INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.130

LINE TRANSMISSION OF NON-TELEPHONE SIGNALS

FRAME STRUCTURES FOR USE IN THE INTERNATIONAL INTERCONNECTION OF DIGITAL CODECS FOR VIDEOCONFERENCING OR VISUAL TELEPHONY

ITU-T Recommendation H.130

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation H.130 was published in Fascicle III.6 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 H.130

FRAME STRUCTURES FOR USE IN THE INTERNATIONAL INTERCONNECTION OF DIGITAL CODECS FOR VIDEOCONFERENCING OR VISUAL TELEPHONY

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

Introduction

Videoconferencing and visual telephony are new services which require greater bit rates than telephony. In the studies in CCITT on the ISDN and on international interworking, 384 kbit/s is emerging as an important channel capacity for wideband services. On this basis it is recommended that the videoconferencing and visual telephone services should be based on multiples of 384 kbit/s.

It is noted that both the 2048 kbit/s and 1544 kbit/s primary digital levels can be expressed by the formula $y + (n \times 384)$ kbit/s, where $n = 5$ or 4 and $y = 128$ or 8 kbit/s, respectively.

While this Recommendation covers only frame structures for transmission at the primary digital rates, it is not intended to suggest that transmissions using other frame structures or formats at primary rates or lower are precluded. In the future, frame structure based on other multiples and/or sub-multiples of 384 kbit/s may also be considered.

1 Characteristics of a 2048 kbit/s (n = 5) frame structure for use in codecs described in § 1 of Recommendation H.120

1.1 *General characteristics*

The multiplex structure described under § 1 is suitable for use on digital paths and connections which interconnect video codecs for videoconferencing or visual telephony using 2048 kbit/s transmission. The connections may either be direct or via higher-order digital multiplex equipment compatible with the primary PCM multiplex equipment defined in Recommendation G.732.

Some of the characteristics of this multiplex structure are identical to those in Recommendation G.704 and are covered by cross-references to that Recommendation.

The main features of the multiplex structure are that it provides:

- one 64 kbit/s channel for frame alignment, alarm signals and other signals as required;
- one 64 kbit/s channel reserved for the transmission of the sound signal;
- one 32 kbit/s channel for codec-to-codec information;
- the option of one or two 64 kbit/s channels and/or one 32 kbit/s channel for stereophonic sound, facsimile, data, etc.;
- the possibility of end-to-end and subscriber-to-network signalling;
- the remaining capacity (between 1664 and 1888 kbit/s) is used for the encoded video signal.

1.1.1 *Fundamental characteristics*

The multiplex structure contains 32 time slots, each of 64 kbit/s.

1.1.2 *Bit rate*

The nominal bit rate is 2048 kbit/s. The tolerance on this rate is ± 50 parts per million (ppm).

1.1.3 *Timing signal*

The timing signal is a 2048-kHz signal from which the bit rate is derived. It should be possible to derive the timing signal from an internal source or from the network.

1.1.4 *Interfaces*

The interfaces should comply with Recommendation G.703.

1.2 *Frame structure and time slot allocations*

The frame structure is in accordance with Recommendation G.704, § 3.3. The time slot (TS) allocations within the frame are given in Table 1/H.130, two options are shown according to whether or not the network is switched (under control of signals within the frame structure).

1.3 *Codec-to-codec information*

This information is transmitted in the 32 kbit/s channel corresponding to odd frames of TS2 (frame parity is gained from the multiframe alignment in the 8th bit of alternate TS2, the frames are consecutively numbered 0 to 15, forming a multiframe).

The 32 kbit/s channel is structured in a multiframe and supermultiframe derived from 128 consecutive 256 bit frames. The multiframe is composed of 8 octets numbered 1, 3, 5, ..., 15, each from TS2 in an odd numbered 256 bit frame. The supermultiframe corresponds to 8 consecutive multiframes which are numbered 0, 1, 2, ..., 7.

The use of the bits in each octet in the odd frames is as follows:

- Bit 1 for clock justification,
- Bit 2 for buffer state,
- Bit 3 for coding mode identification; the 8 consecutive bits 3 of TS2 in a multiframe will carry the following information:

Bit 3.1 [1)]	Codec facilities	(see below)
Bit 3.3	Colour transmission	(1 if provided)
Bit 3.5	split-screen indicator	(if required)
Bit 3.7	Fast update request	(1 if required)
Bit 3.9	Advance warning of interruption	(1 if required)
Bit 3.11	Sound power signal, for use with encrypted multipoint	(under study)
Bit 3.13	Data distribution	(1 if required)
Bit 3.15	Detection of looped ports	(set to 1)

Bit 3.1 is used to signal the availability of certain facilities in the decoder at supermultiframe rate, as follows:

Bit 3.1.0	Graphics (mode 1)	(1 if provided)
Bit 3.1.1	High-quality speech	(1 if provided)
Bit 3.1.2	4 x 384 kbit/s capability (see Note 1)	(1 if provided)
Bit 3.1.3	Encryption	(1 if provided)
Bit 3.1.4	System M	(1 if 525-line signal being coded)
Bit 3.1.5	Graphics (mode 2)	(1 if provided)
Bit 3.1.6	Spare	(set to 0)
Bit 3.1.7	2 x 384 kbit/s capability (see Note 1)	(1 if provided)

1) The notation used here should be interpreted as in the following examples: Bit 3.1 means Bit 3 (in TS2) of frame No. 1 in each multiframe: Bit 3.1.0 means Bit 3 (in TS2) of frame No. 1 in multiframe No. 0 of each supermultiframe.

