CCITT SGXV
Working Party XV/1
Specialists Group on Coding for Visual Telephony

Document #277
Dec. 18, 1987

SOURCE: CHAIRMAN OF THE SPECIALISTS GROUP ON CODING FOR VISUAL TELEPHONY
TITLE : EXTRACT OF THE REPORT OF WORKING PARTY XV/1 MEETING (Nov. 19-26, 1987)

2.1 Report of the activities of the Specialists Group on Coding for Visual Telephony

from TD 31(XV/1)
Question 4/XV

Chairman of the Specialists Group (Mr.Okubo) reported on their activities covering the two meetings held in June 1987 and October 1987, as detailed in Annex 1.
The group has initiated drafting of Recommendation H.12X on the nx384 kbit/s video codec and established the study framework for the mx64 kbit/s video codec.

For the subjects which the Specialists Group requests consideration of Working Party XV/1 (see §4 of Annex 1 to this report), the meeting concluded as follows;

1) Continuation of the Specialists Group in the next study period
Continuation of the activities in the next study period as well as in the interregnum is possible if Study Group XV decides so. Working Party XV/1 supports the continuation of activities as proposed, but this matter will be dealt with in the final meeting of Study Group XV in April 1988.

2) Use of the period from SG XV final meeting in April 1988 and CCITT Plenary meeting in November 1988
CCITT Secretariat advised that the contents to be included in the Blue Book should be finalized at the final meeting of Study Group XV in April 1988. If there remain some items for further study at that time, the next earliest occasion for recommending the work completed during the interregnum is the first Study Group XV meeting the next study period through the accerlated procedure, assuming the activity during the interregnum is endorsed as described in 1) above.

3) Intellectual property
CCITT Secretariat reported that the statement on CCITT patent policy,reproduced as Annex 3 to Part V of the report of WP XV/1 (COM XV-R22-E,P.53), was endorsed by the CCITT Study Group Chairmen meeting held from 1 to 3 September 1987 and that its content should be followed by all Study Groups.
Any further actions, if necessary, may be discussed in the next CCITT Plenary.

For the specific point raised by the Specialists Group, BT's proposal of setting up a special CCITT group involving legal experts toward getting a formal agreement on the intellectual property relevant to CCITT Recommendations, Working Party XV/1 will report it to the Study Group XV meeting in April 1988.

4) Bit assignment in the Application Channel; and
5) Frame structure for mx64 kbit/s;

These items were dealt with in the discussion of two relevant items to Question 5/XV during this meeting (see § 5 /D.5 of this reprt).

During the questions and answers, it was stated that '56 kbit/s' contained in Appendix 5 of the above progress report was not an official ISDN rate. Mr. Wery clarified in this respect that the physical bit rate in North American networks is 64 kbit/s, but one bit can not be used, and that this has already been recognized in Recommendation I.463. This will be taken into account when the Specialists Group studies mx64 kbit/s coding algorithm.

In conclusion, the meeting approved this report, requesting the best efforts of the Specialists Group to produce draft Recommendation H.12X on the nx384 kbit/s codec, AV draft H.222 on frame structure for nx384 kbit/s and an outline draft H.12Y on the mx64 kbit/s codec so that they will be approved at the final Study Group XV meeting to be held in April 1988.

At the end of the meeting, participation of a Korean expert to the Specialists Group on coding for Visual Telephony was provisionally approved, waiting for the formal approval of Study Group XV at the final meeting in April 1988. Chairman of the working Party requests that he will actively contribute to the work of the specialists Group.

2.7 Input document from Working Party IV/5 from TD 31(XV/1) Question 4/XV

The meeting reviewed the response of the Working Party IV/5 to our liaison statement (see Annex 4 to COM XV-R16-E, p.16) regarding the maintenance of the nx384 kbit/s videoconferencing service and reached the following conclusions for the three items they pointed out.

1) Provision of the loop backs: The nx384 kbit/s video codec, which is being studied by the Specialists Group on Coding for Visual Telephony, will include the following control commands in Recommendation H.12x;

   - loop at terminal/network interface (local and towards network), and
   - remote loop at terminal/network interface (remote terminal and towrads sending terminal).

   These control commands are defined in the Application Channel, but their exact code words, bit positions, etc. are for further study at the moment.

2) Use of Frame Alignment Monitors at the primary tate interface : The Specialists Group will consider this request of Working Party IV/5 when they define the transmission coder part of the nx384 kbit/s video codec.

3) Use of CRC block checking procedures at 384 kbit/s level : The same as 2) above.

(Note to the Secretariat : This part of the Report should be sent to WP IV/5.)

ANNEX

(Source : WP IV/5) TD 14 (XV/1)

Working Party IV/5 appreciates the responses of Working Party XV/1 to Question 14 of Collective Letter No. 53. Working Party IV/5 in its discussions at the October 1987 meeting on this subject arrived at the following conclusions regarding the maintenance of this service.

1. **WP IV/5 agrees with the provision of the loopbacks as defined in the WP XV/1 response assuming that the loopback is at the n X 384 kbit/s level.**

2. **WP IV/5, assuming that the n X 384 kbit/s codec interfaces at the primary order digital rate requests WP XV/1 to include as an essential option the provision of an in-service performance monitor at the primary order digital interface. Recommendations G.162 and G.16X (Frame Alignment Signal Monitors) should provide the necessary guidance in the specification of the in-service performance monitor.**

3. **WP IV/5 also recommends that Working Party XV/1 consider the use of CRC block checking procedures at the 384 kbit/s level if at all possible. This would allow in-service performance monitoring of the end to end service connection. This capability would enhance our maintenance procedures by providing the potential for in-service trouble sectionalization and clearance while the videoconference is in progress.**

WP IV/5 requests the views of WP XV/1 in this regard.

2 Updating of draft Rec.H200 — from TD 33 (XV/1) Question 5/XV — 33/1

In anticipation of the situation that final recommendations will be published in various series (F,T,H,G) and that there will not be a Y-series, it was decided that the erstwhile Y-numbers will retain their significance only as positions in the H200-defined framework. Moreover the designation 'Y' is dropped in favour of 'AV'. Where possible, H-series Recs. will be given the same 3-digit number. The AV.100 series is updated according to SG I progress, assigning position AV.121 to the new draft "Videophone for ISDN" recommendation. The coding recommendations for audio and video are transposed to AV.250 and 260 series, since they are not envisaged as necessarily specific to one teleservice. Further minor changes are made.

The outline contents of the AV recommendations (appended to H200) are revised, referencing existing Recs. or drafts where available. The complete draft appears in Part C5. It was decided to send this version of H200 to SG VIII, commenting that suggestions made for an AV 400 protocol series might well be combined into AV230 series: ~~no need for~~ any special requirements for videophone conference, etc. will be included in AV312.

see Attachment 1

5. Frame Structure for a 64 kbit/s channel in Audiovisual Teleservices : Revision of Draft Rec.H221(previously Y221) — from TD 33(XV/1) Question 5/XV

Particular attention of readers is drawn to the changed designation to H221 - this is because the initiation of a Y-Series is not now expected(see para. 2.).

Given the detailed nature of the revisions proposed or implied in documents COM XV-159, D294, D274, D300, D299, TD5, and TD16, a drafting group was set up under the chairmanship of Mr.M.Anderson(USA) ; the report of this group is given in Annex 7, and the current approved draft appears in Part ~~5C~~ C5.

see Attachment 2

Revision of Questions 4/XV and 5/XV

see Attachment 3

ATTACHMENT 1 TO DOC. #277

DRAFT RECOMMENDATION H.200
FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES

Part C.5 to WP XV/1 Report

TD 34 (XV/1)

Draft Recommendation H.200

FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES

I. Service definition

AV 100 General Recommendation for AV services

AV 110 Teleconference services — F.700
AV 111 Audiographic conference service

AV 112 Videoconference service
AV 120 Videophone service
AV 121 Basic narrow-band videophone service in the ISDN — F. ..

AV 130 ...(other AV services)

II. Infrastructure

AV 200 General Recommendation for AV service infrastructure

AV 210 Reference network configuration
AV 220 General Recommendation for Frame Structures
AV 221 Frame structure for a 64 kbit/s channel in audiovisual teleservices — H.221
AV 222 Frame structure for 384 - 2043 kbit/s channels audiovisual teleservices — H.13X
AV 223 Frame structures for use in the international interconnection of digital codecs for video conferencing or visual telephony — H.130
AV 224 ... (Frame structures for higher bit-rates)

AV 230 General Recommendation for AV system Control Indications
AV 231 Multipoint control unit for 64 kbit/s AV
AV 232 Multipoint control for 384 - 2048 kbit/s
AV 233 Multipoint international video conference system — H.243

AV 240 Principles for communication between AV terminals
AV 241 System aspects for the use of the 7 kHz audio codec within 64 kbit/s — G.72Y
AV 242 System for establishing communication between AV terminals using one or two 64 kbit/s channels

AV 250 Audio coding

AV 251	Narrow band audio coding at 64 Kbit/s	G.711
AV 252	Wideband audio coding in 64 Kbit/s	G.722
AV 253	Audio coding at 40/32 Kbit/s (using G.721/723 or extending G.722 down)	
AV 254	Narrowband speech coding at 16 Kbit/s	

AV 260 Video coding

AV 261	Codecs for videoconferencing using primary digital group transmission	H.120
AV 262	$n \times 384$ Kbit/s video codec	H.12X
AV 263	$m \times 64$ Kbit/s video codec	H.12Y

III. Systems and terminal equipment

AV 300 General Recommendation for AV Systems and Terminals

- AV 301 General Recommendation on AV terminal equipment
- AV 302 Teleconference protocol
- AV 310 Requirements for teleconferencing
- AV 311 Audiographic system and terminal requirements
- AV 312 Videoconference system and terminal requirements
- AV 320 Requirements for videophone service

IV. Network aspects

AV 400	Multipoint call setups
AV 410	Reservation systems
AV 420	HLC for use in audiovisual calls
AV 430	Call control C & I

Note 1 : Items in Section IV are outside the scope of Infrastructure considerations but nevertheless require harmonisation for satisfactory provision of AV services.

