ .

*Note* — The relative redundancy  $R$ , of an  $n$ -ary digital signal, is given by:

$$R = 1 - \frac{\frac{f_{Ir}}{f_{dR}} \times \log_2 n}{1 - \frac{f_{Ir}}{f_{dR}} \times \log_2 n} = \left[ \frac{\frac{f_{Ir}}{f_{dR}} \times \log_2 n}{1 - \frac{f_{Ir}}{f_{dR}} \times \log_2 n} \right] \times 100\%$$

where  $r_d$  is the symbol rate of the  $n$ -ary signal and  $r_e$  is the equivalent bit rate.

This may also be expressed in terms of the number of binary digits which can be transmitted by an element of a particular line code. Examples are:

AMI (37% redundant), 1 binary digit per element;

4B3T (16% redundant), 1.33 binary digit per element.

2012 **pseudo n-ary signal**

*F: signal pseudo n-aire*

*S: señal seudo n-aria*

A redundant  $n$ -ary digital signal that is derived from a  $m$ -ary digital signal without change of the line digit rate.

*Note* — An alternate mark inversion signal is an example of a pseudo-ternary signal, i.e.  $n = 3$ ,  $m = 2$ .

2013 **digit rate**

*F: débit numérique*

*S: velocidad digital*

The number of digits per unit time.

*Note 1* — An appropriate adjective may precede the word “digit”, for example, binary digit rate.

*Note 2* — In the interests of clarity it is recommended that this term should not be used to express the symbol rate on the line.

2014 **line digit rate [symbol rate]**

*F: débit numérique en ligne [débit de symboles]*

*S: velocidad digital de línea [velocidad de símbolos]*

The number of signal elements of the line signal transmitted per unit time.

*Note 1* — The baud is usually used to quantify this, one baud being equal to one single element per second.

*Note 2* — Modulation rate is the term used in telegraphy and data communication; it is the reciprocal of the duration of the unit interval.

2015 **equivalent binary content**

*F: contenu binaire équivalent*

*S: contenido binario equivalente*

The number of binary digits strictly necessary to convey the same information as a defined number of signal elements in a given digital signal.

2016 **equivalent bit rate**

*F: débit binaire équivalent*

*S: velocidad binaria equivalente*

The value of the bit rate strictly necessary to convey the same information in the same time as a given digital signal at a given digit rate.

2017      **significant instant, significant instant of a digital signal**

*F: instant significatif, instant significatif d'un signal numérique*

*S: instante significativo, instante significativo de una señal digital*

The instant at which a signal element commences in a discretely-timed signal.

2018      **unit interval**

*F:    intervalle unitaire*

*S:    intervalo unitario (o intervalo unidad)*

The nominal difference in time between consecutive significant instants of an isochronous signal.

2019      **decision instant, decision instant of a digital signal**

*F:    instant de d'ecision, instant de d'ecision d'un signal num'érique*

*S:    instante de decisi'ón instante de decisi'ón de una señal digital*

The instant at which a decision is taken as to the probable value of signal element of a received digital signal.

2020      **decision circuit**

*F:    circuit de d'ecision*

*S:    circuito de decisi'ón*

A circuit that decides the probable value of a signal element of a received digital signal.

2021      **regeneration**

*F:    r'égén'eration*

*S:    regeneraci'ón*

The process of receiving and reconstructing a digital signal so that the amplitudes, waveforms and timing of its signal elements are constrained within specified limits.

2022      **regenerator**

*F:    r'égén'érateur*

*S:    regenerador*

A device that performs regeneration.

2023      **regenerative repeater**

*F:    répéteur régén'érateur*

*S:    repetidor regenerativo*

A repeater that regenerates digital signals.

*Note 1* — A regenerative repeater may operate in one or both directions of transmission, and the term may be qualified by “unidirectional” or “bidirectional” as appropriate.

*Note 2* — Repeater is defined in Recommendation G.601.

2024      **jitter**

*F:*    *gigue*

*S:*    *fluctuación de fase*

Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time.

2025      **wander**

*F:*    *d'éravage*

*S:*    *fluctuación lenta de fase*

Long term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time.



2026      **controlled slip [slip]**

*F:    glissement commandé [saut]*

*S:    deslizamiento controlado [deslizamiento]*

The irretrievable loss or gain of a set of consecutive digit positions in a digital signal, in which both the magnitude and instant of that loss or gain are controlled, to enable the signal to accord with a rate different from its own.

*Note* — Where appropriate the term may be qualified, for example: controlled octet slip, controlled frame slip.

2027      **uncontrolled slip**

*F:    glissement non commandé*

*S:    deslizamiento incontrolado*

The loss or gain of a digit position or a set of consecutive digit positions in a digital signal resulting from an aberration of the timing processes associated with transmission or switching of a digital signal, and in which either the magnitude or the instant of that loss or gain is not controlled.

2028      **scrambler**

*F:    embrouilleur*

*S:    aleatorizador*

A device that converts a digital signal into a pseudo-random digital signal having the same meaning and the same digit rate.

2029      **descrambler**

*F:    d'embrouilleur*

*S:    desaleatorizador*

A device that performs the complementary operation to that of a scrambler.

2030      **error, digital error**

*F:    erreur, erreur numérique*

*S:    error, error digital*

An inconsistency between a digit in a transmitted digital signal and the corresponding digit in the received digital signal.

2031      **error ratio [error rate]**

*F:    taux d'erreur [rapport d'erreur]*

*S:*    *tasa de errores [proporci'ón de errores]*

The ratio of the number of digital errors received in a specified period to the total number of digits received in the same period.

*Note 1* — Numerical values of error ratio should be expressed in the form

$$n \mid (\mu \mid 0 \mid p^D \mid F261$$

where  $p$  is a positive integer.

*Note 2* — Error ratio may be qualified, for example by the term “bit” or “block”.

## 2032      **error multiplication**

*F:*    *multiplication d'erreurs*

*S:*    *multiplicaci'ón de errores*

The property of an apparatus whereby a single digital error in the input signal presented to it results in more than one digital error in the output signal.

*Note* — Line code converters and descramblers are examples of apparatus that may cause error multiplication.

2033 **error multiplication factor**

*F:* *facteur de multiplication d'erreurs*

*S:* *factor de multiplicaci6n de errores*

The ratio of the number of digital errors in the output signal to the number of digital errors in the input signal.

*Note* — The error multiplication factor may be expressed as either an average or maximum value.

2034 **error spread**

*F:* *étalement d'erreurs [répartition des erreurs]*

*S:* *dispersi6n de errores*

The number of consecutive digits of the output signal over which digital errors are distributed when a single digital error in the input signal causes error multiplication.

2.3 *Digital transmission*

3001 **digital transmission** [107]

*F:* *transmission numérique*

*S:* *transmisi6n digital*

The transmission of digital signals by means of a channel or channels that may assume in time any one of a defined set of discrete states.

3002 **digital channel, digital transmission channel** [109]

*F:* *voie numérique, voie de transmission numérique*

*S:* *canal digital, canal de transmisi6n digital*

The means of unidirectional digital transmission of digital signals between two points.

3003 **digital circuit, digital telecommunication circuit** [112]

*F:* *circuit numérique, circuit numérique de télécommunications*

*S:* *circuit6o digital, circuito de telecomunicaci6n digital*

A combination of two digital transmission channels permitting bidirectional digital transmission in both directions between two points, to support a single communication.

