



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**G.702**

**GENERAL ASPECTS OF DIGITAL TRANSMISSION  
SYSTEMS**

**TERMINAL EQUIPMENTS**

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**DIGITAL HIERARCHY BIT RATES**

**ITU-T Recommendation G.702**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation G.702 was published in Fascicle III.4 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

**Recommendation G.702**

**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:

Digital Hierarchy Level	Hierarchical bit rates (kbit/s) for networks with the digital hierarchy based on a first level bit rate of	
	1544 kbit/s	2048 kbit/s
	64	64
1	1544	2 048
2	6312	8 448
3	32 064	44 736
4	97 728	139 264

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 bits available for services.

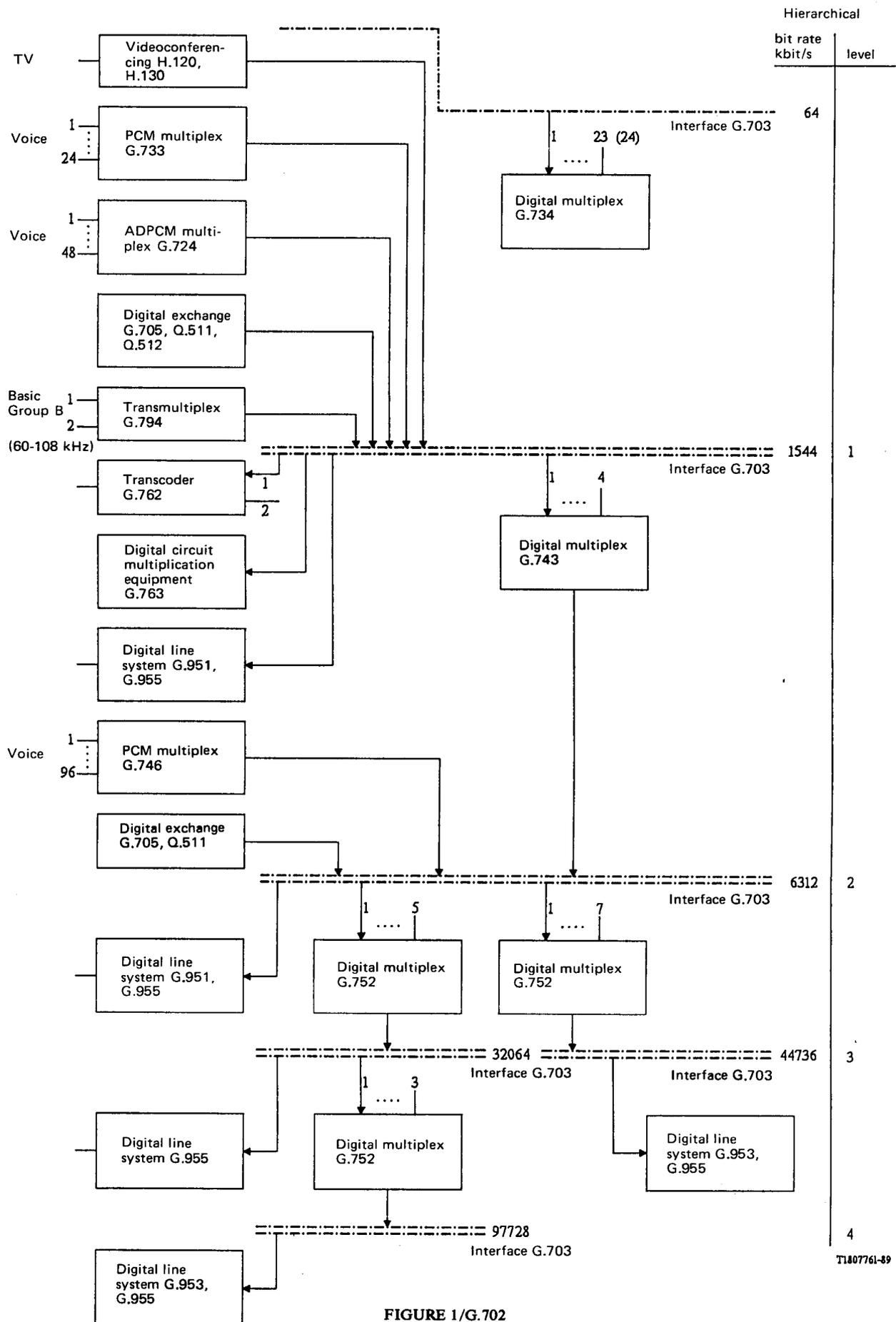


FIGURE 1/G.702

Hierarchical bit rates for networks with the digital hierarchy based on the first level bit rate of 1544 kbit/s