Note 2 : It is intended to merge the substance of existing Recs. H100, 110 into this framework in the next study period.

Appendix to Rec. H.200 3 34/1

PRESENT STATUS AND CONTENTS OF PROPOSED RECOMMENDATIONS IN H.200

1. SERVICE DEFINITIONS

AV100 General Recommendation for Audiovisual Services

List of specific services included in the general set
List of facilities (or "media") included in the general set

Call-control requirements, including multipoint
Interworking between various AV services

AV110 ~~Recommendation for~~ Teleconference Services

Draft Rec. F.700 (COM I-R23 Part III.T)

AV111 Audiographic conference service

Description of service; basic facilities
Optional facilities
Terminal configuration and accommodation ~~[taking into account Recommendation V110 above]~~
Control and indications ~~(see also Rec. V100)~~
Perceived performance on international calls ~~(see also Rec. V110)~~
Network accesses applicable to the service
Availability and conditions of international service
Supplementary services (call forwarding/transfer, interconnection to other types of audiovisual service terminal).
Use of telematic facilities

Quality description for audio, taking into account transducer and room performance, options as to the particular coding used from the infrastructure set, and the effect of transmission errors.

AV112 Videoconference Service

As for AV/V111 above with the following additions: ~~telematic facilities as for V112 above~~
Video system (see also ~~Rec.~~ AV/V100, V110 and V313)
Terminal configuration and accommodation includes video aspects

Quality description for video including effect of terminal transducers and room conditions, video coding options from the infrastructure set, and the effect of transmission errors (the description must take into account the fact that video coding may be changed within the network, for example from high bit rate to low bit rate coding).

AV120 ~~Recommendation for~~ Videophone Service

As for the videoconference service ~~Rec. V113~~ AV/112 above, though of course the details will differ in many respects, see also ~~Rec. T320~~ AV/120.

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AV 121 Basic narrowband videophone service in the ISDN

Draft Rec. F ... (COM I-R22 Part IV.3)

AV 130 ~~Recommendations for~~ Other Audiovisual Services

Such recommendations should cover audiovisual services not already covered by teleconferencing or videophone. Known applications are telemedicine and remote lecturing.

2. INFRASTRUCTURE RECOMMENDATIONS

AV 200 General Recommendation for Audiovisual Service Infrastructure

~~Short umbrella recommendation describing the framework for the AV200 series.~~

~~Definition of Infrastructure~~

Outline proposed in COM XV R__ (Annex 1 to Part B.5)

AV.210 ~~Recommendation for a~~ Reference Network Configuration for AV Services

Description/explanation
Definitions
Reference Configuration
Interfaces
Functional specification for multipoint working (refer to ~~Rec~~ AV 230)
Interconnections between "broadband" and lower bit-rate networks
Inter-regional interconnections

AV 220 General Recommendations for Frame Structures

Short umbrella recommendation for the AV 220 series

AV 221 ~~Recommendation for a~~ Frame Structure for 64 kbit/s channel in audiovisual teleservices

Draft Rec. H.221 (COM XV R- Part C.5)

AV 222 ~~Recommendation for~~ Frame Structures for 384-2048 kbit/s channels in AV teleservices

Utilisation of Rec H 221 with additional 64 kbit/s channels for video, etc
Utilisation of Frame Structures for 1544 and 2048 kbit/s to Rec G704

AV 230 General Recommendation for AV system control and indications

Outline proposed in COM XV R__ (Annex __ to Part B.5)

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AV 260 Video coding

AV 261 Codecs for videoconferencing using primary digital group transmission — H.120

AV 262 $n \times 384$ kbit/s video codec — H.12X

AV 263 $m \times 64$ kbit/s video codec — H.12Y

III. Systems and terminal equipment

AV 300 General Recommendation for AV Systems and Terminals

AV 301 General Recommendation on AV terminal equipment
AV 302 Teleconference protocol

AV 310 Requirements for teleconferencing

AV 311 · Audiographic system and terminal requirements

Transducers
Room disposition (mainly left to customer choice)
Processing (mixing, echo cancellation, voice switching, etc)
Noise specification
- Audio alignment (level-setting)
Subjective quality (in association with infrastructure coding options as given in ~~Recs Y33F~~).
/ AV 250 series

AV 312 Videoconference system and terminal requirements

Transducers
Room disposition and lighting
Noise specification

Processing (mixing/split-screen, switching, etc)
Video alignment
Subjective quality (including video coding options according to ~~Rec Y332~~). AV 260 series

AV 320 ~~Recommendation for Video~~ Requirements for Videophone service

Generally as for videoconference, ~~Y313~~ AV 312 above (differences of detail).

4 NETWORK ASPECTS

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AV 400 Multipoint Call Set-up

Purely from the network point of view, and nothing specifically to do with audiovisual services, there will be a need to ensure that multipoint calls can be set up in a suitable way from the human factor point of view. Clearly this must be closely co-ordinated with the requirements of teleconferencing, and of conference calls as a supplementary service to videophone and other audiovisual services (see ~~Rec. I.250~~ A/230).

Charging aspects must also be taken into account.

AV410 Reservation systems

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ATTACHMENT 2 TO DOC. #277

DRAFT RECOMMENDATION H.221

FRAME STRUCTURE FOR A 64 KBIT/S CHANNEL IN AUDIOVISUAL TELESERVICES

CCITT

Temporary Document 28 (XV/1)

WORKING PARTY XV/1

Geneva, 24-27.11.87

Question : 5/XV

SOURCE : CHAIRMAN OF THE DRAFTING GROUP FOR Y.221

TITLE : REPORT OF THE DRAFTING GROUP (Annex to Part B.5 of the report)

The drafting group met 23-24 November to draft a modified text for Rec. Y.221 "Frame structure for a 64 kbit/s channel in audiovisual applications teleservice" (Attachment 1), COM XV-159, FRG, "Revised proposal for draft Rec. Y.221" was accepted as a baseline following discussion of differences between it and the previous draft attached to COM XV-R16. In some cases the previous text was restored. Two significant changes were retained. The tables of BAS code definitions were moved to Annexes to improve the text, and several BAS codes involving audio coding at less than 48 kbit/s were left reserved, but undefined.

D.294/XV, FRG "Revised proposal for draft Rec. Y.221" included several points contained in TD 5. TD 5 (XV/1) "Liaison statement to SG XV related to complements to draft Rec. Y.221 (Q.5/XV) (Annex 2 to Part A of the Report of WP XVIII/8, COM XVIII-R45)" was taken into account as follows :

- The method of octet timing described in Attachment 1 to TD 5 was included as Y.221, section 2.5.

- The CRC4 procedure described in Attachment 2 was included as Y.221 section 2.6, it was left optional by defining default fixed states for E and C1-C4 bits when they are unused, and a provisional method for enabling and disabling error reporting by the receiving terminal was included along the lines proposed in D.274/XV Bellcore "Proposal for additions to draft Rec. Y.221".

- A means for switching to and from unframed modes was not included in draft Rec. Y.221. Instead it will be kept in mind for draft Rec. Y.242 which will define comparable procedures for ~~video telephony~~ services including video.

- The requested BAS attributes and codes for communicating terminals audio capabilities were included in Annex 3 of draft Rec. Y.221.

The method for sending BAS by (16,8) cyclic error correcting codes in 2 frame submultiframes to allow switching in 20 ms intervals was included as described in D.300/XV, Japan, "Frame structure for mx64 kbit/s videophone". The methods performance with respect to burst errors and the possibility that it may emulate the frame alignment signal are concerns which require urgent study before the next meeting.

of draft Y.221.

The BAS codes to identify ~~videophone~~ video capability proposed in D.299/XV, Japan, "Communications control procedures for mx64 kbit/s videophone" were included in Annex 3. Additional BAS codes for videophone capability negotiation and for allocation of the 64 kbit/s channel as proposed in D.299/XV and D.300/XV (op.cit) were discussed. It could not be decided to include them without further discussion of the procedures of draft Rec. Y.242. Consequently, the proposed Appendices 2 and 3 are annexed to this report.

The sequencing of data bits when 8 kbit/s subchannels are merged had been identified for further study. It was decided to transmit data bits in the same order as they are received from the Data Terminal Equipment or Data Terminal Adaptor.

To permit octet synchronization of two separate B-connections, a module 16 numbering of multiframes was specified as suggested in D.274/XV (op.cit). The method of indicating octet synchronization to the remote terminal is for further study.

SG XVIII had replied to our earlier liaison by advising us that a 128 kbit/s capability should not be considered a service candidate because a corresponding bearer capability in Rec. I.211 is yet to be agreed to (TD 6(XV/1)) "Audio visual services (§ 5 and Annex 5 of WP XVIII/1)". Considering that octet synchronization would now be accomplished for separate B-connections, a reply was drafted indicating that 128 kbit/s was not necessary, but should be kept in mind for further study because of its advantages (Annex 3).