*Note 1* — If the telecommunication is by nature unidirectional (for example, long-distance television transmission), the term “digital circuit” is sometimes used to designate the single digital channel providing the facility.

*Note 2* — In a telecommunication network, use of the term “digital circuit” is generally limited to a digital telecommunication circuit directly connecting two switching devices or exchanges, together with associated terminating equipment.

*Note 3* — A digital telecommunication circuit may permit transmission in both directions simultaneously (duplex), or not simultaneously (simplex).

*Note 4* — A digital telecommunication circuit that is used for transmission in one direction only is sometimes referred to as a unidirectional digital telecommunication circuit. A digital telecommunication circuit that is used for transmission in both directions (whether simultaneously or not) is sometimes referred to as a bidirectional digital telecommunication circuit.

3004      **digital connection** [310]

*F:*    *connexion numérique*

*S:*    *conexi'on digital*

A concatenation of digital transmission channels or digital telecommunication circuits, switching and other functional units set up to provide for the transfer of digital signals between two or more points in a telecommunication network, to support a single communication.

3005      **digital link, digital transmission link [digital path] [302]**

*F: liaison numérique, liaison de transmission numérique [conduit numérique]*

*S: enlace digital, enlace de transmisión digital [trayecto digital]*

The whole of the means of digital transmission of a digital signal of specified rate between two digital distribution frames (or equivalent).

*Note 1* — A digital link comprises one or more digital sections and may include multiplexing and/or demultiplexing, but not switching.

*Note 2* — The term may be qualified to indicate the transmission medium used, for example, “digital satellite link”.

*Note 3* — The term always applies to the combination of “go” and “return” directions of transmission, unless stated otherwise.

*Note 4* — The term “digital path” is sometimes used to describe one or more digital links connected in tandem, especially between equipments at which the signals of the specified rate originate and terminate.

3006      **digital distribution frame**

*F: répartiteur numérique*

*S: repartidor digital*

A structure that provides flexibility of semipermanent interconnection of digital channels or digital circuits.

*Note* — Digital sections and digital links normally terminate at digital distribution frames.

Figure 1/G.701 gives examples of digital sections, digital links, digital line sections, etc.

3007      **digital section**

*F: section numérique*

*S: sección digital*

The whole of the means of digital transmission of a digital signal of specified rate between two consecutive digital distribution frames or equivalent.

*Note 1* — A digital section forms either a part or the whole of a digital link, and includes terminating equipments at both ends, but excludes multiplexers.

*Note 2* — Where appropriate, the digital rate or multiplex order should qualify the title.

*Note 3* — The definition applies to the combination of “go” and “return” directions of transmission, unless stated otherwise.

3008      **section termination**

*F: extrémité de section*

*S: extremo de sección*

A connectional interface selected to be the boundary between a physical transmission medium and its associated equipment.

*Note* — This point will usually be the connectors at the input and output of an equipment.

3009      **elementary cable section [repeater section]**

*F: section élémentaire de câble [section (élémentaire) d'amplification]*

*S: sección elemental de cable [sección con amplificaci3n]*

The whole of the physical transmission medium between the section termination at the output of one equipment and the section termination at the input of the following equipment.

*Note 1* — An elementary cable section usually consists of several factory lengths of cable connected together and any associated accessories (such as flexible cables) necessary to connect it to the section terminals.

*Note 2* — Examples of the physical transmission media are a coaxial or symmetric pair, and optical fibre.

3010 **elementary repeater section**

*F: section 'el'ementaire amplifi'ee*

*S: secci'on elemental de repetici'on*

In a given direction of transmission, an elementary cable section together with the immediately following analogue repeater.

3011 **elementary regenerator section [regenerator section]**

*F: section 'el'ementaire r'eg'en'er'ee [section de r'eg'en'eration]*

*S: secci'on elemental de regeneraci'on [secci'on de regeneraci'on]*

In a given direction of transmission, an elementary cable section together with the immediately following regenerative repeater.

3012 **digital line section**

*F: section de ligne num'erique*

*S: secci'on de l'nea digital*

A digital section implemented on a single type of manufactured transmission medium, such as symmetric pair, coaxial pair, or optical fibre.

*Note* — A digital line section includes line terminating equipments at both ends, and regenerative repeaters if needed, but excludes multiplexers.

3013 **digital line link [digital line path]**

*F: liaison de ligne num'erique [conduit de ligne num'erique]*

*S: enlace de l'nea digital [trayecto de l'nea digital]*

A digital link that comprises a digital line section or a number of tandem-connected digital line sections.

3014 **digital transmission system**

*F: syst'eme de transmission num'erique*

*S: sistema de transmi'si'on digital*

A specific means of providing a digital section.

3015 **digital line system**

*F: syst'eme de ligne num'erique*

*S: sistema de l'nea digital*

A digital transmission system that provides a digital line section.

3016      **digital radio section**

*F:*    *section radio'électrique num'érique*

*S:*    *sección radiodigital*

A digital section implemented on a radio-relay system.

3017      **digital radio link [digital radio path]**

*F:*    *liaison radio'électrique num'érique [conduit radio'électrique num'érique]*

*S:*    *enlace radiodigital, [trayecto radiodigital]*

A digital link that comprises a digital radio section or a number of tandem-connected digital radio sections.



3018      **digital radio system**

*F:    syst`eme radio`electrique num`erique*

*S:    sistema radiodigital*

A digital transmission system that provides a digital radio section.

3019      **bit sequence independence**

*F:    ind`ependance de la s`equence des bits*

*S:    independencia de la secuencia de bits*

The property of a binary transmission channel, telecommunication circuit or connection, that permits all sequences of binary signal elements to be conveyed over it at its specified bit rate, without change to the value of any signal elements.

*Note* — Practical transmission systems that are not completely bit sequence independent may be described as quasi bit sequence independent. In such cases the limitations should be clearly stated.

3020      **digit sequence integrity**

*F:    int`egrit`e de la suite des `el`ements num`eriques*

*S:    integridad de la secuencia de d`ıgitos*

The property of a digital transmission channel, telecommunication circuit or connection, that permits a digital signal to be conveyed over it without change to the order of any signal elements.

3021      **octet sequence integrity**

*F:    int`egrit`e de la suite des octets*

*S:    integridad de la secuencia de octetos*

The property of a digital transmission channel, telecommunication circuit or connection that permits a digital signal to be conveyed over it without change to the order of any octets.

3022      **transparency, digital transparency**

*F:    transparence, transparence num`erique*

*S:    transparencia, transparencia digital*

The property of a digital transmission channel, telecommunication circuit or connection, that permits any digital signal to be conveyed over it without change to the value or order of any signal elements.

*Note* — The digital transmission channel, telecommunication circuit or connection concerned may introduce delay, and may contain reversible code conversion functions.

3023      **alarm indication signal (AIS)**

*F:* *signal d'indication d'alarme (SIA)*

*S:* *señal de indicación de alarma (SIA)*

A signal that replaces the normal traffic signal when a maintenance alarm indication has been activated.

3024      **upstream failure indication**

*F:* *indication de défaillance en amont*

*S:* *indicación de fallo atrás*

An indication provided by a digital multiplexer, line section or a radio section, that a signal applied at its input port is outside its prescribed maintenance limit.