TABLE 1/H.130

Timeslot allocation in 32 Timeslot frame structure of Recommendation G.704

		Timeslot allocation (within the 256-bit frame)	
	Bit rate (kbit/s)	Non switched (i)	Switched (ii)
Frame alignment, network alarms, etc.	as in G.704	0	0
Speech information	64	1	1
Codec-to-codec information	32	2	2
Signalling information (subscriber-network)	64	-	16
Fax, data, etc. (optional)	up to 2×64	17 and/or 18	17 and/or 18
Encoded video information (minimum)	(i) 27×64 (ii) 26×64	3 to 16 + 19 to 31	3 to 15 + 19 to 31

Note 1 – Frame alignment, network alarms, etc.

This information is transmitted in TSO with the same rules and characteristics as recommended in Recommendation G.704. Additionally, bit 8 in odd frames is used as a synchronization bit which is required when the codec is used with synchronous digital networks. On receipt of this bit set to zero, the transmission clock for the encoder will be derived from the incoming data stream. This bit is always set to one in the encoder.

Note 2 – Speech

Speech is transmitted at 64 kbit/s in TS1. The coding law is the A- law of Recommendation G.711 or, for future applications, the law that will be recommended by CCITT for higher quality speech. In the case of stereophonic transmission, the second speech channel will be transmitted in TS17.

Note 3 – Codec-to-codec information

This information requires a capacity of 32 kbit/s and is transmitted on odd frames of TS2. The remaining 32 kbit/s capacity on the even frames of TS2 will be used for encoded video or data transmission. The detailed use and structure of the 32 kbit/s channel for codec-to-codec information is described in § 1.3.

Note 4 – Signalling (subscriber-to-network)

A capacity of 16 kbit/s is considered adequate for videoconference as for basic access. The methods of switched access to the ISDN at 2048 kbit/s have not yet been formulated. Option (ii) avoids any problems in this respect, by leaving the whole of TS16 (64 kbit/s) clear of video information and available for subscriber signalling and call set-up information when switched access is required. For non-switched access, option (i) should be used.

Note 5 – Facsimile, data, etc.

When required, this information will be transmitted in TS17 and/or 18.

Note 6 – Encoded video

A minimum of 26 x 64 kbit/s capacity is reserved for encoded video in TS3 to 15 and 19 to 31. In addition, depending on applications, TS2 (even frames), TS16, 17 and 18 may also be used for video, providing a maximum of 29.5 x 64 kbit/s capacity; the available video bit-rate therefore lies between 1664 and 1888 kbit/s.

– Bit 4 to identify the use of time slots; the 8 consecutive bits 4 of TS2 in a multiframe will carry the following information:

Bit 4.1	TS2 (even) is used for video (0) or other (1)	
Bit 4.3	TS16 is used for video (0) or other (1)	
Bit 4.5	TS17 is used for video (0) or other (1)	
Bit 4.7	TS18 is used for video (0) or other (1)	
Bit 4.9	TS16, 26 to 31 are not used for video	(see Note 2)
Bit 4.11	Graphics transmission	(1 if required)

Bit 4.13 Error correction (1 if required)
(see Note 3)

Bit 4.15 Use of time slots for video in conjunction with bit 4.9 (see Note 2)

– Bit 5 for multipoint conferencing; provides a 4 kbit/s message channel (transparent through the codec) from customer to multipoint control unit, between control units and from customer to customer. (The message format and protocols are under study.)

  When the codec is not equipped with a message channel, bit 5 is used to signal split-screen: 1 = split-screen active, 0 = split- screen inactive.

– Bit 6 free (for possible national use) (set to 0)

– Bit 7 free (for possible national use)

– Bit 8 for multiframe and supermultiframe alignment; the values of bit 8 in each frame of the multiframe (multiframe and supermultiframe alignment patterns) should be as detailed in Table 2/H.130.

Note 1 – Bits 3.1.2 and 3.1.7, taken together, signal the capability of the codec to operate at various bit rates, as follows:

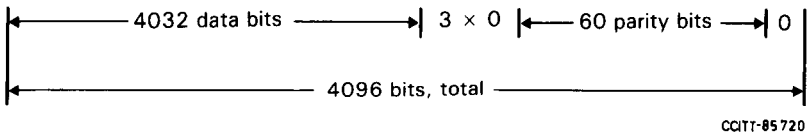
Bit 3.1.2	Bit 3.1.7	
0	0	2 Mbit/s only
1	0	2 Mbit/s and 4 x 384 kbit/s operation
0	1	2 Mbit/s and 2 x 384 kbit/s operation
1	1	2 Mbit/s and 4, 3, and 2 x 384 kbit/s operation

Note 2 – Bits 4.9 and 4.15, taken together, signal the time slots available (subject to the settings of bits 4.1, 4.3, 4.5 and 4.7) for video at various bit rates. The use of TS0, TS1 and TS2 (odd) is unaffected by these bits.