Annex 1 to TD 28 (XV/1)

Proposed Appendix 2 to Rec. Y.221

The attribute 101 is planned for use by audio/video/data terminals. The attribute values are subject to further definition in recommendations specifying intercommunication among such terminals. Provisionally, attribute values in the range 00000 to 00111 are reserved for the purpose of indicating the possibility of further terminal capability negotiation for the specific type of terminal. Attributes in the range 01000 – 11111 are reserved for the purpose of continued negotiation, and then switching from negotiation to information transfer.

Attribute Bits 9-11	Attribute Value Bits 12-16	Meaning
101 Continued Terminal Capability Negotiation	00000	64 kbit/s audio/video/data terminal
	00001	2×64 kbit/s audio/video/data terminal
	00010 ... 00111	Reserved
	01000	Indication (standard)
	01001	Indication (non-standard)
	01010	Acknowledgment (standard)
	01011	Acknowledgment (non-standard)
	01100	64 kbit/s — Begin information transfer phase
	01101	2×64 kbit/s — Begin information transfer phase
	01110	non-standard — Begin information transfer phase
	01111 ... 11111	Reserved

Annex 2 to TD 28 (XV/1)

Proposed Appendix 3 to Rec. Y.221

The attribute 010 is planned for use by 64 kbit/s audio/video/data terminals to indicate the number of bits per frame occupied by audio, video, data, and control and indication information. Subject to further definition of this attribute in recommendations specifying such terminals, a provisional assignment of attribute values is shown.

Bit Rate Allocation for 64 kbit/s Audio/Video/Data
(for 1B type, number of bits per 10 msec frame)

Attribute Value Bits 12-16	FAS	BAS	Audio	Video	Data	C & I	Data rate (Note)
00000	8	8	160	456	0	8	
00001	8	8	160	464	0	0	
00010	8	8	0	616	0	8	
00011	8	8	0	624	0	0	
10000	8	8	160	453	3	8	Data1 = 300b/s
10001	8	8	160	461	3	0	Data1 = 300b/s
10010	8	8	0	613	3	8	Data1 = 300b/s
10011	8	8	0	621	3	0	Data1 = 300b/s
10100	8	8	160	444	12	8	Data2 = 1200b/s
10101	8	8	160	452	12	0	Data2 = 1200b/s
10110	8	8	0	604	12	8	Data2 = 1200b/s
10111	8	8	0	612	12	0	Data2 = 1200b/s
11000	8	8	160	408	48	8	Data3 = 4800b/s
11001	8	8	160	416	48	0	Data3 = 4800b/s
11010	8	8	0	568	48	8	Data3 = 4800b/s
11011	8	8	0	576	48	0	Data3 = 4800b/s
11100	8	8	160	0	452	8	Data4 = 45.2kb/s
11101	8	8	160	0	464	0	Data4 = 46.4kb/s
11110	8	8	0	0	616	8	Data4 = 61.6kb/s
11111	8	8	0	0	624	0	Data4 = 62.4kb/s

Note : Data bit rates show an example. Actual values and number of classes need further study.

Reply to SG XVIII, Q2, concerning Videophone Service using transfer rates 64, 2x64, 128 kbit/s

During its last meetings the above mentioned bitrates for a videophone service have been discussed in SG XV, Q4, Q5.
All three options have their advantages (and disadvantages). It might finally be up to the user whether he is satisfied with a quality of picture and sound obtained by using one and two B-Channels resp.
In case of using two B-Channels, each with the frame-structure given in Y.221 an alignment of both channels ~~is~~ can be provided by numbering the multiframes *
Thus a delay of < 1280 msec between both channels can be detected and compensated in the terminal.

Conclusion
It is not nessesary to define a service based on 128 kbit/s
The frame structure of Y.221 applied to multimedia service terminals will lead to a 128 kbit/s bitstream using two B-Channels with ~~[redacted]~~ ISDN call procedures

However, some administrations feel that a 128 kb/s bearer capability would have advantages for videophone services and this should be kept in mind for future study.

* See Draft Recommendation Y.221 section 2.2

Draft Recommendation Y.221

FRAME STRUCTURE FOR A 64 KBIT/S CHANNEL IN AUDIOVISUAL ~~APPLICATIONS~~ TELESERVICES

Introduction /video

The purpose of this Recommendation is to define a frame structure for audiovisual teleservices in a single 64 kbit/s channel which makes the best use of the characteristics and properties of the audio encoding algorithms, of the transmission framing structure and of the existing CCITT Recommendations. It offers several advantages:

- It takes into account CCITT Recommendations such as G.704, X.30/I.461, etc. It may allow the use of existing hardware or software;
- It is simple, economic and flexible. It may be implemented on a simple microprocessor, using well known hardware principles;
- It is a synchronous procedure. The exact time of a configuration change is the same in the transmitter and the receiver. Configurations can be changed at 20 ms intervals;
- It needs no return link, since a configuration is signalled by a repeatedly transmitted codeword;
- It is very secure in case of transmission errors, since the BAS is protected by a double error correcting code;
- It can be used to derive octet synchronisation in networks where this is not provided by other means;
- It can be used in multipoint configurations, where no dialogue is needed to negotiate the use of a data channel;
- It provides a variety of data bitrates (from 6.25 bit/s up to 64 kbit/s) to the user.
- It allows the control of a higher multiplex configuration, into which the basic 64 kbit/s channel is inserted (case of nx64 kbit/s multimedia services as videoconference);

1. Basic principle

The 64 kbit/s channel is structured into octets transmitted at 8 kHz. The eighth bit of each octet conveys a sub-channel of 8 kbit/s. This sub-channel, called Service Channel (SC), provides end-to-end signalling and consists of three parts (see Figure 1):

- Frame Alignment Signal (FAS). This signal structures the 64 kbit/s channel into frames of 80 octets each and multiframes (MF) of 16 frames each. Each multiframe is divided into ~~eight 2-frame~~ submultiframes (SMF). In addition to framing and multiframing information, control and alarm information may be inserted, as well as error check information to control end-to-end error performance and to check frame alignment validity.
  The FAS can be used to derive octet timing when it is not provided by the network.

- Bitrate Allocation Signal (BAS). This signal allows the transmission of Codewords to describe the structure of the residual 62.4 kbit/s capacity, as well as, if necessary, the structure of the primary rate multiplex in which the basic 64 kbit/s channel is inserted, in the case of n x 64 kbit/s multimedia service as videoconference or videophony. Other possibilities are under study, like describing sub-multiplexing, rate adaption and low-layer protocols of the data channels.

  Note: For some countries having 56 kbit/s channels, the net available bit rates will be 8 kbit/s less.

- Application Channel (AC).
  This channel allows transmission of binary information or the insertion of message type data channel(s) (e. g. for telematic information) at up to 6400 bit/s. A minimum required Command and Indication (C&I) channel should be provided and defined as part of the application channel (for further study). The remaining bit rate for the application channel may ~~can~~ be added to the sound, (data) or video channel. In this context, compatibility problems among audio/visual services should be considered.

The remaining 56 kbit/s capacity (with fully reserved application channel), carried in bits 1-7 of each octet, may convey a variety of signals within the framework of a multimedia service, under the control of the BAS and possibly the AC. Some examples follow:

- voice, encoded at 56 kbit/s using a truncated form of the PCM of CCITT Recommendation G.711 (A-law or mu-law).

- voice, encoded at 32 kbit/s and data at 24 kbit/s or less;

- voice, encoded at 56 kbit/s with a bandwidth 50-7000 Hz (sub-band ADPCM according to CCITT draft Recommendation G.722). The coding algorithm is also able to work at 48 kbit/s. Data can then be dynamically inserted at up to 14.4 kbit/s;

- still pictures coded at 56 kbit/s;

- data at 56 kbit/s inside an audiovisual session (e.g., file transfer for communicating between personal computers);
- sound and video sharing the 56 kbit/s capacity.

2. Frame alignment

2.1 General

An 80-octet frame length produces an 80-bit word in the Service Channel. These 80 bits are numbered 1-80. Bits 2-8 of the Service Channel in every even frame contain the frame alignment word (FAW) 0011011. These bits are completed by bit 2 in the succeeding odd frame to form the complete Frame Alignment Signal (FAS). So a pattern similar to the one in CCITT Recommendation G.704 is used (see Figure 2).

2.2 Multiframe structure

Each multiframe contains 16 consecutive frames numbered 0 to 15 divided into eight submultiframes of 2 frames each (Figure 3). The multiframe alignment signal is located in bit 1 of frames 1-3-5-7-9-11 and has the form 001011. Bits 1 of frames 8-10-12-13-14-15 are reserved for future use. Their value is provisionally fixed at 0.

Bits 1 of frames 0-2-4-6 may be used for a modulo 16 counter to number multiframes in descending order. The least significant bit is transmitted in frame 0, and the most significant bit in frame 6. The receiver may use the multiframe numbering to determine the differential delay of separate 64 kbit/s connections, and to synchronize the received signals. The use of an additional reserved bit to turn on and off the counting procedure is for further study.

2.3 Loss and recovery of frame alignment

Frame alignment is defined to have been lost when three consecutive frame alignment signals have been received with an error.

Frame alignment is defined to have been recovered when the following sequence is detected:

- for the first time, the presence of the correct frame alignment word ;
- the absence of the frame alignment signal in the following frame detected by verifying that bit 2 is a 1;
- for the second time, the presence of the correct frame alignment word in the next frame.