3025      **service digits [housekeeping digits]**

*F:    éléments numériques de service*

*S:    dígitos de servicio*

Digits that are added, to a digital signal at the sending end of a digital link, normally at regular intervals and removed at the receiving end of that link and used to provide ancillary facilities.

**Figure 1/G.701, p.**

4001 **highway (American: bus)**

*F: bus (jonction multiplex interne) [canal]*

*S: arteria (bus)*

A common path within an apparatus or station over which pass signals from a number of channels identified by time division.

4002 **channel gate**

*F: porte de canal*

*S: puerta de canal*

A device for connecting a channel to a highway, or a highway to a channel, at specified times.

4003 **digital multiplex hierarchy**

*F: hiérarchie de multiplexage numérique*

*S: jerarquía de los m'ultiplex digitales*

A series of digital multiplexers graded according to capability so that multiplexing at one level combines a defined number of digital signals, each having the digit rate prescribed for a lower order, into a digital signal having a prescribed digit rate which is then available for further combination with other digital signals of the same rate in a digital multiplexer of the next higher order.

4004 **primary digital group**

*F: groupe numérique primaire*

*S: grupo digital primario*

An assembly, by digital multiplexing, of digital signals occupying a specified number of channel time-slots to form a composite signal having a digit rate of 2048 kbit/s or 1544 kbit/s.

*Note* — Normally each channel time-slot has eight digit time-slots and an effective digit rate of 64 kbit/s.

4005 **primary PCM group [primary block] (American: digroup)**

*F: groupe primaire MIC [bloc primaire]*

*S: grupo primario MIC [bloque primario]*

An assembly, by digital multiplexing, of PCM signals occupying a specified number of channel time-slots to form a composite signal having a digit rate of 1544 kbit/s or 2048 kbit/s, in both directions of transmission.

*Note* — The following conventions could be useful:

Primary group $\mu$	—	a basic group of PCM signals derived from 1544-kbit/s PCM multiplex equipment.
Primary group A	—	a basic group of PCM signals derived from 2048-kbit/s PCM multiplex equipment.

#### 4006      **n-ary digital group**

*F:*    *groupe numérique n-aire*

*S:*    *grupo digital n-ario*

A number of primary digital or pcm groups assembled by digital multiplexing to form a composite signal of specified digit rate, in both directions of transmission.

*Note 1* — A secondary digital group may comprise four primary digital or pcm groups to form a composite signal having a digit rate of 8448 or 6312 kbit/s.

*Note 2* — A tertiary digital group may comprise four 8448 kbit/s secondary digital groups or five or seven 6312 kbit/s secondary digital groups to form a composite signal having a digit rate of 34368, 32064 or 44736 kbit/s.

*Note 3* — A quaternary digital group may comprise four 34368 kbit/s tertiary digital groups to form a composite signal having a digit rate of 139264 kbit/s.

4007      **frame**

*F:*    *trame*

*S:*    *trama*

A cyclic set of consecutive time slots in which the relative position of each time slot can be identified.

4008      **multiframe**

*F:*    *multitrame*

*S:*    *multitrama*

A cyclic set of consecutive frames in which the relative position of each frame can be identified.

4009      **subframe**

*F:*    *sous-trame, secteur de trame*

*S:*    *subtrama*

A sequence of noncontiguous time-slots within a frame, each occurring at  $n$  times the frame repetition rate where  $n$  is an integer  $>1$ .

4010      **parallel to serial converter (American: serializer) [dynamicizer]**

*F:*    *convertisseur parallèle/série*

*S:*    *convertidor paralelo/serie*

A device that converts a group of signal elements, all of which are presented simultaneously, into a corresponding sequence of consecutive signal elements.

4011      **serial to parallel converter (American: deserializer) [staticizer]**

*F:*    *convertisseur série/parallèle*

*S:*    *convertidor serie/paralelo*

A device that converts a sequence of consecutive signal elements into a corresponding group of signal elements all of which are presented simultaneously.

4012      **time-division multiplexing**

*F:   multiplexage temporel [multiplexage par répartition dans le temps]*

*S:   multiplexación por división en el tiempo*

Multiplexing in which several signals are interleaved in time for transmission over a common channel.

4013       **digital multiplexing**

*F:   multiplexage numérique*

*S:   multiplexación digital*

A form of time division multiplexing applied to digital channels which convey digital signals.

4014      **digital multiplexer**

*F:    multiplexeur numérique*

*S:    multiplexor digital*

Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

4015      **digital demultiplexing**

*F:    d'emultiplexage numérique*

*S:    demultiplexaci'on digital*

The separation of a composite digital signal into its component digital signals.

4016      **digital demultiplexer**

*F:    d'emultiplexeur numérique*

*S:    demultiplexor digital*

Equipment that separates a composite digital signal into its component digital signals.

4017      **digital multiplex equipment**

*F:    'équipement de multiplexage numérique*

*S:    equipo m'ultiplex digital*

The combination of a digital multiplexer and a digital demultiplexer at the same location, operating in opposite directions of transmission.

4018      **PCM multiplex equipment**

*F:    'équipement de multiplexage MIC*

*S:    equipo m'ultiplex MIC*

Equipment that derives a single digital signal at a defined digit rate from several voice frequency channels by a combination of pulse code modulation and time division multiplexing, and that also carries out the complementary functions in the opposite direction of transmission.

4019      **digital block**

*F:    bloc numérique*

*S:    bloque digital*

The combination of a digital link and associated digital multiplex equipments.



*Note* — The bit rate of the digital link should form part of the title.

4020      **transmultiplexer**

*F:*    *transmultiplexeur*

*S:*    *transmultiplexor*

An equipment that transforms a frequency-division multiplexed signal (such as group or supergroup) into a corresponding time-division multiplexed signal that has the same structure as if it had been derived from PCM multiplex equipment, and that also carries out the complementary function in the opposite direction of transmission.

4021      **digital filling [digital padding]**

*F:*    *remplissage numérique*

*S:*    *relleno digital [complementación digital]*

The addition of signal elements at regular intervals to a digital signal to change the digit rate from its original value to a predetermined higher value.

*Note* — The added digits are not normally used to transmit information.

4022      **justification [stuffing, pulse stuffing]**

*F:    justification*

*S:    justificaci'ón [relleno de impulsos]*

The process of changing the digit rate of a digital signal in a controlled manner so that it can accord with a digit rate different from its own inherent rate, usually without loss of information.

4023      **positive justification [positive stuffing, positive pulse stuffing]**

*F:    justification positive*

*S:    justificaci'ón positiva [relleno positivo de impulsos]*

A method of justification in which the digit time-slots used to convey a digital signal have a digit rate that is always higher than the digit rate of that original signal.

*Note 1* — Positive justification is usually achieved by the provision of a fixed number of digit time-slots (justifiable digit time-slots) per frame in the resultant signal which may be used to transmit either information from the original signal, or no information, according to the relative digit rates of the resultant signal and the original signal.

*Note 2* — Information which indicates whether the justifiable digit time-slots contain information digits or justifying digits is conveyed by means of the justification service digits.

4024      **negative justification [negative stuffing, negative pulse stuffing]**

*F:    justification n'egative*

*S:    justificaci'ón negativa [relleno negativo, relleno negativo de impulsos]*

A method of justification in which the digit time-slots used to convey a digital signal have a digit rate that is always lower than the digit rate of that original signal.

*Note 1* — The deleted digits are conveyed by separate means.

*Note 2* — Information which facilitates the recovery of the deleted digits is conveyed by means of the justification service digits.