Bit 4.9	Bit 4.15	Bit rate	Time slot available for video
0	0	2 048 kbit/s	TS2 (even), TS3-31
1	0	4×384 kbit/s	TS2 (even), TS3-15 and 17-25
1	1	3×384 kbit/s	TS2 (even), TS3-9 and 17-25
0	1	2×384 kbit/s	TS2 (even), TS3-6 and 17-22

A 2 Mbit/s codec which allows $n \times 384$ kbit/s working, will set to zero time slots other than those mentioned above in its transmitter and ignore them in the receiver.

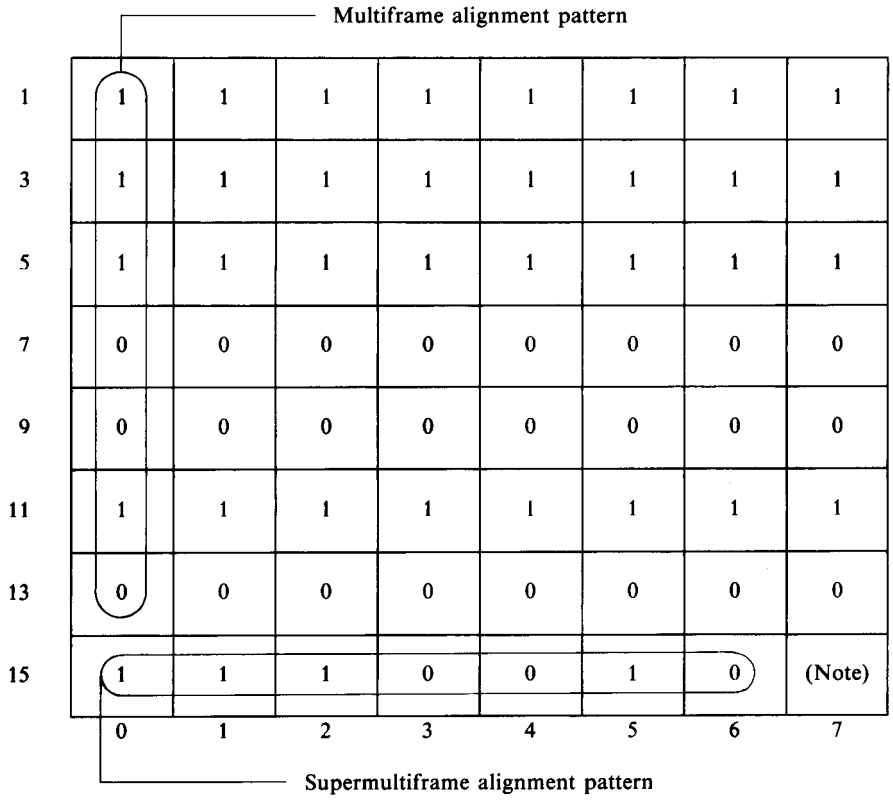
Note 3 – When set to 1, the last 64 bits of each multiframe contain the error corrector parity bits. The multiframe then appears as follows:



The conditions signalled in bits 3 and 4 can only change at supermultiframe rate. The change at the decoder will take place at the start of the first supermultiframe following the one where the change in signalling has been detected. This procedure can be used to improve the resistance to transmission errors.

TABLE 2/H.130

Multiframe and supermultiframe alignment on bit 8 of TS2 (odd)



Note - Undefined (reserved for possible future use in a higher level framing structure).

2 Characteristics of a 1544 kbit/s (n = 4) frame structure for use with codecs described in § 2 of Recommendation H.120

2.1 *General characteristics*

The multiplex structure described under § 2 is suitable for use on digital paths and connections which interconnect video codecs for videoconferencing or visual telephony using 1544 kbit/s transmission. The connections may either be direct or via higher-order digital multiplex equipment compatible with the primary PCM multiplex equipment defined in Recommendation G.733.

Some of the characteristics of this multiplex structure are identical to those in Recommendation G.704 and/or in § 1 of this Recommendation; these are covered by cross-references to the appropriate documents.

The main features of the multiplex structure are that it provides:

- one 8 kbit/s channel for frame alignment, alarm signals and other signals as required;
- one 64 kbit/s channel for the sound signal;
- one 32 kbit/s channel for codec-to-codec information;
- the option of one or two 64 kbit/s channels and/or one 32 kbit/s channel for auxiliary data services;
- the remaining capacity (between 1280 and 1440 kbit/s) is used for the encoded video signal.