When frame alignment is lost, bit 3 (A) of the next odd frame is set to 1 in the transmit direction.

2.4 Loss and recovery of multiframe alignment

Multiframe alignment is used to validate the Bitrate Allocation Signal (see § 3). The criteria for loss and recovery of multiframe alignment described below are provisional.

Multiframe alignment is defined to have been lost when three consecutive multiframe alignment signals have been received with an error. It is defined to have been recovered when the multiframe alignment signal has been received with no error in the next multiframe. When multiframe alignment is lost, even when an unframed mode is received, bit 3 (A) of the next odd frame is set to 1 in the transmit direction. It is reset to 0 when multiframe alignment is regained again.

2.5 Procedure to recover octet timing from frame alignment

When the network does not provide octet timing, the terminal may recover octet timing in the receive direction from bit timing and from the frame alignment. The octet timing in the transmit direction may be derived from the network bit timing and an internal octet timing.

2.5.1 General rule

The receive octet timing is normally determined from the FAS position. But at the start of the call and before the frame alignment is gained, the receive octet timing may be taken to be the same as the internal transmit octet timing. As soon as a first frame alignment is gained, the receive octet timing is initialised at the new bit position, but it is not yet validated. It will be validated only when frame alignment is not lost during the 16 next frames.

2.5.2 Particular cases.

a - When, at the initiation of a call, the terminal is in a forced reception mode, or when the frame alignment has not yet been gained, the terminal may temporarily use the transmit octed timing.

b - When frame alignment is lost after being gained, the receive octet timing should not change until frame alignment is recovered.

c - As soon as frame and multiframe alignment have been gained once, the octet timing is considered as valid for the rest of the call, unless frame alignment is lost and a new frame alignment is gained at another bit position.

d - When the terminal switches from a framed mode to an unframed mode (by means of the BAS), the octet timing, previously gained, must be kept.

e - When a new frame alignment is gained on a new position, different from that previously validated, the receive octet timing is reinitialised to the new position but not yet validated and the previous bit position is stored. If no loss of frame alignment occurs in the next 16 frames, the new position is validated; otherwise the stored old bit position is reutilised.

2.5.3 Search for Frame Alignment Signal (FAS)

Two methods may be used: sequential or parallel. In the sequential method, each of the 8 possible bit positions for the FAS is tried. When FAS is lost after being validated, the search must resume starting from the previously validated bit position. In the parallel method, a sliding window, shifting one bit for each bit period, may be used. In that case, when frame alignment is lost, the search must resume starting from the bit position next to the previously validated one.

2.6 Description of the CRC4 procedure

In order to provide an end-to-end quality monitoring of the 64 kbit/s connection, a CRC4 procedure ~~is~~ may be used and the four bits C1, C2, C3, C4 computed at the source location are inserted in bit positions 5 to 8 of the odd frames. In addition, bit 4 of the odd frames, noted E, is used to transmit an indication about the received signal in the opposite direction whether the most recent CRC block has been received with errors or not.

When the CRC4 procedure is not used, bit E shall be set to 0, and bits C1, C2, C3, and C4 shall be set to 1 by the transmitter. Provisionally, the receiver may disable reporting of CRC errors after receiving 8 consecutive CRCs set to all 1s, and it may enable reporting of CRC errors after receiving 2 consecutive CRCs each containing a 0 bit. (This method of enabling and disabling CRC error reporting must be verified and is for further study.)

2.6.1 Computation of the CRC4 bits

The CRC4 bits C1, C2, C3, C4 are computed from the whole 64 kbit/s channel, for a block made of two frames: one even frame (containing the FAW) followed by one odd frame (not containing the FAW). The CRC4 block size is then 160 octets, i.e. 1280 bits, and the computation is performed 50 times per second.

2.6.1.1. Multiplication-division process

A given C1-C4 word located in block N is the remainder after multiplication by x^4 and then division (modulo 2) by the generator polynominal $x^4 + x + 1$ of the polynomial representation of block (N-1).

When representing the contents of a block as a polynomial the first bit in the block should be taken as being the most significant bit. Similary C1 is defined to be the most significant bit of the remainder and C4 the least significant bit of the remainder.

This process can be realized with a four stage register and two exclusive-ors.

2.6.1.2 Encoding procedure

(i) The CRC bit positions in the odd frame are initially set at zero, i.e. C1 = C2 = C3 = C4 = 0.

(ii) The block is then acted upon by the multiplication-division process referred to above in 2.6.1.1.

(iii) The remainder resulting from the multiplication-division process is stored ready for insertion into the respective CRC locations of the next odd frame.

Note: These CRC bits do not affect the computation of the CRC bits of the next block, since the corresponding locations are set at zero before the computation.

2.6.1.3 Decoding procedure

(i) A received block is acted upon by the multiplication division process, referred to above in 2.6.1.1, after having its CRC bits extracted and replaced by zeros.

(ii) The remainder resulting from this multiplicaton-division process is then stored and subsequently compared on a bit-by-bit basis with the CRC bits received in the next block.

(iii) If the decoder calculated remainder exactly corresponds to the CRC bits sent from the encoder, it is assumed that the checked block is error-free.

2.6.2. Consequent actions

2.6.2.1 Action on bit E

Bit E of block N is set to 1 in the transmitting direction if bits C1-C4 detected in the most recent block in the opposite direction have been found in error (at least one bit in error). In the opposite case, it is at zero.

2.6.2.2 Monitoring for incorrect frame alignment

In case of a long simulation of the FAW, the CRC4 information can be used to re-initiate a search for frame alignment. For such a purpose, it is possible to count the number of blocks CRC in error within 2 s (100 blocks) and to compare this number with 89. If the number of CRC blocks in error is greater than or equal to 89, a search for frame alignment should be re-initiated.

These values of 100 and 89 have been chosen in order that:

- for a random transmission error rate of 10^{-3}, the probability of incorrectly re-initiating a search for frame alignment because of

89 or more blocks in error, should be less than 10^{-4}.

- in case of simulation of frame alignment, the probability of not re-initiating a search of frame alignment after a 2 second period should be less than 2.5 %.

2.6.2.3 Monitoring for error performance

The quality of the 64 kbit/s connection can be monitored by counting the number of of CRC blocks in error within a period of 1 second (50 blocks). For instance, a good evaluation of the proportion of seconds without errors as defined in CCITT Recommendation G.821 can be provided.

For information purposes, the following propositions of CRC block in error can be computed for randomly distributed errors of error rate Pe:

Pe	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Proportion of CRC blocks in error	70%	12%	1,2%	0,12%	0,012%

By counting the received E bits, it is possible to monitor the quality of the connection in the opposite direction.

3. Bitrate Allocation Signal (BAS) and switching between configurations

The Bit rate Allocation Signal (BAS) occupies bits 9-16 of the Service Channel in every frame. An eight bit BAS code (b_0, b_1, b_2, b_3, b_4, b_5, b_6, b_7) is accompanied by eight parity bits (p_0, p_1, p_2, p_3, p_4, p_5, p_6, p_7) where the (16,8) double error correcting code is applied. This error correcting code is obtained by shortening the (17,9) cyclic code with generator polynomial:

$$g(x) = x^8 + x^7 + x^6 + x^4 + x^2 + x + 1.$$

The parity bits are calculated as coefficients of the remainder polynomial in the following equation:

$$p_0x^7 + p_1x^6 + p_2x^5 + p_3x^4 + p_4x^3 + p_5x^2 + p_6x + p_7 = RES_{g(x)}[b_0x^{15} + b_1x^{14} + b_2x^{13} + b_3x^{12} + b_4x^{11} + b_5x^{10} + b_6x^9 + b_7x^8]$$

where $RES_{g(x)}[f(x)]$ represents the residue obtained by dividing $f(x)$ by $g(x)$.

The BAS code is allocated in the even numbered frame with b_0 assigned in the bit 9 position and b_7 in the bit 16 position, while parity bits are allocated in the subsequent odd numbered frame with p_0 assigned in the bit 9 position and p_7 in the bit 16 position. The validated value of BAS applies to the next submultiframe. A change in configuration can then occur at submultiframe rate, i.e., every 20 ms. In case of loss of frame or multiframe alignment, the BAS should keep the same value as the previously validated one, until frame and multiframe alignment are recovered.

Note: The method of sending BAS with error correction is preferred by many administrations and has been incorporated in the text. However, its performance with regard to burst errors and the possibility of FAS emulation are of great concern. Administrations are requested to urgently study these points before the April '88 meeting of SG XV. If these concerns are not satisfactorily addressed, the former method of sending BAS with 3/8 majority decision will be reinstated at that meeting.

The encoding of BAS is made in accordance with the attribute method.

The three first bits (bits 9-10-11) represent the attribute number relevant to the description of the configuration. Up to now, three attributes are defined: the Audio Coding (attribute 000), the Transfer Rate (attribute 001), and the Terminal Capability (attribute 100). Other attributes are under study.

Bits 12-16 of each frame represent the values of the attributes and describe the used configuration.

Annexes 1, 2, and 3 give the coding of BAS for attributes 000, 001, and 100, and also for values of such attributes for defined services.

4. Application Channel (AC)

It occupies bits 17-80 of the Service Channel in each frame, providing a user available bitrate of 6.4 kbit/s. According to the application, different kinds of information may be inserted herein. In particular, information concerning forward error correction or end-to-end encryption which both depend on the application, could take place in the Application Channel.