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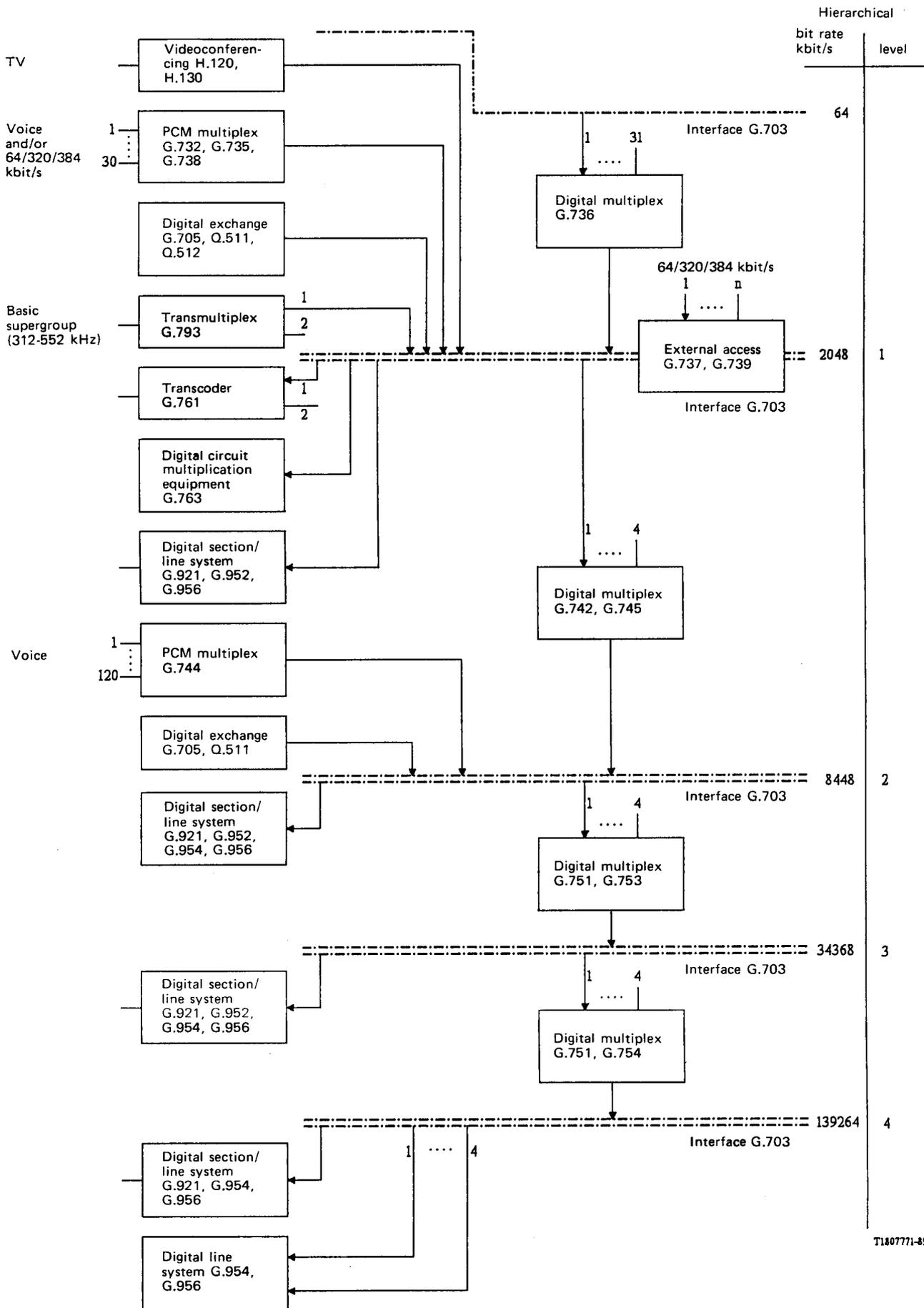


FIGURE 2/G.702

Hierarchical bit rates for networks with the digital hierarchy based on the first level bit rate of 2048 kbit/s

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

**Bit rates available for services and frame structures required at hierarchical interfaces**

Hierarchy bit rate (kbit/s)	Frame structure as per Recommendations	Reserved bits	Bit rate available for services (kbit/s)
1 544	G. 704	F <sup>a)</sup>	1 536
6 312 <sup>b)</sup>	Not applicable	None	6 312
6 312 <sup>c)</sup>	G.704	F bits and bits in time slots 97 and 98	6 144
44 736	G.752	M <sub>j</sub> <sup>d)</sup> F <sub>0</sub> , F <sub>11</sub> , F <sub>12</sub>	44 407 <sup>d)</sup>

a) The use of the F-bit for purposes additional to framing is under study.

b) In networks with asynchronous operation.

c) In networks with synchronous operation.

d) In some applications, the C-bits ( $C_{j1}$ ,  $C_{j2}$  and  $C_{j3}$ ) may also need to be reserved. In this case, the bit rate available for services becomes 44 209 kbit/s.

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.