2.1.1 *Fundamental characteristics*

The multiplex structure contains 24 time slots per frame, each of 64 kbit/s, plus one bit per frame for frame alignment and signalling. The number of bits per frame is 193 and the nominal frame repetition rate is 8000 Hz.

2.1.2 *Bit rate*

The nominal bit rate is 1544 kbit/s. The tolerance on this rate is ± 50 parts per million (ppm).

2.1.3 *Timing signal*

The timing signal is a 1544 kHz signal from which the bit rate is derived. It should be possible to derive the timing signal from an internal source or from the network.

2.1.4 *Interfaces*

The interfaces should comply with Recommendation G.703; the option of AMI or B8ZS should be provided as the interface code. Which of the two codes is used should be determined by bilateral agreement.

2.1.5 *Format restrictions enforced by the network*

As indicated in Recommendation G.703, runs of more than 15 "zeros" are forbidden in some networks; also, there must be, on average, at least three "ones" in every 24 digits. Provision is made by means of a scrambling system to ensure that forbidden patterns cannot occur.

2.2 *Frame structure and time slot allocations*

The basic frame structure follows Recommendation G.704. The time slots are numbered from 1 to 24, with the 1st bit positioned between TS24 and TS1.

2.2.1 *Frame alignment*

The basic frame alignment is obtained at bit No. 1, as in Recommendation G.704, Method 2 (see § 2.1.3.2). The pattern transmitted is as shown in Table 3/H.130.

TABLE 3/H.130

Frame No.	Frame alignment signal	S-bit	Signalling bit
1	1	-	
2	-	0	
3	0	-	
4	-	0	
5	1	-	
6	-	1	A
7	0	-	
8	-	1	
9	1	-	
10	-	1	
11	0	-	
12	-	0	B

2.2.2 *Speech*

Speech is transmitted at 64 kbit/s in TS1. The coding law is the A-law of Recommendation G.711 or, for future applications, the law that will be recommended by CCITT for higher-quality speech. In the case of stereophonic transmission, the second speech channel will be transmitted in TS17.

2.2.3 *Codec-to-codec information*

This information is transmitted in the 32-kbit/s channel corresponding to the odd frames of TS2. The channel is structured in multiframes of 16 frames and supermultiframes of 8 multiframes in exactly the same way as in the 2-Mbit/s version in § 1. Multiframe and supermultiframe alignment are obtained from bit 8 of TS2 (odd) in the same way as in § 1.

The multiframe of TS2 for codec-to-codec signalling is quite independent of the basic 12-frame multiframe of Recommendation G.704.

2.2.4 *Signalling*

In the future, some 1.5 Mbit/s networks will allow the use of bits A and B for signalling. This facility is not available on all networks.

2.2.5 *Facsimile, data, etc.*

When required, this information will be transmitted in TS16 and TS17 and TS2 (even).

2.2.6 *Encoded video*

A minimum of 20 x 64 kbit/s capacity is reserved for encoded video in TS3-15 and 18-24; depending on applications, TS2 (even), TS16 and 17 may also be used for video, providing a maximum of 22.5 x 64 kbit/s capacity. The available bit rate for video therefore lies between 1280 and 1440 kbit/s.

2.3 *Codec-to-codec information*

The structure of the multiframe and supermultiframe are exactly the same as in § 1, except that each frame contains only 24 time slots as compared with 32 in the frames in § 1.

The bit allocations [in TS2 (odd)] are identical with § 1, with the following exceptions:

- Bit 1 for clock justification, required for interworking with 625-line codecs; disregarded in 525-line decoders.
- Bit 3.1.2 is permanently set to 1 (see Note 1)
- Bit 4.9 time slots are used for video (see Note 2)
- Bit 6 is reserved for the transmission of encryption data (see Annex D Recommendation H.120).
- Bit 7 is used for scrambler control (see § 2.4).

Note 1 – Bits 3.1.2 and 3.1.7, taken together, signal the capability of the codec to operate at various bit rates, as follows:

Bit 3.1.2	Bit 3.1.7	
0	0	Not used in 525-line codecs
1	0	4×384 kbit/s
0	1	2×384 kbit/s operation
1	1	4, 3, and 2×384 kbit/s operation

Note 2 – Bits 4.9 and 4.15, taken together, signal the time slots available (subject to the settings of bits 4.1, 4.3, 4.5 and 4.7) for video at various bit rates. The use of TS1 and TS2 (odd) is not affected by these bits.

Bit 4.9	Bit 4.15	Bit rate	Time slot available for video
0	0	This combination is not used in 525-line codecs	
1	0	4×384 kbit/s	TS2 (even), TS3-24
1	1	3×384 kbit/s	TS2 (even), TS3-9 and 16-24
0	1	2×384 kbit/s	TS2 (even), TS3-6 and 16-21

2.4 *Scrambling*

2.4.1 *General*

The bit sequence produced by a videoconference codec is not subject to any limitation on the bit patterns that are generated. Therefore, reversible processing has to be carried out at the output and input ports to ensure that the format restrictions specified for some 1544 kbit/s networks are not violated.

There are two typical constraints on the format:

1) There must not be runs of more than 15 consecutive “zeros”.