The AC may be used to convey a message channel conforming to the OSI protocols where appropriate. With this message channel, a transport and a session protocol may be used to control the use of audio and data channels. For example, once the command/response procedure has agreed to open a connection, if necessary the BAS is used to adjust the capability available for data. Examples for the use of AC are given in Appendix 1.

5. Access to data within bits 1 to 7

The bits 1 to 7 of each octet can be used for voice encoded according to CCITT Recommendation G.721 or Recommendation G.722, and allow a static or dynamic allocation of data channels. The access to those channels may be realised according to standardized procedures (e.g., I.461, I.462, I.463 or ECMA-TAxx...).

The 56 kbit/s capacity may also be used to transmit data only.

In some applications, it may be desirable to combine the Application Channel with the data channel in order to have a single user-data path.

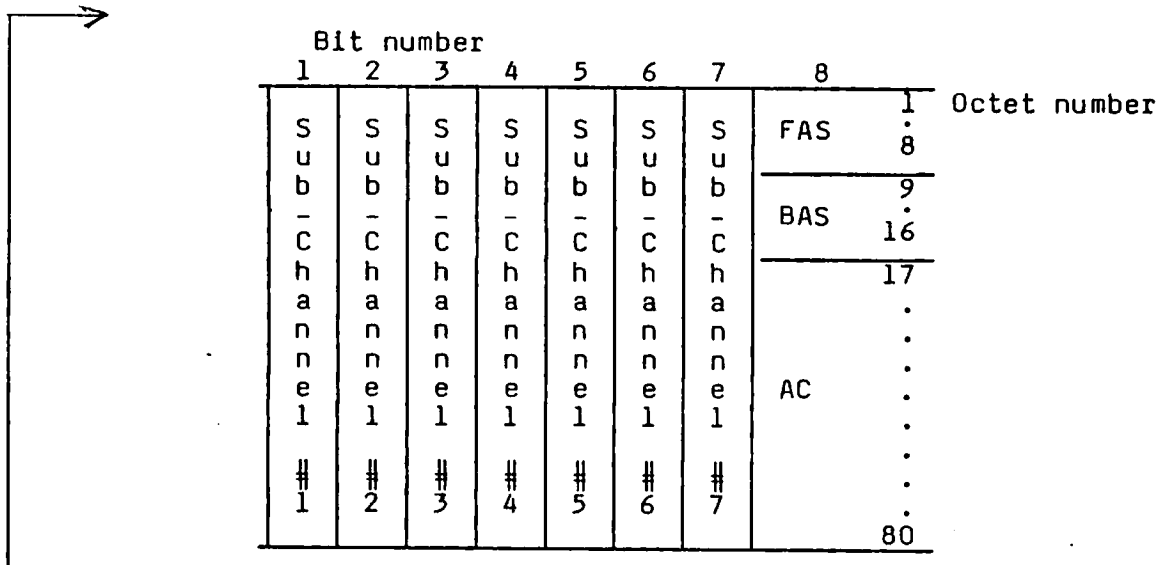

FIGURE 1

Frame structure

FAS: Frame Alignment Signal (note 1)
BAS: Bitrate Allocation Signal
AC: Application Channel

Note 1: The block termed as FAS also contains information other than that used for frame alignment.

Data is transmitted in the order received from the Data Terminal Equipment or Data Terminal Adaptor.

SUCCESSIVE FRAMES / Bit #	1	2	3	4	5	6	7	8
Even frames (those containing FAW)	Note1	0	0	1	1	0	1	1
		Frame Alignment Word						
Odd frames	Note1	1 Note2	A Note3	E	C1	C2	C3	C4
				Note 4				

FIGURE 2

Assignment of bits 1-8 of the Service Channel in each frame

Note 1: see Section 2.2 and Fig. 3

Note 2: Bit used to avoid simulation of FAW by a frame-repetitive pattern.

Note 3: A - Loss of either frame or multiframe alignment indication.
(0 = alignment 1 = loss)

Note 4: The use of bits E and C1-C4 is described in 2.6.

	Sub-Multi-Frame	Frame	Bits 1 to 8 of the Service Channel in every frame							
			1	2	3	4	5	6	7	8
Multiframe	SMF 1	0	R1	0	0	1	1	0	1	1
		1	0	1	A	E	C1	C2	C3	C4
	SMF 2	2	R2	0	0	1	1	0	1	1
		3	0	1	A	E	C1	C2	C3	C4
	SMF 3	4	R3	0	0	1	1	0	1	1
		5	1	1	A	E	C1	C2	C3	C4
	SMF 4	6	R4	0	0	1	1	0	1	1
		7	0	1	A	E	C1	C2	C3	C4
	SMF 5	8	R5	0	0	1	1	0	1	1
		9	1	1	A	E	C1	C2	C3	C4
	SMF 6	10	R6	0	0	1	1	0	1	1
		11	1	1	A	E	C1	C2	C3	C4
	SMF 7	12	R7	0	0	1	1	0	1	1
		13	R9	1	A	E	C1	C2	C3	C4
	SMF 8	14	R8	0	0	1	1	0	1	1
		15	R10	1	A	E	C1	C2	C3	C4

FIGURE 3

Assignment of bits 1-8 of the Service Channel in each frame in a multiframe

R1-R10: Reserved for future use - Provisionally set to 0
A, E, C1-C4: As in figure 2.

Annex 1

Attribute 000 used for BAS encoding for defined services

Attribute Bits 9-11	Attrib. value Bits 12-16	Meaning
000 Audio coding	00000	"Neutralised channel"(the 62.4 kbit/s user data are unused)
	S001	PCM G.711 (truncated to 7 bits) (Note 1) (Note 2)
	0	A law; data at 0 or 6.4 kbit/s Mode 0F
	1	u law; data at 0 or 6.4 kbit/s Mode 0F
	S0001	32 kbit/s ADPCM (Note 3) data at 0 or 6.4 kbit/s
	001	64 kbit/s unframed mode (Note 4)
	00	PCM Alaw Mode 0
	01	PCM u law Mode 0
	10	SB-ADPCM G.722 Mode 1 (Note 5)
	11	0 kbit/s; data at 64 kbit/s Mode 10
	S1	Variable bitrate audio coding
	000	G.722 56 kbit/s; data at 0 or 6.4 kbit/s Mode 2
	001	G.722 48kbit/s; data at 8 or 14.4 kbit/s Mode 3
	010 ... 110	Reserved for audio coding at bit rates less than 48 kbit/s (Note6)
	111	0 kbit/s; data at 56 or 64kbit/s Mode 9 (Note 7)
	10000	Free
	101xx	Free

Note 1: The 8th bit is fixed to 0 in the audio PCM decoder.

Note 2: The S bit set to 1 indicates that the Application Channel is merged with the data channel to form a single user-data path. The method for merging the two channels is shown in Figure A1 for the 14.4 kbit/s case.

Note 3: The coding law and respective place of data and audio in each byte of the 64 kbit/s channel is under study.

Note 4: Attribute values 001xx imply the switching to an unframed mode. In the receive direction, reverting to a framed mode can only be achieved by recovering frame and multi-frame alignment, which might take up to 2 multiframes (ie 320 ms).

Note 5: The allocation of bits in each byte of the 64 kbit/s channel is as follows:

Audio bitrate	1	2	3	4	5	6	7	8
64 kbit/s	H	H	L	L	L	L	L	L
56 kbit/s	H	H	L	L	L	L	L	S
48 kbit/s	H	H	L	L	L	L	D	S

S = Service channel
H = High band audio
L = Low band audio
D = Data channel

Bitrates of 56 and 48 kbit/s are respectively modes 2 and 3 of Recommendation G.722.

Note 7: The whole of the 56 (or 62.4) kbit/s is used for data and the audio channel is not available.

Note 6: Audio coding bitrates of 40-32-24-16-8 kbit/s require further study.

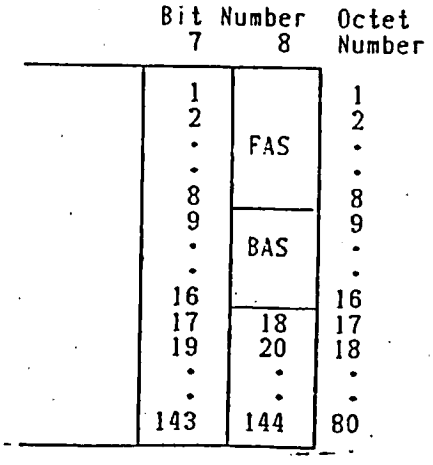

FIGURE A.1

Bit number for a merged 14.4 kbit/s data channel

Annex 2

The following list gives a possible assignment of codes for attribute 001 and requires further study.

Attribute Bits 9-11	Attrib. value Bits 12-16	Meaning
001 Transfer Rate	00000	64 kbit/s
	00001	64 kbit/s(audio) + 64 kbit/s (data/video)
	01010	384 kbit/s .: 64(audio)+ 320(video)
	01011	64 " 256 " +64(data)
	01100	768 kbit/s .: 64 " 704 "
	01101	64 " 640 " 64 "
	01110	1152 kbit/s .: 64 " 1088 "
	01111	64 " 1024 " 64 "
	10000	1536 kbit/s .: 64 " 1472 "
	10001	64 " 1408 " 64 "
	10010	1920 kbit/s .: 64 " 1856 "
	10011	64 " 1792 " 64 "

Attribute 001 used for BAS encoding (provisional values)

Annex 3

The following list gives a possible assignment of codes for attribute 100 and requires further study. This attribute is used to exchange terminal capabilities.