4025      **positive/zero/negative justification [positive/zero/negative stuffing, positive/zero/negative pulse stuffing]**

*F:    justification positive/nulle/n'egative*

*S:    justificati'ón positiva/nula/negativa [relleno positivo/nulo/negativo de impulsos]*

A method of justification in which the digit time-slots used to convey a digital signal have a digit rate that may be higher than, the same as, or lower than the digit rate of the original signal.

*Note 1* — Justifiable digit time-slots are provided in accordance with Note 1 of 4023 above.

*Note 2* — Separate means of transmitting deleted digits are provided in accordance with Note 2 of 4024 above.

*Note 3* — Information which facilitates the recovery of the original digits, which are conveyed by means of the justification service digits.

*Note 4* — Usually the digit time-slots used to convey a digital signal have the same nominal digit rate as the original signal.

4026      **justifiable digit time-slot [stuffable digit time-slot]**

*F: cr'eneau temporel 'el'ementaire justifiable*

*S: intervalo de tiempo de d'igito justificable [intervalo de tiempo de d'igito rellenable]*

A digit time-slot that is provided for the purpose of justification and which may contain either an information digit or a justifying digit.

4027      **justifying digit [stuffing digit]**

*F:    l'élément numérique de justification*

*S:    dígito de justificación [dígito de relleno]*

A digit inserted in a justifiable digit time-slot when that time slot is not required for an information digit.

4028      **justification service digit [stuffing service digit]**

*F:    l'élément numérique de service de justification*

*S:    dígito de servicio de justificación [dígito de servicio de relleno]*

A digit that transmits information concerning the status of a justifiable digit time-slot.

4029      **justification rate [stuffing rate]**

*F:    débit de justification*

*S:    velocidad de justificación [velocidad de relleno]*

The rate at which justifying digits are inserted, or at which information digits are transmitted by other means.

4030      **nominal justification rate [nominal stuffing rate]**

*F:    débit nominal de justification*

*S:    velocidad nominal de justificación [velocidad nominal de relleno]*

The justification rate that occurs when the digit rates of both the original signal and the justified signal are at their nominal values.

4031      **maximum justification rate [maximum stuffing rate]**

*F:    débit maximal de justification*

*S: velocidad máxima de justificación [velocidad máxima de relleno]*

The maximum possible justification rate that can be accommodated by a justification process.

*Note* — In practice the tolerance limits of the original signal and of the system used to convey the justified signal might be such that the maximum justification rate is never realized.

4032      **justification ratio [stuffing ratio]**

*F:    taux de justification*

*S:    relación de justificación [relación de relleno]*

The ratio of the actual justification rate to the maximum justification rate.

4033      **nominal justification ratio [nominal stuffing ratio]**

*F:*    *taux nominal de justification*

*S:* *relación nominal de justificación [relación nominal de relleno]*

The ratio of the nominal justification rate to the maximum justification rate.

## 2.5      *Frame alignment*

Similar definitions are applicable to multiframe alignment.

5001      **frame alignment**

*F:*    *verrouillage de trame*

*S:*    *alineación de trama*

The state in which the frame of the receiving equipment is synchronized with that of the received signal.

5002      **frame alignment signal**

*F:*    *signal de verrouillage de trame*

*S:*    *señal de alineación de trama*

The distinctive signal inserted in every frame or once in every  $n$  frames, always occupying the same relative position within the frame, and used to establish and maintain frame alignment.

5003      **bunched frame alignment signal**

*F:*    *signal de verrouillage de trame concentrée*

*S:*    *señal de alineación de trama concentrada*

A frame alignment signal whose signal elements occupy consecutive digit time slots.

5004      **distributed frame alignment signal**

*F:*    *signal de verrouillage de trame réparti [signal de verrouillage de trame distribuée]*

*S:*    *señal de alineación de trama distribuida*

A frame alignment signal whose signal elements occupy non-consecutive digit time slots.

5005      **frame alignment recovery time**

*F:*    *temps de reprise du verrouillage de trame*

*S:*    *tiempo de recuperación de la alineación de trama*

The time that elapses between a valid frame alignment signal being available at the receive terminal equipment and frame alignment being established.

*Note* — The frame alignment recovery time includes the time required for replicated verification of the validity of the frame alignment signal.

5006      **out-of-frame alignment time**

*F:*    *durée de perte du verrouillage de trame*

*S:*    *duración de la pérdida de la alineación de trama*

The time during which frame alignment is effectively lost.

*Note* — That time includes the time to detect loss of frame alignment and the frame alignment recovery time.

2.6      *Timing*

6001      **timing signal**

*F:    signal de rythme*

*S:    señal de temporización*

A cyclic signal used to control the timing of operations.

6002      **timing recovery [timing extraction]**

*F:    récupération du rythme*

*S: recuperación de la temporización [extracción de la temporización]*

The derivation of a timing signal from a received signal.

6003      **retiming**

*F:    r'éajustement du rythme*

*S:    reajuste de la temporizaci'ón*

Adjustment of the intervals between the significant instants of a digital signal, by reference to a timing signal.

6004      **time-slot**

*F:    cr'eneau temporel [intervalle de temps]*

*S:    intervalo de tiempo [sector de tiempo, celda de tiempo]*

Any cyclic time interval that can be recognized and defined uniquely.

6005      **digit time-slot**

*F:    cr'eneau temporel 'el'ementaire [intervalle de temps 'el'ementaire]*

*S:    intervalo de tiempo de d'ígito*

A time slot allocated to a single digit.

6006      **channel time-slot**

*F:    cr'eneau temporel de voie*

*S:    intervalo de tiempo de canal*

A time slot occupying a specific position in a frame and allocated to a particular time-derived channel.

*Note 1* — Where appropriate a description may be added, for example “telephone channel time slot”.

*Note 2* — In addition to its main function of transmitting a character signal, a channel time slot may also be used for in-slot signalling or for transmitting other information.

6007      **signalling time-slot**

*F:    cr'eneau temporel de signalisation*

*S:    intervalo de tiempo de señalizaci'ón*

A time slot occupying a specific position in a frame and allocated to the transmission of signalling.

6008      **frame alignment time-slot**

*F:    cr'eneau temporel de verrouillage de trame*

*S:    intervalo de tiempo de alineaci'ón de trama*

A time slot occupying the same relative position in every frame and used to transmit the frame alignment signal.



6009      **clock**

*F:*    *horloge*

*S:*    *reloj*

Equipment that provides a timing signal.

*Note* — Where replicated sources are used for security reasons, the assembly of these is regarded as single clock.

6010      **reference clock**

*F:    horloge de référence*

*S:    reloj de referencia*

A clock of very high stability and accuracy that may be completely autonomous and whose frequency serves as a basis of comparison for the frequency of other clocks.

6011      **master clock**

*F:    horloge ma | tresse*

*S:    reloj maestro*

A clock that is used to control the frequency of other clocks.

6012      **time interval error**

*F:    d'érive temporelle*

*S:    error de intervalo de tiempo*

The total difference over a specified interval of time in the significant instants of a digital signal from their ideal positions in time.

6013      **relative time interval error**

*F:    d'érive temporelle relative*

*S:    error de intervalo de tiempo relativo*

The total difference over a specified interval of time in the corresponding significant instants of two digital signals.