2) The average density of “ones” must be at least 12.5 %.

A classical self-synchronizing or reset scrambler, based on a maximum-length pseudo-random sequence, is incapable of guaranteeing that such a bit-sequence never occurs. It is however possible, by judicious choice of scrambler design, to minimize the number of violations of the above rules to such an extent that the residual violations can be removed by forcibly inserting “ones”. The effect of this is to introduce transmission errors giving a residual bit-error-ratio of approximately 1×10^{-7}, which is imperceptible as far as the picture quality is concerned.

2.4.2 *Details of scrambling – first stage*

The scrambling sequence is applied to all 24 time slots but not to bit 193 nor to bit 7 of TS2 (odd).

Note – If data are inserted and/or extracted from TS2 (even), 16 or 17 within the network, the insertion/extraction equipments must ensure that the network constraints are not violated.

The 1544 kbit/s serial data from the codec are first applied to the following scrambling sequence:

I N I N N I,

where

I = inverted and

N = do not invert.

This sequence starts from the bit following bit 193, and is restarted every frame. Bit 193 and bit 7 of TS2 (odd) are not scrambled but the scrambling sequence is continuous through bit 7 of TS2 (odd).

2.4.3 *Details of scrambling – second stage*

Data scrambled by the above sequence are then checked for runs of more than 15 zeros. For signalling purposes, these data are considered to be in blocks of 385 bits. Each block starts with bit 8 of TS2 (odd) and ends with bit 6 of TS2 (odd). If a block of data preceding bit 7 of TS2 (odd) is found *not* to contain the string of data, 1 00000000 00000000 (i.e. no runs of 16 or more zeros), bit 7 of TS2 (odd) is set to one.

If a block of data preceding bit 7 of TS2 (odd) is found to contain the string of data, 1 00000000 00000001 (i.e. a run of 15 zeros), bit 7 of TS2 (odd) remains set to one, even if one or more subsequent runs of zeros within the same block reaches or exceeds 16. However, in such a case, the 16th zero(s) of the run(s) are set to one. As this is not signalled to the descrambler, it causes (a) single-bit transmission error(s).

Bit 7 of TS2 (odd) is set to zero only if the preceding block of data is found to contain the string, 1 00000000 00000000 (i.e. a run of 16 zeros or more), in which case the 16th zero is inverted to one and all subsequent strings of the form 1 00000000 0000000B within the same block have bit B inverted, except in the case where bit B = 1 before inversion, in which case it remains unchanged.

2.4.4 *Details of descrambler*

When bit 7 of TS2 (odd) is one, the preceding block of scrambled data is left unchanged. When bit 7 of TS2 (odd) is zero, the descrambler must detect all occurrences of the string 1 00000000 0000000B in the preceding block and invert the bit B. This can introduce transmission errors if the second or subsequent runs of zeros within the block (at the scrambler) contain 15 zeros.

The repetitive scrambling sequence, I N I N N I, is then applied to the data.

For the purpose of counting runs of zeros, at both the scrambler and descrambler, bit 7 of TS2 (odd) and bit 193 are both assumed to be zero. In the case where bit B would be on bit 193 or bit 7 of TS2 (odd), the string 1 00000000 000000B is used instead of 1 00000000 0000000B. Only bit B has to be within the block of data being considered. The preceding zeros may lie partially or completely within the preceding block.

When bit B is inverted, the “zeros” counter is reset to zero.

3 Characteristics of a 1544 kbit/s (n = 4) frame structure for use with codecs described in § 3 of Recommendation H.120

3.1 *General characteristics*

The multiplex structure describes under § 3 is suitable for use on digital paths and connections which interconnect video codecs for videoconferencing or visual telephony using 1544 kbit/s transmission. The connection may either be directly via the ISDN defined in Recommendation I.431 or via higher order digital multiplex equipment compatible with the primary PCM multiplex equipment defined in Recommendation G.733.

The main features of the multiplex structure are that it provides:

- one 8 kbit/s channel for frame alignment, alarm signals and other signals as required,
- one 64 kbit/s channel for the audio signal,
- one 32 kbit/s channel for codec-to-codec information,
- one optional 64 kbit/s for auxiliary data service, and
- the use of the remaining capacity (between 1376 and 1440 kbit/s) for the encoded video signal.

3.1.1 *Fundamental characteristics*

The multiplex structure contains 192 bits per frame plus one bit per frame for frame alignment and other purposes. The nominal frame repetition rate is 8000 Hz.

3.1.2 *Bit rate*

The nominal bit rate is 1544 kbit/s with a tolerance of ± 50 parts per million (ppm).

3.1.3 *Timing signal*

The timing signal is a 1544 kHz signal from which the bit rate is derived. It should be possible to derive the timing signal either from an internal source or from the network.

3.1.4 *Interfaces*

The interfaces should comply with Recommendation G.703. The interface code should be either of AMI/B8ZS described in Recommendation G.703, in addition to which CMI (Coded Mark Inversion) code is also applicable when the codec is installed as a part of terminal equipment. Which of the three codes is used should be determined by bilateral agreement.