Attribute Bits 9-11	Attribute Value Bits 12-16	Meaning
100 Terminal Capability	00000	Neutral
	00001	G.72Y Type 0 - A law
	00010	G.72Y Type 0 - mu law
	00011	G.72Y Type 1 - G.722
	00100	G.72Y Type 1 - G.722 + data
	00101	} Reserved
	00110	
	00111	Reserved for national use
	01000 ... 01110	} Reserved
	01111	Reserved for national use
	10000	64 kbit/s audio/video/data terminal
	10001	2x64 kbit/s audio/video/data terminal
	10010 ... 10110	} Reserved
	10111	Reserved for national use
	11000 ... 11110	} Reserved
	11111	Reserved for national use

Note 1: The neutral value indicates no change in the current capabilities of the terminal.

Note 2: Types 0, 1, and 2 are defined according to Recommendation G.72Y section 2.

- Type 0 terminal can work in mode 0 (PCM) only.

- Type 1 terminal preferably works in mode 1 (G.722) but is able to work in mode 0.

- Type 2 terminal preferably works in mode 2 (G.722 + Y.221) but is able to work in modes 1 and 0.

Appendix 1

Examples for the use of the Application Channel

1 Binary information

Each bit of the Application Channel may be used to convey the information of a 100 bit/s channel, repeated 100 times per second. If odd and even frames are identified, each bit may carry the 50 Hz bit/s channels. If multiframing is used, each bit may carry the information of 16 channels, each at 6.25 bit/s.

An example of this kind of information is, in teleconference, the use of a bit to synchronize the encoder clock on the receive clock, or to indicate the microphone number, or to signal the use of the graphics mode, etc...

2 Synchronous message-type channel

As each bit of the Application Channel represents a bitrate of 100 bit/s, any synchronous channel working at n x 100 bit/s may be inserted in the Application Channel. An example is, in videoconference, the Message Channel at 4 kbit/s which is used for multipoint management.

Another possibility is the insertion of data channels at one of the bitrates defined in CCITT Recommendation X.1, according to CCITT Recommendation X.30/I.461: "Support of X.21 and X.21 bis based DTEs by an ISDN". The present frame structure is consistent with the X.30/I.461 frame structure in a double way:

- it has the same length (80 bits by bearer channel at 8 kbit/s);
- it needs 63 bits per frame (17 bits are used for framing information not to be transmitted), which fits into the 64 bits available in this frame structure.

3 Asynchronous message-type channel

In case of asynchronous terminals, X.1 bitrates are relevant, too. The applicable standard is the ECMA standard ECMA-TAxx "Bitrate adaption for the support of synchronous and asynchronous terminal equipment using the V-series interfaces on a PSTN". This standard also uses the same 80-bit frame structure as X.30/I.461 mentioned above. The Application Channel will therefore allow adoption of this ECMA standard if needed.

4 Error correction and encryption

When needed, forward error correction and encryption information may be transmitted in the Application Channel. The bitrate and the protocol to be used will depend on the application.

ATTACHMENT 3 TO DOC. #277

REVISED TEXTS FOR QUESTIONS 4/XV AND 5/XV

Annex 6

Question m/XV - Visual telephone services : videoconferencing and videophone (Continuation of Question 4/XV studied in 1984-1988)

Considering

1) that Rec.H.100 provides a generic definition of services involving the transmission of visual information on networks for telephony and other telecommunications services, and that such services include videoconferenceing (as defined in Rec.F (=Y.110)) and videophone (as defined in Rec.F (=Y.120), an example being that of Rec.F (=Y.121)),

2) that a number of videoconferencing systems are already in operation and interworking of these videoconferencing systems are required;

3) that a number of Administrations are examining the introduction of a videophone service through ISDN, and that experiments and trials of such services are in progress in a number of countries,

4) that the scale of demand has not yet been established; and

that differing facilities may be required by different classes of subscribers, but these have not yet been clearly identified and defined;

5) that the possibility of international use must be a basic feature of any such service; and

that the problem of international working will be easier to resolve if they are studied while national plans are still in a preliminary and formative stage;

6) that, since digital transmission is economical and suitable for long-distance visual communications, the long-distance transmission for the visual telephone service will be digital; moreover, Narrowband ISDN and future Broadband ISDN will be used for providing the visual telephone service;

7) that, in addition to videoconferencing and videophone, it is expected that other various services such as video lecturing, video transmission, surveillance, video information retrieval will be required, and

that intercommunication between audiovisual terminals for those sevices is essential;

8) that, for videoconferencing, a reservation system for booking calls is required to ensure connections at the time of actual usage;

9) that Recommendations H.120, H.12x specify the coding algorithms at primary rate and nx384 kbit/s,

The following subjects should be studied:

A. For the moving picture system

1. What system architecture should be recommended?

a) structure of system using ISDN or other networks, for different services,

b) hypothetical reference connections and circuits,

c) national extensions,

d) user interfaces with network,

e) synchronization and timing aspects.

f) requirements for signalling and switching

2. What system parameters and transmission standards should be recommended?

a) performance objectives for the HRCs,

b) bit rates to be used on the connection,

c) frame structure for different bit rates,

d) communication procedures and channels for system control signals,

e) characteristics of interfaces with the local network and with subscriber terminals,

f) methods for the combined and separate transmission of sound and picture,

g) characteristics of audio channels.

3. What equipment specification can be recommended?

a) specification of worldwide unique video coding algorithm, parameters and equipment in various bit rates such as nx384 kbit/s, mx64 kbit/s for Narrowband ISDN,

b) video coding algorithm, parameters and equipment for Asynchronous Transfer Mode (ATM) in Broadband ISDN, in paticular;

- use of static bandwidth flexibility offered ATM,
- variable bit rate video coding techniques,
- influence of cell loss on image quality,
- coder/decoder synchronization in presence of cell delay jitter,
- harmonization of distributive and communicative video services,

c) transmission equipment specially designed for the visual telephony, such as remultiplexers, television standard convertors, transcoders, etc.

4. What characteristics should be recommended for the subscriber terminals and their environments ?

a) terminal functions desired for various services,

b) requirements to the lighting and acoustic environments where terminal equipments are placed,

c) interfaces between user and terminal, e.g. for video, speech, data etc.,

d) functional specification for interworking, particularly C&I (control and indication) signals.

5. What Recommendtions can be made for multipoint visual telephony?

a) specification of multipoint videoconferencing (and videophone) systems using standardized video codecs, particularly on,

- system architecture,
- communication control protocol,
- picture processing method,
- speech processing method,
- data signal handling.

6. What Recommendations can be made on aspects of quality?

a) methods of subjective testing; these studies should include the development of test tapes containing standardized sequences of moving pictures with different degree of motion,

b) evaluation of pictures containing distortion in both spatial and temporal aspects,

c) effects of large signal delay,

d) quality aspects of the tandem connection of codecs.

7. What special Recommendations can be made for videoconferencing?

a) specification of control and data signals for the split-screen system, and their transmission methods,

b) specification of communication reservation system, particularly on,

- necessary information,
- parameter definition and values,
- service capabilities,
- protocol for international interworking.

8. What revision is necessary for to existing Recommendations of the H.100 series?

B. For the still picture system

1. What system parameters should be recommended for the transmission of still pictures or sequences of still pictures?

END

ANNEX 2

Source: Rapporteur for Q5/XV

Title: **STUDY PERIOD 1989-1992: REVISION OF Q5/XV ON MULTIFACILITY SERVICES**

Considering the progress made during the current study period on Q5/XV, and on the related questions Q4/XV, Q17/I, Q18/VIII, Q19/VIII, Q26/VIII, and Q3/II, it is suggested that a complete revision of the question would now be appropriate. The following proposal is offered as a starting point.

Question a/B - Harmonisation of Audiovisual Services
(Continuation of Q.5/XV studied in 1984-1988)

Considering that

1. Audiovisual services are to be offered, in which different combinations of facilities (speech, pictures, telematics, etc), may be used during a connection; such services include videoconferencing, audiographic and telematic teleconferencing, and videophone, as studied in other Questions, as well as other services which may be defined in the future for special applications;

2. Such services should be offered for the simultaneous interconnection of two, three, or more terminals in different locations as necessary; frequently, interconnection may be between terminals which are not identical in the facilities which they have available; indeed, in general intending callers will not be aware of the capabilities of the distant terminal;

3. In the case of three or more terminals, one or more multipoint control units (MCU) will be required within the network to distribute appropriately the signals representing the various facilities;

4. Under some circumstances, connections will be required between terminals on networks operating at different bit rates; in particular, services such as videophone and videoconference may be offered both on broadband and narrowband networks, requiring gateways between these for interconnection;

5. In addition to the facilities perceived by the user, other signals will be required for the proper organisation and control of the system, especially in a multipoint environment;

6. The Recommendation H200 sets out a framework for Recommendations covering the defined services and the necessary technical conditions for implementing them in a harmonised and interworkable way;

The following questions should be studied:

1. What basic signal structures should be defined for utilisation on interconnections of various bit rates corresponding to the bearer services defined in Rec ...?

2. How should recommended coding methods for audio and still or moving television images and telematics facilities be incorporated into such basic signal structures, such that optimal interworking conditions are secured; what procedures are to be followed to establish correct interworking between similar and dissimilar terminals, taking into account the facilities available in each;

3. What harmonised set of control and indications should be made available within the technical implementation to facilitate correct operation and provide information required by user-friendly terminals?