6014      **isochronous**

*F:    isochrone*

*S:    is'ocrono*

The essential characteristic of a time-scale or a signal such that the time intervals between consecutive significant instants either have the same duration or durations that are integral multiples of the shortest duration.

*Note* — In practice, variations in the time intervals are constrained within specified limits.

6015      **anisochronous**

*F:    anisochrone*

*S:    anis'ocrono*

The essential characteristic of a time-scale or a signal such that the time intervals between consecutive significant instants do not necessarily have the same duration or durations that are integral multiples of the shortest duration.

6016      **synchronous [mesochronous]**

*F:*    *synchrone [m'esochrone]*

*S:*    *s'íncrono [mes'ocrono]*

The essential characteristic of time-scales or signals such that their corresponding significant instants occur at precisely the same average rate.

*Note* — The timing relationship between corresponding significant instants usually varies between specified limits.

6017      **homochronous**

*F:*    *homochrone*

*S:*    *hom'ocrono*

The essential characteristic of time-scales or signals such that their corresponding significant instants have a constant, but uncontrolled, time relationship with each other.

6018      **non-synchronous [asynchronous/heterochronous]**

*F:*    *nonsynchrone [asynchrone/h'et'erochrone]*

*S:*    *no-s'íncrono [as'ícrono/heter'ocrono]*

The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

6019      **plesiochronous**

*F:*    *pl'esiochrone*

*S:*    *plesi'ochrono*

The essential characteristic of time-scales or signals such that their corresponding significant instants occur at nominally the same rate, any variation in rate being constrained within specified limits.

*Note 1* — Two signals having the same nominal digit rate, but not stemming from the same clock or homochronous clocks, are usually plesiochronous.

*Note 2* — There is no limit to the time relationship between corresponding significant instants.

6020      **heterochronous**

*F:*    *h'et'erochrone*

*S:*    *heter'ocrono*

The essential characteristic of time-scales or signals such that their corresponding significant instants occur at different nominal rates.

*Note 1* — Two signals having different nominal digit rates, and not stemming from the same clock or from homochronous clocks are usually heterochronous.

*Note 2* — Terms 6015 to 6020 are based on the following Greek roots:

iso            = equal

homo         = same

plesio        = near

hetero        = different

6021      **codirectional interface**

*F:*    *interface codirectionnelle*

*S:*    *interfaz codireccional*

An interface across which the signals to be transferred and their associated timing signals are transmitted in the same direction.

6022      **centralized-clock interface**

*F: interface à horloge centralisée*

*S: interfaz de reloj centralizado*

An interface across which, for both directions of transmission of the signals to be transferred, the associated timing signals of both the exchange terminal on the line side and the exchange terminal on the service side are supplied from a centralized clock.

*Note* — The timing of the centralized clock may be derived from a nominated incoming line signal.

#### 6023 **contradirectional interface**

*F: interface contradirectionnelle*

*S: interfaz contradireccional*

An interface across which the timing signals associated with both directions of transmission of the signals to be transferred, are directed towards the same side of the interface.

7001 **synchronization**

*F: synchronisation*

*S: sincronizaci'ón*

The process of adjusting the corresponding significant instants of signals to make them synchronous.

7002 **timing information**

*F: information de rythme*

*S: informaci'ón de temporizaci'ón*

Information contained in a signal relating to the timing of another signal.

7003 **synchronization information**

*F: information de synchronisation*

*S: informaci'ón de sincronizaci'ón*

Information that indicates the relationship between the timing of two or more signals.

7004 **clock control signal**

*F: signal de commande d'horloge*

*S: se'ñal de control de reloj*

A signal that directly controls the phase or frequency of a clock.

7005 **synchronization node**

*F: noeud de synchronisation*

*S: nodo de sincronizaci'ón*

A point in a synchronized network at which synchronization information is derived, sent or received.

7006 **synchronization link**

*F: liaison de synchronisation*

*S: enlace de sincronizaci'ón*

A link between two synchronization nodes over which synchronization information is transmitted.

7007      **synchronization network**

*F:*    *réseau de synchronisation*

*S:*    *red de sincronizaci'ón*

An arrangement of synchronization nodes and synchronization links provided in order to synchronize the clocks at, or connected to, those nodes.

7008      **single-ended synchronization**

*F:*    *synchronisation locale [synchronisation unilat'érale]*

*S:*    *sincronizaci'ón uniterminal*

A method of synchronizing a specified synchronization node with respect to another synchronization node in which synchronization information at the specified node is derived from the phase difference between the local clock and the incoming digital signal from the other node.

7009      **double-ended synchronization**

*F: synchronisation locale et distante [synchronisation bilatérale]*

*S: sincronizaci3n biterminal*

A method of synchronizing a specified synchronization node with respect to another synchronization node in which synchronization information at the specified node is derived by comparing the phase difference between the local clock and the incoming digital signal from the other node, with the phase difference at the other node between its local clock and the digital signal incoming from the specified node.

7010      **unilateral control**

*F: synchronisation unilatérale [commande unilatérale]*

*S: control unilateral*

Control between two synchronization nodes such that the frequency of the clock of only one of these nodes is influenced by timing information derived from the clock of the other node.

7011      **bilateral control**

*F: synchronisation bilatérale [commande bilatérale]*

*S: control bilateral*

Control between two synchronization nodes such that the frequency of the clock of each of these nodes is influenced by timing information derived from the clock of the other node.

7012      **analogue control**

*F: synchronisation analogique [mode analogique]*

*S: control anal3gico*

A method of controlling clocks in which the clock control signal is a continuous (monotonic) function of the phase difference between clocks, at least over a limited range.

7013      **linear analogue control**

*F: synchronisation analogique linéaire [mode analogique linéaire]*

*S: control anal3gico lineal*

Analogue control in which the clock control signal is proportional to the phase difference between clocks, at least over a limited range.

7014      **amplitude quantized control**

*F: synchronisation quantifiée [mode à quantification d'amplitude]*

*S: control por cuantificaci3n de amplitud*



A method of controlling clocks in which the clock control signal is a quantized function of the phase difference between clocks.

*Note* — In practice this implies that the working range of phase errors is divided into a finite number of subranges and that a unique signal is derived for each subrange whenever the error falls within a subrange.

7015      **time quantized control**

*F: synchronisation échantillonnée [mode à quantification temporelle]*

*S: control por cuantificaci'on temporal*

A method of controlling clocks in which each clock control signal is derived or utilized only at a number of discrete instants, which may or may not be equally separated in time.

7016      **synchronized network [synchronous network]**

*F: r'eseau synchronisé [r'eseau synchrone]*

*S: red sincronizada [red sincrona]*

A network in which the corresponding significant instants of nominated signals are adjusted to make them synchronous.

7017      **non-synchronized network**

*F: réseau non synchronisé*

*S: red no sincronizada*

A network in which signals need not be synchronous.

7018      **mutually synchronized network**

*F: réseau à synchronisation mutuelle*

*S: red mutuamente sincronizada*

A synchronized network in which each clock exerts a degree of control on all others.

7019      **democratic network, democratic mutually synchronized network**

*F: réseau démocratique, réseau à synchronisation mutuelle démocratique*

*S: red democrática, red democrática mutuamente sincronizada*

A mutually synchronized network in which all clocks are of equal status and exert equal amounts of control on the others; the network operating frequency (digit rate) being the mean of the natural (uncontrolled) frequencies of all the clocks.