3.1.5 *Format restrictions enforced by the network*

As indicated in Recommendation G.703, runs of more than 15 “zeros” are forbidden in some networks. Additionally, on the average, there must be at least three “ones” in every 24 digits. Provision is made by means of a stuffing system to ensure that forbidden patterns do not occur.

3.2 *Frame structure and bit allocation*

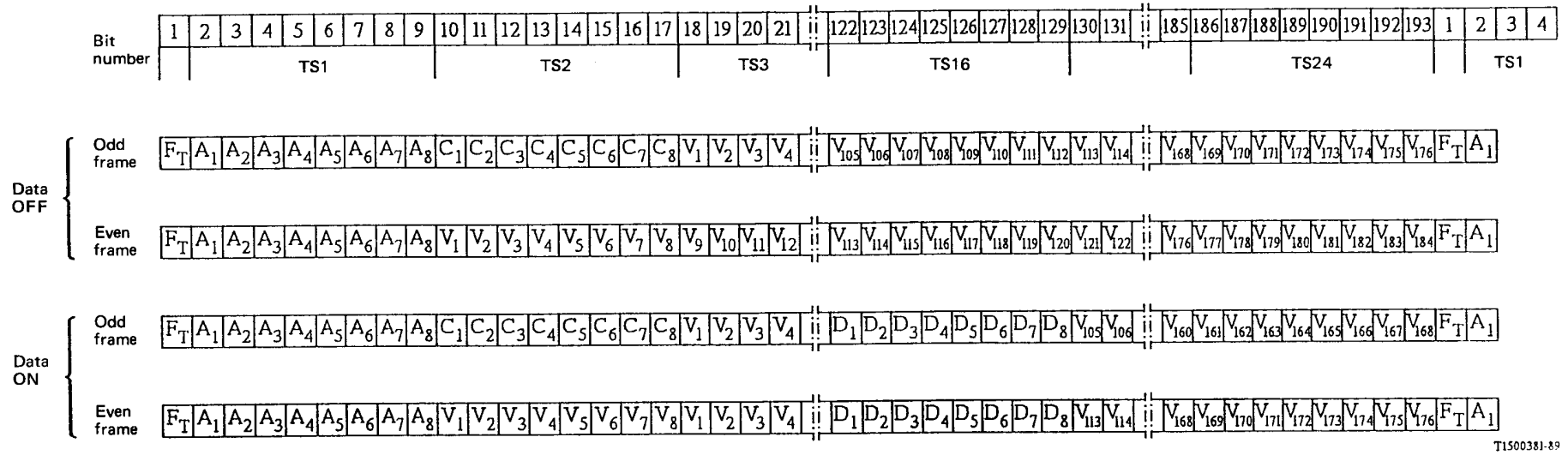
The basic frame structure follows Recommendation G.704 with changes in bit allocations. The bits in a frame are numbered from 1 to 193 with a transmission frame bit as numbered one. Remained 192 bits are divided into 24 time slots (TS) in which each time slot has 64 kbit/s rate. Time slot number is assigned to each TS in the way that the first slot is TS1 and the last slot is TS24. Bit allocation in a frame is shown in Figure 1/H.130.

3.2.1 *Frame alignment*

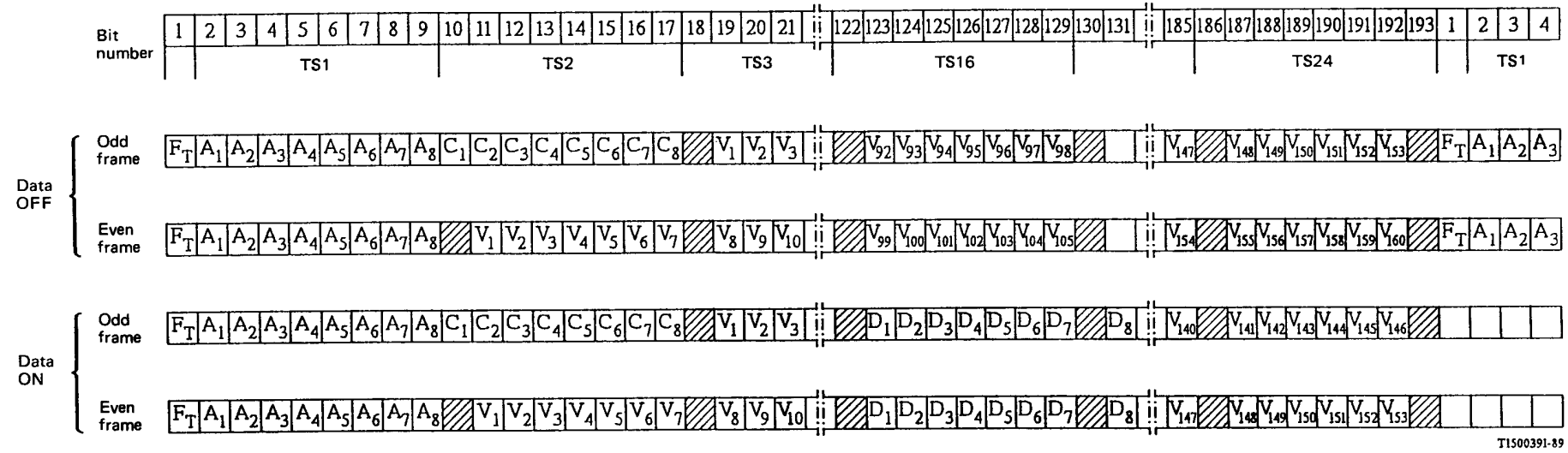
The basic frame alignment is obtained at bit No. 1 as in Recommendation G.704, Method 1 (§ 2.1.3.1).