4. What should be the specification of multipoint control units for the various types of interconnection, and the procedures required for establishing multipoint calls on digital networks?

5. What specifications should be applied to equipment required at gateways between different networks and/or interconnection bit rates?

NDK/1200

Attachment 4 to Doc. #277

SOME DRAFT OUTLINE RECOMMENDATIONS

1) Objectives for Audiovisual Service Recommendations as listed in draft Rec. H.200

2) AV200 GENERAL RECOMMENDATION FOR INFRASTRUCTURE FOR AUDIOVISUAL TELESERVICES

3) AV230 OUTLINE GENERAL RECOMMENDATION FOR AUDIOVISUAL SYSTEM CONTROL AND INDICATIONS

4) AV240 PRINCIPLES FOR COMMUNICATION BETWEEN AUDIOVISUAL TERMINALS

5) AV320 VIDEOPHONE SYSTEMS AND TERMINAL EQUIPMENT

OBJECTIVES for AUDIOVISUAL SERVICE RECOMMENDATIONS as listed in draft Rec.H200

(Please notify Q5/XV Rapporteur of status changes)

	Shortened Title		*R = Rec. 1988* *A = Annex to 1985-88 report* *N = Rec. next study period*	
AV100	General AV Services	I	R	Drafted
AV110	Teleconference	I	R	Draft F-tcs
AV111	Audiographic Teleconference	I	N	
AV112	Telematic Teleconference	I	N	
AV113	Videoconference	I	N	
AV120	Videophone Services	I	A	Drafted
AV121	ISDN Videophone	I	R	Drafted
AV130...	Other AV Services	I		
AV200	General AV Infrasructure	XV	A	Outline
AV210	Reference Network	XV	N	
AV220	Gen.Frame Structures	XV	N	
AV221	64kb/s Frame Structure	J	R	Draft H221
AV222	nx384kb/s Frame Structure	XV	R	**Draft required**
AV230	Gen. C&I	J	A	Outline
AV231	64kb/s Multipoint	J	A	Drafted
AV232	nx384kb/s Multipoint	XV	N	
AV233	Multipoint system for H120/130	XV	R	Drafted H233
AV240	Communication, principles	XV	A	Drafted
AV241	System aspects of wideband audio	XVIII	R	Draft G72Y
AV242	System asp. AV 1or2x64kb/s	XV	A	Drafted
AV250	Audio coding	XVIII	N	
AV251	Narrowband speech in 64kb/s	XVIII		*Red Book,G711*
AV252	Wideband (7kHz) audio in 64kb/s	XVIII		*Accel. Proc. G722*
AV253	Audio coding at 40/32kb/s	XVIII	N	
AV254	Narrowband speech, 16kb/s	XVIII	N	
AV260	Video Coding	XV		
AV261	Videoconf codecs, 2/1.5Mb/s	XV		*Red Book H120/130*
AV262	nx384kb/s video codec	XV	R	Drafting H12X
AV263	2x64kb/s AV codec	XV	A	Draft required, H12Y
AV300	Gen.AVsystems/terminals	?		
AV301	Gen.AV terminal equipment	J	N	
AV302	Teleconference protocol	J	A	
AV310	Gen. Teleconf.	J	N	
AV311	Audiographic teleconference	VIII	A	Draft T122
AV312	Videoconference	XV	N	
AV320	Videophone	XV	A	Outline

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DRAFT OUTLINE REC AV200: GENERAL RECOMMENDATION FOR INFRASTRUCTURE FOR AUDIOVISUAL TELESERVICES

1. INTRODUCTION

    1.1 Definition of Infrastructure (applies between "network" and "application"; covers 64 kbit/s)
    1.2 Need for Harmonistion
    1.3 Relationship to Network Aspects

2. COVERAGE

    2.1 List of Applicable AV Teleservices (as in AV100)
    2.2 Applicable Attributes (Nos 10-13 of SG XVIII List)
    2.3 List of Applicable Facilities

3. ELEMENTS OF INFRASTRUCTURE

    3.1 Reference Network Configurations
    3.2 Frame Structures
    3.3 Control and Indications
    3.4 Communication and Intercommunication
    3.5 Audio and Video Coding

Footnote: it is proposed that, when complete and adopted, this Rec should be designated H201.

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AV 200
AV230

DRAFT REC AV230: OUTLINE GENERAL RECOMMENDATION FOR AUDIOVISUAL SYSTEM CONTROL AND INDICATIONS

CONTENTS

SM

1. INTRODUCTION

Some functions are control, suggesting or requiring action/response; others are merely to make for good ergonomics by providing indications as to system status, capabilities, etc. Both controls and indications (C&I) organised into a consistent set, applicable to the full range of AV services. However, for any one service it is not mandatory to implement the complete set (see §8), though the system behaviour in the presence of non-implemented C&I must be clearly defined. The applicable services are listed in AV100.

2. CLASSIFICATION

- Audio C&I
- Video C&I
- Data Channel C&I
- Other Conference C&I
  (Chairman control &c)
- Interworking C&I

3. REFERENCE MODEL FOR AV SYSTEMS

(NB: this section may be more appropriate to AV210 since it is also needed in AV240)

3.1 Terminals (see Fig AV230/3.1)

Elements:
- User, object external to the technical system, background
- Transducers (mic, l/s, camera, monitor, keyboard, display/ indicators ...)
- Processing 1 (switching between mic &c; mixing &c; associated storage)
- Processing 2 (codecs, synthesis/analysis, associated storage
- Multiplex and transmission framing
- Network termination
- Call control processing

3.2 Call Configurations (see Fig AV230/3.2)

Point-to-point calls:
- calling terminal A, (T_A)
- called terminal B, (T_B)

Multipoint calls:
- multipoint control unit(s), (MCU)
- convenor terminal (T_R), for which the MCU reservation is made if required
- chairman ("conductor") terminal (T_C)

Interworking calls: (see also AV240)
- terminal in normal-application operation
- terminal in fallback (interworking) operation
- internetwork gateway
- application interworking service unit

4. FUNCTIONAL TYPES OF C&I

- Control (= "for action")
- Indicator (= "for information")

4.1 Control (C)

4.2 Indication (I)

The information transmitted cannot result in any action other than the presentation of audible and/or visible information to users*; the presentation itself may not be mandatory, such presentations being most often at the discretion of the terminal manufacturer or user, but the availability of the information is important for standardisation.

5. C&I DEFINITIONS

6. DYNAMIC RELATIONSHIPS

7. FORMAT OF C&I

7.1 64 kbit/s Channels

8. C&I REQUIRED/AVAILABLE FOR LISTED AV SERVICES

Table AV230/8 (not drafted) will show subsets for videophone (basic), videoconference ...

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*Exceptionally, a terminal manufacturer may elect to use such information for other purposes, but there is no effect on the Recommended AV system other than through the specified C&I.

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DRAFT REC AV240: PRINCIPLES FOR COMMUNICATION BETWEEN AUDIOVISUAL TERMINALS

CONTENTS

AV240

1. INTRODUCTION

All AV services must intercommunicate, though it is obvious that total intercommunication is in most cases impossible because of the limited capabilities (such as transducers) available at the terminals connected. The concept of Grade of Intercommunication is defined to take account of this problem, the available Grades ranging from full-facility to explanatory indications only.

The foremost principle of intercommunication is that the intercommunicating users should receive at least the service corresponding to the highest common capabilities of their terminals; that is, the service is restricted only by the mutually available facilities and not by incompatibilities of signal formats. This principle must include the extension of the meaning of 'facilities' to different attributes (or sub-attributes) of those facilities, and in particular must include:

- quality of audio (3kHz, 7kHz, 15kHz, stereo) and video (SPTV, MPTV of various qualities)
- bit-rate (eg, 3kHz audio at 64 or 16 kbit/s; video at 34, 140 Mbit/s)

2. SERVICES AND FACILITIES COVERED

2.1 Services (reference to Y100)

2.2 Facilities

It should be noted that the term "media" has been used in some CCITT documents: since this term may be misleading, the word "facilities" is preferred here.

- audio (2.2.1)
- video (2.2.2)
- telematics (2.2.3)
- telewriting
- other applications, controls and indications

The most common intercommunication situations in AV services are those involving differences in the "normal" operating modes of audio, and likewise of video; these differences have to be resolved by adoption of a common mode. Under some circumstances it may be possible to provide conversion capabilities within the network or elsewhere, to promote communication even between different terminal facilities (eg facsimile to still-picture TV conversion); these possibilities are for further study.

2.2.1 Audio - 3kHz, PCM A or mu-law, 64/56 kbit/s
- 3kHz, 16 kbit/s
- 7kHz, 64/56/46 kbit/s; 40/32 kbit/s, less than 7kHz (G722 extended?)
- 15kHz, 384 kbit/s (J41)
- 3kHz, 8 kbit/s (?)
- 15kHz, stereo, 768 kbit/s (J41)

2.2.2 Video - 320 kbit/s MPTV (or /n x 384 - 64/ kbit/s)
- 48-128 kbit/s MPTV
- greater than 30 Mbit/s MPTV (various, for further study)
- Rec H120
- SPTV

2.2.3 Telematics - facsimile
- teletex
- videotex

2.2.4 Telewriting

2.2.5 Other C&I - conference control
- remote camera control &c

3. SERVICE ASPECTS OF INTERCOMMUNICATION BETWEEN DIFFERENT AUDIOVISUAL TERMINALS

(Insert Definition of Intercommunication)

3.1 Grades of Intercommunication

GRADE I - All facilities are available that are normally available for the service of the "calling" terminal. This grade may be sub-divided as follows:

GRADE IA - no compromises are made in respect of quality or other human factors (eg, indications)

GRADE IB - although all the facilities are available, in some respects, such as video quality, there is a compromise or degradation.