7020      **hierarchic network, hierarchic synchronized network**

*F: réseau hiérarchisé, réseau à synchronisation hiérarchisée*

*S: red jerárquica, red con sincronización jerárquica*

A synchronized network in which each clock is assigned a particular status which determines the degree of control it exerts over the other clocks.

7021      **hierarchic mutually synchronized network**

*F: réseau hiérarchisé à synchronisation mutuelle*

*S: red jerárquica mutuamente sincronizada*

A mutually synchronized network in which each clock is assigned a particular status which determines the degree of control it exerts over other clocks; the network operating frequency being a weighted mean of the natural frequencies of all the clocks.

7022      **monarchic network, monarchic synchronized network [despotic network, despotic synchronized network]**

*F: réseau despotique, réseau à synchronisation despotique*

*S: red despótica, red con sincronización despótica [red monárquica, red con sincronización monárquica]*

A synchronized network in which a single clock exerts control over all the other clocks.

7023      **oligarchic network, oligarchic synchronized network**

*F: réseau oligarchique, réseau à synchronisation oligarchique*

*S: red oligárquica, red con sincronización oligárquica*

A synchronized network in which a few selected clocks are mutually synchronized and exert control over all the other clocks.

2.8      *Pulse Code Modulation*

8001      **pulse code modulation (PCM)**

*F: modulation par impulsions et codage (MIC)*

*S: modulación por impulsos codificados (MIC)*

A process in which a signal is sampled, and each sample is quantized independently of other samples and converted by encoding to a digital signal.

8002      **differential pulse code modulation (DPCM)**

*F: modulation par impulsions et codage différentiel (MICD)*

*S: modulación por impulsos codificados diferencial (MICD)*

A process in which a signal is sampled, and the difference between each sample of this signal and its estimated value is quantized and converted by encoding to a digital signal.

*Note* — The estimated values of the signal are calculated by a predictor from the quantized difference signal.

8003      **delta modulation**

*F: modulation delta*

*S: modulación delta*

A form of differential pulse code modulation in which only the sign of the difference between each sample and its predicted value is detected and encoded by a single bit.

8004      **adaptive differential pulse code modulation (ADPCM)**

*F: modulation par impulsions et codage différentiel adaptatif (MICDA)*

*S: modulación por impulsos y código diferencial adaptativo (MICDA)*

A form of differential pulse code modulation that uses adaptive quantizing.

*Note 1* — The predictor may be either fixed (time invariant) or variable.

*Note 2* — When the predictor is adaptive, the adaption of its coefficients is made from the quantized difference signal.

8005      **predictor**

*F: prédicteur*

*S: predictor*

A device that provides an estimated value of a sampled signal derived from previous samples of the same signal or from a quantized version of those samples.

8006      **adaptive predictor**

*F: prédicteur adaptatif*

*S: predictor adaptativo*

A predictor whose estimating function is made variable according to the short term spectral characteristics of the sampled signal.

8007      **sample**

*F:*    *échantillon*

*S:*    *muestra*

A representative value of a signal at a chosen instant, derived from a portion of that signal.

8008        **sampling**

*F:*    *échantillonnage*

*S:*    *muestreo*

The process of taking samples of a signal, usually at equal time intervals.

8009        **sampling rate**

*F:*    *fréquence d'échantillonnage [taux d'échantillonnage]*

*S:*    *velocidad de muestreo [frecuencia de muestreo]*

The number of samples taken of a signal per unit time.

8010      **working range**

*F:    plage de fonctionnement [gamme de fonctionnement]*

*S:    gama de funcionamiento*

The range of values of an input signal over which an equipment is designed to operate with a specified performance. (See Figure 2/G.701.)

8011      **quantizing**

*F:    quantification*

*S:    cuantificaci´on*

A process in which a continuous range of values is divided into a number of adjacent intervals, and any value within a given interval is represented by a single predetermined value within the interval. (See Figure 2/G.701.)

8012      **adaptive quantizing**

*F:    quantification adaptative*

*S:    cuantificaci´on adaptativa*

Quantizing in which some parameters are made variable according to the short term statistical characteristics of the quantized signal.

8013      **uniform quantizing**

*F:    quantification uniforme*

*S:    cuantificaci´on uniforme*

Quantizing in which all the quantizing intervals lying entirely with the working range are equal. (See Figure 2/G.701.)

8014      **non-uniform quantizing**

*F:    quantification non uniforme*

*S:    cuantificaci´on no uniforme*

Quantizing in which not all the quantizing intervals lying entirely with the working range are equal. (See Figure 2/G.701.)

8015      **quantizing interval**

*F:    intervalle de quantification*

*S:    intervalo de cuantificaci´on*

One of the intervals used in quantizing. (See Figure 2/G.701.)

8016      **decision value**

*F:*    *valeur de d'écision [amplitude de d'écision]*

*S:*    *valor de decisi'ón*

A value defining the boundary between adjacent quantizing intervals. (See Figures 2/G.701 and 4/G.701.)

8017      **virtual decision value**

*F:* *valeur virtuelle de d'écision [amplitude virtuelle de d'écision]*

*S:*    *valor virtual de decisi'ón*

Each of the two defined values, that provide conventional bounds for the working range in quantizing. (See Figure 2/G.701.)

*Note* — These values are taken to represent hypothetical outer bounds for the two extreme quantizing intervals of the quantizing law.

8018      **quantized value**

*F:    valeur quantifiée [amplitude quantifiée]*

*S:    valor cuantificado*

The single discrete value used to represent any value in a particular quantizing interval. (See Figure 2/G.701.)

8019      **load capacity [overload point]**

*F:    capacité de charge [point de surcharge]*

*S:    capacidad de carga [punto de sobrecarga]*

The level of a sinusoidal signal whose positive and negative peaks coincide with the virtual decision values.

8020      **peak limiting, peak limiting in quantizing**

*F:    écr | tage*

*S:    limitación de cresta (en cuantificación)*

The effect whereby any value to be quantized lying outside the working range is replaced by the nearest quantized value. (See Figure 2/G.701.)

8021      **quantizing distortion**

*F:    distorsion de quantification*

*S:    distorsión de cuantificación*

The distortion resulting from the process of quantizing samples within the working range.

8022      **quantizing distortion power**

*F:    puissance de distorsion de quantification*

*S:    potencia de la distorsión de cuantificación*

The power of the distortion component of the output signal resulting from the process of quantizing.

8023      **encoding [coding, coding in PCM]**

*F:    codage*

*S:    codificación [codificación en MIC]*

The generation of a code word to represent a quantized value.

8024      **encoder [coder]**



*F:*    *codeur*

*S:*    *codificador*

A device that performs encoding.

8025        **uniform encoding**

*F:*    *codage uniforme*

*S:*    *codificaci' on uniforme*

The generation of code words to represent uniformly quantized values.

8026        **non-uniform encoding**

*F:*    *codage non uniforme*

*S:*    *codificaci' on no uniforme*

The generation of code words to represent non-uniformly quantized values. (See Figure 3/G.701.)

8027      **encoding law**

*F: loi de quantification [loi de codage]*

*S: ley de codificaci'ón*

The law defining the relative values of the quantizing intervals used in quantizing and encoding. (See Figure 4/G.701.)

8028      **segmented encoding law**

*F: loi de quantification à segments [loi de codage à segments]*

*S: ley de codificaci'ón por segmentos*

An encoding law in which an approximation to a smooth law is obtained by a number of linear segments. (See Figures 3a/G.701 and 3b/G.701.)