3.2.2 *Audio signal*

The audio signal is transmitted at 64 kbit/s in TS1.



a) Without stuffing



b) With stuffing

FIGURE 1/H.130

Frame structure and bit allocation

3.2.3 *Codec-to-codec information*

This information is transmitted in odd numbered time slots 2 the 32 kbit/s channel. Identification of codec-to-codec information is made by detecting multiframe alignment which is inserted in the eighth bit of the odd numbered TS2.

The channel is structured in multiframes of 16 frames each (numbered from 1 to 16) and supermultiframes of 8 multiframes each (numbered from 1 to 8). Multiframe and supermultiframe alignment is obtained from bit No. 8 in TS2.

The multiframe of the codec-to-codec information channel is independent of the multiframe of the transmission frame generated by bit No. 0.

3.2.4 *Auxiliary data information*

When required, this information is transmitted basically in TS16 which is used for the encoded video signal when no optional auxiliary equipment is connected. If stuffing is performed due to some channel restrictions, data alignment is as given in § 3.4.2.

3.2.5 *Encoded video*

A minimum of 64 x 21.5 kbit/s capacity is primarily reserved for encoded video in even numbered TS2, TS3 through TS15 and TS17 through TS24. When the auxiliary data information channel is not set up, the capacity is increased to 64 x 22.5 kbit/s with TS16 added. The available bit rate for the encoded video signal therefore lies between 1376 and 1440 kbit/s. If stuffing is performed, data alignment is as given in § 3.4.2.

3.3 *Codec-to-codec information channel*

The use of the bits in the codec-to-codec information channel is as follows (see Table 4/H.130). In the following Sections, the notation, “m.n.l”, is used for a bit position expressing the *n*th multiframe and the *l*th supermultiframe of bit No. m.

3.3.1 *C_1 Bit*

Bits 1.1, 1.5, 1.9, 1.13	Permanently set to 1
Bits 1.3, 1.7, 1.11	FC (sampling frequency control)

The lower 8 bits of the binary count for the two supermultiframe periods, i.e. 32 ms, are measured with the video sampling frequency clock, the MSB first. These same 8-bit words are transmitted in the three bits (1.3, 1.7 and 1.11) as well as in the two consecutive multiframes.

Bit 1.15	Spare (Note)

Note – Spare bits are set to 1.

3.3.2 *C_2 bit: stuffing flag*

Bits 2.1-2.15 (odd number)	0 if not stuffed

The stuffing flag consists of four bits including C_2 and C_7 in each violation detection block (four frame length) which is defined in § 3.4.2. The first three bits are used for majority decision logic at the decoder. When the result indicates “stuffing”, the decoder undergoes destuffing.

TABLE 4/H.130

Codec-to-codec information

<table>
<tr><th>Multiframe
frame number</th><th>C_1</th><th>C_2</th><th>C_3</th><th>C_4</th><th>C_5</th><th>C_6</th><th>C_7</th><th>C_8</th></tr>
<tr><td>1</td><td>1</td><td rowspan="2">Stuffing
flag</td><td>Codec
facility</td><td rowspan="3">Data
channel
flag</td><td rowspan="8">Message
channel

1</td><td rowspan="8">Message
channel

2</td><td rowspan="2">Stuffing
flag</td><td>MAS(1)</td></tr>
<tr><td>3</td><td>Spare</td><td rowspan="6">Spare</td><td>MAS(1)</td></tr>
<tr><td>5</td><td>1</td><td rowspan="2">Stuffing
flag</td><td rowspan="2">Stuffing
flag</td><td>MAS(1)</td></tr>
<tr><td>7</td><td>Spare</td><td>MAS(0)</td></tr>
<tr><td>9</td><td>1</td><td rowspan="2">Stuffing
flag</td><td rowspan="4">Graphics
mode
flag</td><td rowspan="2">Stuffing
flag</td><td>MAS(0)</td></tr>
<tr><td>11</td><td>Spare</td><td>MAS(1)</td></tr>
<tr><td>13</td><td>1</td><td rowspan="2">Stuffing
flag</td><td rowspan="2">Stuffing
flag</td><td>MAS(0)</td></tr>
<tr><td>15</td><td>Spare</td><td>Coding
mode</td><td>SAS</td></tr>
</table>