8029      **decoding**

*F: d'ecodage*

*S: decodificaci'ón*

The generation of reconstructed samples.

8030      **decoder**

*F: d'ecodeur*

*S: decodificador*

A device that performs decoding.

8031      **reconstructed sample**

*F: échantillon reconstitu'é*

*S: muestra reconstruida*

The signal generated at the output of a decoder when a specified digital signal representing a quantized value is applied to its input.

8032      **codec**

*F: codec*

*S: c'odec*

A combination of an encoder and a decoder operating in opposite directions of transmission in the same equipment.

*Note* — When used to describe an equipment the function of the equipment should qualify the title, for example: supergroup codec, hypergroup codec.

8033      **digilogue channel**

*F:*    *voie digilogue*

*S:*    *canal digi-anal'ogico*

A channel in which information is represented by a digital signal at one end and the same information is represented by the corresponding analogue signal at the other end.

*Note* — The term may be qualified by “A to D” or “D to A” to indicate whether encoding or decoding is being performed.

8034      **digilogue circuit**

*F:*    *circuit digilogue*

*S:*    *circuito digi-anal'ogico*

A circuit in which transmission is provided in one direction by an A to D digilogue channel and in the other direction by a D to A digilogue channel.

*Note* — Because the digital interface is inherently 4-wire, the term may be qualified by “2-W” or “4-W” to indicate whether the analogue interface is 2-wire or 4-wire.

**Figure 2/G.701, p.**

**Figure 3/G.701, p.**

## 2.9 Codes

### 9001 pulse code

*F:* code d'impulsions (code de modulation d'impulsions)

*S:* c'ódigo de impulsos

A set of rules giving the equivalence between each quantized value and its corresponding code word.

### 9002 line code

*F:* code en ligne

*S:* c'ódigo de l'ínea, c'ódigo en l'ínea

A code chosen to suit the characteristics of a channel, that defines the equivalence between sets of digits presented for transmission and the corresponding sequence of signal elements transmitted over that channel.

### 9003 redundant line code

*F:* code en ligne redondant

*S:* c'ódigo de l'ínea redundante

A line code that uses more encoded signal elements than strictly necessary to represent groups of digits of the original signal.

### 9004 alternate mark inversion code (AMI code)

*F: code bipolaire [code bipolaire alternant, code bipolaire strict]*

*S: código de inversión de marcas alternada (código AMI) [código bipolar]*

A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating, positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

9005      **modified alternate mark inversion code**

*F:    code bipolaire alternant modifié*

*S:    código de inversión de marcas alternada modificado*

A line code that is based on an alternate mark inversion code, in which alternate mark inversion violations occur in accordance with a defined set of rules.

9006      **alternate mark inversion signal [bipolar signal]**

*F:    signal bipolaire [signal bipolaire alternant]*

*S:    señal de inversión de marcas alternada [señal bipolar]*

The encoded signal produced by alternate mark inversion code.

9007      **alternate mark inversion violation [bipolar violation]**

*F:    violation de bipolarité*

*S:    violación de inversión de marcas alternada [violación bipolar]*

A non-zero signal element in an alternate mark inversion signal that has the same polarity as the previous non-zero signal element.

9008      **disparity**

*F:    disparité*

*S:    disparidad*

The algebraic sum of the values of the departure from notional zero level of one or more consecutive signal elements forming a defined group.

9009      **digital sum**

*F:    somme numérique*

*S:    suma digital*

The algebraic sum of the disparities of a sequence of consecutive defined groups of signal elements.

9010      **digital sum variation**

*F:    variation de la somme numérique*

*S:    variación de la suma digital*

The difference between the maximum possible digital sum and the minimum possible digital sum of a specified number of groups of signal elements.

9011      **balanced code**

*F:*    *code à somme bornée*

*S:*    *código equilibrado*

A code that generates only groups of signal elements that have zero digital sum.

9012      **paired-disparity code [alternate code, alternating code]**

*F:*    *code à disparité compensée*

*S:*    *código con disparidad compensada [código alternado, código alternante]*

A code in which some or all of the digits in the original signal are represented by two assemblies of digits, of opposite disparity, which are used in a sequence to minimize the digital sum of a longer sequence of digits.

*Note* — An alternate mark inversion signal is an example of a paired-disparity code.



9013      **PCM binary code**

*F:    code binaire MIC*

*S:    código binario MIC*

A pulse code in which all the quantized values are identified by binary numbers taken in order.

*Note* — This term should not be used for line transmission.

9014      **symmetrical binary code**

*F:    code binaire symétrique*

*S:    código binario simétrico*

A pulse code in which the sign of the quantized value, is represented by one digit, and in which the remaining digit constitute a binary number representing the magnitude.

*Note 1* — In a particular symmetrical binary code, the order of the digits and the use made of the symbols 0 and 1 in the various digit positions must be specified.

*Note 2* — This term should not be used for line transmission.

9015      **code conversion**

*F:    transcodage*

*S:    conversi3n de código*

The conversion of digital signals in one code to the corresponding signals in a different code.

ANNEX A  
(to Recommendation G.701)

**Alphabetical list of terms defined in this Recommendation**

8004	adaptive differential pulse code modulation (ADPCM)
8006	adaptive predictor
8012	adaptive quantizing
3023	alarm indication signal (AIS)
9012	[alternate code]
9004	alternate mark inversion code (AMI code)
9012	[alternating code]
9006	alternate mark inversion signal
9007	alternate mark inversion violation

7014	amplitude quantized control
7012	analogue control
1002	analogue signal
6015	anisochronous
6018	[asynchronous/heterochronous]
9011	balanced code
7011	bilateral control
2003	binary digit
2002	binary figure
9006	[bipolar signal]
9007	[bipolar violation]
3019	bit sequence independence
5003	bunched frame alignment signal
4001	(bus: American)
6022	centralized-clock interface
1005	channel, transmission channel
4002	channel gate
6006	channel time-slot
2005	[character signal]
1007	circuit, telecommunication circuit
6009	clock
7004	clock control signal
2005	code word
8032	codec
8024	[coder]
8023	[coding, coding in PCM]
6021	codirectional interface
6023	contradirectional interface
2026	controlled slip
2020	decision circuit
2019	decision instant, decision instant of a digital signal
8016	decision value

8030	decoder
8029	decoding
8003	delta modulation
7019	democratic network, democratic mutually synchronized network
2029	descrambler
4011	(deserializer: American)
7022	[despotic network, despotic synchronized network]
8002	differential pulse code modulation (DPCM)
8033	digilogue channel
8034	digilogue circuit
2001	digit
2008	digit position
2013	digit rate
3020	digit sequence integrity
6005	digit time-slot
4019	digital block
3002	digital channel, digital transmission channel
3003	digital circuit, digital telecommunication circuit
3004	digital connection
4016	digital demultiplexer
4015	digital demultiplexing
3006	digital distribution frame
2030	digital error
4021	digital filling
3013	digital line link
3013	[digital line path]
3012	digital line section
3015	digital line system
3005	digital link, digital transmission link
4014	digital multiplexer
4017	digital multiplex equipment
4003	digital multiplex hierarchy