MAS Multiframe alignment signal

SAS Supermultiframe alignment signal (1110010 * : * is for future use)

3.3.3 *C_3 bit: codec facility/coding mode*

Bit 3.1	Codec facilities	
Bit 3.1.1	Graphics mode 1 (high resolution)	(0 if provided)
Bit 3.1.2	Bit sequence independence	(0 if secured)
Bit 3.1.3	Monochrome mode	(0 if provided)
Bit 3.1.4	Video encryption	(0 if provided)
Bit 3.1.5	Audio encryption	(0 if provided)
Bit 3.1.6	Pointing function	(0 if provided)
Bit 3.1.7	Graphics (mode 2, standard resolution)	(0 if provided)
Bit 3.1.8	Spare (Note 1)	
Bit 3.3	Spare (Note)	
Bit 3.5	Spare (Note)	
Bit 3.7	Spare (Note)	
Bit 3.9	Spare (Note)	
Bit 3.11	Spare (Note)	
Bit 3.13	Spare (Note)	
Bit 3.15	Coding mode	
Bit 3.15.1	Video encryption	(0 if used)
Bit 3.15.2	Audio encryption	(0 if used)
Bit 3.15.3	Frame memory refresh request	(0 if requested)
Bit 3.15.4	Backward path	(0 if available)
Bit 3.15.5-3.15.8	Spare (Note)	

Note – Spare bits are set to 1.

3.3.4 *C_4 bit: channel assignment flag*

Bits 4.1, 4.3, 4.5, 4.7	Auxiliary data channel flag	(0 if used)
Bits 4.9, 4.11, 4.13, 4.15	Graphics mode flag	(0 if used)
	In graphics mode, video data are inhibited and their bit positions are used for graphics data transmission.	

These two flags consist of four bits as stuffing flag. Both auxiliary data and graphics data can be inserted or removed in a unit of multiframe (16 frames). Flags should precede the data by a multiframe.

3.3.5 *C_5 bit: Message channel 1*

Bits 5.1-5.15 (odd number)	Message channel 1 (Note)

Note – Protocols for these message channels are under study.

3.3.6 *C_6 bit: Message channel 2*

Bits 6.1-6.15 (odd number)	Message channel 2 (Note)

Note – Protocols for these message channels are under study.

3.3.7 *C_7 bit: Stuffing flag*

Bit 7.1-7.15 (odd number)	0 if stuffed

3.3.8 *C_8 bit: Multiframe alignment*

Bits 8.1, 8.3, 8.7, 8.9, 8.11, 8.13	Multiframe alignment signal (1110010)

Bit 8.15	Supermultiframe alignment signal (1110010*) (see Note)

Note – The bit * is used for future higher order multiframing.

3.4 *Stuffing*

3.4.1 *General*

The bit sequence produced by a videoconferencing codec is not subject to any limitation on the bit patterns that are generated. Therefore, reversible processing has to be carried out at the output and input ports to ensure that the format restrictions specified for some 1544 kbit/s networks (described in § 3.1.5 above) are not violated.

To ensure this, the stuffing method shuld be employed in which necessary "ones" are inserted, or stuffed, if any violations are found in a block of bit streams to be transmitted. A flag is attached to the block to identify whether or not the block is stuffed.

3.4.2 *Details of stuffing*

Each block, which consists of four transmission frame lengths, i.e. 4 x 193 = 772 bits starting from the C_1 bit of the codec-to-codec information in the (4*n*–3)th frame, is checked. If any violations occur with respect to the rules:

– no more than 15 consecutive zeros, and

– at least 3 ones in any 24 bits,

ones are stuffed as follows,

TS1 not stuffed,

TS2 not stuffed in odd numbered frames, stuffed at the top bit of TS in even numbered frames,

TS3-23 stuffed at the top bit of each time slot,

TS24 stuffed at the top bit and bottom bit of the time slot.

The stuffing position is shown in Figure 1/H.130.

Note – When stuffing pulses are inserted, the transmission bit rate for encoded video is reduced to 1252 kbit/s without auxiliary data transmission and to 1188 kbit/s with auxiliary data transmission.

In order to ease processing at block boundaries, the C_1 bit at the start of any block is assigned to be always as described in § 3.3.1 above as shown in Table 4/H.130.

To prevent 8 consecutive zeros in the codec-to-codec information when stuffing is carried out, the stuffing flag transmitted in the (C_2, C_7) bits are assigned as (1,0) for stuffing and (0,1) for no stuffing.

Violations are checked assuming that all transmission framing bits in bit No. 0 and stuffing flag bits in C_2 and C_7 are zero.

Note – If audio data are processed in the network, corresponding bits should also be assumed as zero for violation checking. However, as this may increase the probability of stuffing, measures are necessary to prevent such stuffing from becoming excessive.

3.4.3 *Stuffing mode operation*

Stuffing should be operated only when necessary. To identify the network restrictions, the bit sequence independence (BSI) in the codec-to-codec information channel is used. A coder usually operates without stuffing, but shifts to the stuffing mode if the received BSI is "one".