4013	digital multiplexing
4021	[digital padding]
3005	[digital path]
3017	digital radio link
3017	[digital radio path]
3016	digital radio section
3018	digital radio system
3007	digital section
2006	digital signal
9009	digital sum
9010	digital sum variation
3003	digital telecommunication circuit
3001	digital transmission
3002	digital transmission channel
3005	digital transmission link
3014	digital transmission system
3022	digital transparency
4005	(digroup: American)
1003	discretely-timed signal
9008	disparity
5004	distributed frame alignment signal
7009	double-ended synchronization
4010	[dynamicizer]
3009	elementary cable section
3011	elementary regenerator section
3010	elementary repeater section
8024	encoder
8023	encoding
8027	encoding law
2015	equivalent binary content
2016	equivalent bit rate
2030	error, digital error

2032	error multiplication
2033	error multiplication factor
2031	[error rate]
2031	error ratio
2034	error spread
4007	frame
5001	frame alignment
5002	frame alignment signal
5005	frame alignment recovery time
6008	frame alignment time-slot
6020	heterochronous
7021	hierarchic mutually synchronized network
7020	hierarchic network, hierarchic synchronized network
4001	highway
6017	homochronous
3025	[housekeeping digits]
1008	interface
6014	isochronous
2024	jitter
4026	justifiable digit time-slot
4022	justification
4029	justification rate
4032	justification ratio
4028	justification service digit
4027	justifying digit
9002	line code
2014	line digit rate
7013	linear analogue control
8019	load capacity
6011	master clock
4031	maximum justification rate
4031	[maximum stuffing rate]

6016	[mesochronous]
9005	modified alternate mark inversion code
7022	monarchic network, monarchic synchronized network
4008	multiframe
7018	mutually synchronized network
4006	n-ary digital group
2009	n-ary digital signal
4024	negative justification
4024	[negative stuffing, negative pulse stuffing]
4030	nominal justification rate
4033	nominal justification ratio
4030	[nominal stuffing rate]
4033	[nominal stuffing ratio]
7017	non-synchronized network
6018	non-synchronous
8026	non-uniform encoding
8014	non-uniform quantizing
2004	octet
3021	octet sequence integrity
7023	oligarchic network, oligarchic synchronized network
5006	out-of-frame alignment time
8019	[overload point]
9012	paired-disparity code
4010	parallel to serial converter
4018	PCM multiplex equipment
8020	peak limiting, peak limiting in quantizing
6019	plesiochronous
4023	positive justification
4023	[positive stuffing, positive pulse stuffing]
4025	positive/zero/negative justification
4025	[positive/zero/negative stuffing]
4025	positive/zero/negative pulse stuffing

8005	predictor
4005	[primary block]
4004	primary digital group
4005	primary PCM group
2012	psuedo n-ary signal
9001	pulse code
8001	pulse code modulation (PCM)
4022	[pulse stuffing]
8018	quantized value
8011	quantizing
8021	quantizing distortion
8022	quantizing distortion power
8015	quantizing interval
8031	reconstructed sample
2010	redundant digital signal
9003	redundant line code
2011	redundant n-ary signal
6010	reference clock
2021	regeneration
2023	regenerative repeater
2022	regenerator
3011	[regenerator section]
3009	[repeater section]
6013	relative time interval error
6003	retiming
8007	sample
8008	sampling
8009	sampling rate
2028	scrambler
3008	section termination
8028	segmented encoding law
4011	serial to parallel converter

4010	(serializer: American)
3025	service digits
1001	signal
2007	signal element
6007	signalling time-slot
2017	significant instant, significant instant of a digital signal
7008	single-ended synchronization
2026	[slip]
4011	[staticizer]
4026	[stuffable digit time-slot]
4022	[stuffing]
4027	[stuffing digit]
4029	[stuffing rate]
4032	[stuffing ratio]
4028	[stuffing service digit]
4009	subframe
2014	[symbol rate]
9014	symmetrical binary code
7001	synchronization
7003	synchronization information
7006	synchronization link
7005	synchronization node
7007	synchronization network
6016	synchronous
7016	synchronized network
7016	[synchronous network]
1006	telecommunication
1007	telecommunication circuit
4012	time-division multiplexing
6012	time interval error
7015	time quantized control
6004	time-slot



6002	[timing extraction]
7002	timing information
6001	timing signal
6002	timing recovery
1004	transmission
1005	transmission channel
4020	transmultiplexer
3022	transparency, digital transparency
2027	uncontrolled slip
8025	uniform encoding
8013	uniform quantizing
7010	unilateral control
2018	unit interval
3024	upstream failure indication
8017	virtual decision value
2025	wander
8010	working range

## Reference

- [1] CCITT Recommendation *Definitions relating to national and international numbering plans* , Vol. VI, Rec. Q.10.

**DIGITAL HIERARCHY BIT RATES**

*(Malaga-Torremolinos, 1984; amended at Melbourne, 1988)*

The CCITT,

*considering*

(a) that digital hierarchy bit rates are those bit rates which are or will be used as the basis for higher digital hierarchy levels if such levels exist (see Recommendation G.701, definition 4003);

(b) that the specification of hierarchical bit rates is necessary to prevent the proliferation of interface standards used in digital networks;

(c) that international interconnections of digital network components are preferably carried out at hierarchical bit rates;

(d) that when determining hierarchical bit rates a number of factors relating to services, transmission media and networking need to be taken into account, for example:

- characteristics of and suitable coding method for analogue source signals;
- bit rates of digital source signals;
- use of available transmission media;
- compatibility with analogue multiplex systems;
- modularity and flexibility in assembling and routing groups of source signals,

*recommends*

that the following bit rates should be used as hierarchical bit rates in digital networks:

**Table [T1.702], p.**

Figure 1/G.702 and Figure 2/G.702 show the recommended hierarchical bit rates only, including references to related Recommendations on network interfaces, multiplex equipments, digital sections/systems.

Recommendations on the following may also exist, but are not identified in Figure 1/G.702 and Figure 2/G.702:

- multiplex equipments operating between non-adjacent levels of the digital hierarchy;
- network interfaces, multiplex equipments and digital sections/systems at non-hierarchical bit rates.

Annex A to this Recommendation provides guidelines on usable bit rates available for services.

**Figure 1/G.702, p.**

**Figure 2/G.702, p.**

ANNEX A  
(to Recommendation G.702)

**Usable bit rates available for services**

In the case of access to the ISDN for broadband services, bit rates up to the primary hierarchy level are specified in the I.200 series of Recommendations.

In general, with regard to bit rates available for transport of service signals, the following guidelines apply:

A.1 For the hierarchies based on the 1544 kbit/s primary rate, the principle has been established that some bits in the frame should be reserved, in particular to perform quality control of the digital paths when several digital sections in tandem are involved. Table A-1/G.702 provides the necessary information.

**Table A-1/G.702 [T2.702], p.**

A.2 In case of networks using 2048 kbit/s based hierarchy there is in principle no basic restriction on the use of full capacity of the digital path. However, it is recognized that compatibility with recommended frame structures at the various levels of the 2 Mbit/s hierarchy (e.g. the use of the same frame alignment pattern) could be a preferred solution since it offers the following advantages:

- use of the same framing devices for switched and non-switched applications;
- end-to-end quality control performed in a unique way by the network when the maintenance entity that terminates the service (e.g. the encoding device) does not belong to the network;
- possibility of performing additional network management functions that could be required, depending on the applications.

The preference for compatibility with recommended frame structures could be reconsidered for the applications where significant restrictions on the efficient use of the digital path capability can be identified.