GRADE II - Some useful communication between terminals is possible but not all facilities are available; the control and indication system makes the users aware of the constraints.

GRADE III - No useful communication is possible; the call set-up procedures are such that no call is established but the reason for this is (or can be, according to terminal facilities) made clear to the calling party.

NOTE - Grades IB and II are of course to be supported by the detail of compromises, degradation, mismatch, etc involved.

3.2 Multilevel Matrix Structure

Given the variety of service classes, services, and applications that are required to intercommunicate, the representation of intercommunication possibilities is necessarily complex; the complexity is increased by the fact that, in some cases, there may be more than one service providing a particular application (thus, for example, videophone is actually a group of services comprising broadband videophone, narrowband videophone). A multi-level matrix representation is used to set out the intercommunication possibilities; the levels contain increasing amounts of detail, to enable the use of a zoom concept to arrive at necessary detail without losing sight of the overall structure. The levels are as follows:

(a) A matrix of service class and group intercommunication, with the calling service group on the vertical axis and the called service group on the horizontal axis;

(b) A matrix of service intercommunication, giving the cellular detail of (a);

(c) An expansion of (b), detailing the methods of intercommunication which are possible, together with information on audio/video coding, quality, etc.

Matrices (in draft form) following this structure are given as Figure AV240/4(a)-(c).

4. PRINCIPLES OF INTERCOMMUNICATION BETWEEN SPECIFIC AUDIOVISUAL SERVICES

References are made in this section to certain cells or cell groups in Fig Y240/4(a)-(c), thus: A/R2C3:6 refers to Fig AV240(a), row 2 and columns 3 through 6.

4.1 Intercommunication with Telephony

All AV terminals have PCM audio capability, in A-law or u-law format according to region. The telephone terminal user sees Grade I intercommunication (A/R1C2:5), while the AV terminal user sees Grade II (A/R2:5C1).

4.2 Intercommunication Between Different "Services" for the Same Application

4.2.1 Basic Narrowband and Broadband Videophone Services

The only perceived service variations in the basic services (ie, no optional enhancements included, see section 4.2.3) are in the qualities of audio and video. The user of the lower-quality terminal sees Grade I intercommunication (B/R5C6) while the other user(s) sees Grade IA (B/R6C5).

4.2.2 Basic Narrowband and Broadband Videoconference Services

(similar to 4.2.1)

4.2.3 Optional Enhancements to Videophone and Videoconference Services

All services will support enhanced terminals (the term 'enhanced' generally refers to additional applications facilities, such as a document camera, facsimile machine, and so on). Two cases are distinguished:

(a) a data channel is required; once opened, the telematic procedures are invoked to establish communication if the terminals have compatible telematic equipments.

(b) no data channel is required; messages are exchanges to establish communication if the terminals have compatible facilities.

In either case, if one terminal has no such available standardised procedural capability and/or no compatible applications equipment, then information to this effect is generated by the C&I system and must(?) be displayed in some way at both (all) terminals.

4.2.4 Proprietary and/or National Options to Videophone and Videoconference Services

The recommendation will provide the mechanism only, not the content.

4.3 Intercommunication Between Different Applications in the Class "Conversational Services"

4.3.1 Between Videophone (Vp) and Videoconference (VC)

Audio communication is assured, at 7kHz (G722) if the Vp is so equipped, otherwise 3kHz. Moving picture communication is possible if either the codecs are normally working to the same algorithm, or the VC codec is equipped to fallback to the Vp algorithm. Further study is necessary to determine whether it is reasonable to include in the VC codec Recommendation (H12x) a clause making the Vp fallback capability mandatory.

4.3.2 Between Audiographic Teleconference (AGC) and Videophone or Videoconference

(to be completed)

4.4 Intercommunication Between Services in Different Classes

4.4.1 Between Conversational and Messaging Services
4.4.2 Between Conversational and Retrieval(/Storage) Services
4.4.3 Between Conversational and Distribution Services

5. PRACTICAL ASPECTS OF INTERCOMMUNICATION

5.1 General Approach

The approach shown in Table 1 may be useful.

Since various types of AV terminals will be developed in the future, a hand-shaking process between the terminals prior to the communication phase is required: each terminal must indicate what media (Level 1 indication) and what coding algorithm (Level 2 indication) it has. In the case of facsimile, Rec T30 defines this procedure. For AV terminals, Series AV240 Recommendations are expected to play this role. This aspect is discussed in greater detail in the next section. However, in the case of AV terminals using different channel types (different step 1 properties in Table 1, eg, B, H0, H1 ... channel), it will be necessary to perform the hand-shaking in the D channel protocol.

5.2 Call Phases

An AV service call can be divided into the following five phases if we apply the concepts contained in Recommendation T30 for document facsimile transmission.

Phase A: Call establishment
Phase B: Pre-message procedure
Phase C: Audiovisual message transmission
Phase D: Post-message procedure
Phase E: Call release

To ensure intercommunication between various types of AV service terminals, all terminals are requested to have at least a common Phase B procedure. If a call is established between two terminals, common operation modes are discovered through this procedure before actual AV service signal transmission. If there are no common modes, this fact should be indicated to both terminals before call release.

This approach has already been incorporated in Draft G72Y for audio capability aspect related to the use of 7kHz audio codecs within 64 kbit/s. The idea is to utilise flag and timing sequences in the service channel of the Y221 frame structure. This procedure should be extended to cover all aspects of AV terminal capabilities.

5.3 Call Set-up

Call set-up between any two AV terminals must be assured.

Calls between an AV terminal and an audio-only terminal (3kHz or 7kHz telephony) must also be assured, but may take place in one of three ways:

(a) Telephone accepts a call from an audiovisual terminal, at the first attempt and without special action by the user;

(b) Telephone does not answer an audiovisual call request, but AV terminals are programmed to repeat call attempt requesting only telephony;

(c) Telephone does not answer an audiovisual call; AV terminal users are required to activate a telephony mode in their terminal before the first or second call attempt.

In all three cases, AV terminals accept calls from telephones. The implementation of (b) or (c) is a matter for the terminal manufacturer; the preferred method (a) requires further study to establish suitable practices for ISDN (and other switched network) call set up.

5.4 Phases B and D: In-channel (non-message) Intercommunication

5.4.1 Audio Intercommunication

G722 fallback to PCM (A or mu-law)
16 kbit/s fallback to PCM (A or mu-law)
8 kbit/s fallback to 16 kbit/s and PCM (A or mu-law)
G721 or extend G722 to 32 kbit/s working (?)
Optional(?) G722 with also 16 kbit/s fallback (Type 2bis)
J41 codec optional fallback to G722 and PCM
Stereo J41 codec fallback to mono
and optional fallback to G722 and PCM.

5.4.2 Video Intercommunication

Single algorithm for 48-128 kbit/s moving picture TV ("V_L")
Single algorithm for 320- n x 384-64 kbit/s moving picture TV ("V_M")
Fallback from V_M to V_L for further study
No fallback from high-bit-rate video codecs to V_L or V_M - for further study (interworking to be via network gateway in these cases)
Interworking between SPTV and MPTV for further study.

5.4.3 Telematics Intercommunication

5.4.4 Controls and Indication for Intercommunication

(to be completed)

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OUTLINE DRAFT REC AV320: VIDEOPHONE SYSTEMS AND TERMINAL EQUIPMENT

PROPOSED CONTENTS

1. SCOPE

This Recommendation covers the technical requirements for videophone services. As a minimum two videophone services are standardised: narrowband videophone, and broadband videophone; the possibility of standardising more than one narrowband videophone service is not precluded for the time being.

(See Appendix 1, Note 1)

The service requirements for videophone services are presented in Recommendation Y120; video and audio coding systems, and other technical aspects common to audiovisual services are covered in other Recommendations in the Y-series.

2. DEFINITIONS

(to be completed)

3. SYSTEM DESCRIPTION

3.1 Block Diagram and Identification of Elements

Videophone instrument; camera; monitor; microphone; loudspeaker; handset; control unit; audio codec; video codec; transmission multiplex; network termination; interfaces (...); optional enhancements (low speed data port, document camera, facsimile ...); broadband/narrowband gateway.

(NB: for interworking arrangements, see section 5.)

AV320

3.2 Signals

Videophone signals are classified as video, audio, data 1, and data 2, as follows:

Audio signals are continuous traffic and require real-time transmission (Note 2).

Video signals are also continuous traffic; the bit rate allocated to video signals should be as high as possible, in order to maximise the quality within the available capacity.

Data 1 signals include still pictures, facsimile, and documents, or other facilities requiring bit rates comparable with those for audio or video; this signal occurs only occasionally as required, and may temporarily displace all or part of the audiovisual signal content; it should be noted that data 1 signals are associated only with optional enhancements to the basic videophone system; therefore the opening of a path to carry such signals is preceded by negotiation between the terminals.

Data 2 signals include telewriting/marker, and some system control signals by definition the path provided for these signals is permanent and at a fairly low bit rate (for example 2400 bits per second).

3.3 Infrastructure and Bit Rate Options

The following types of channel configurations for videophone service are being considered:

Type A ("Vp 64"): one B-channel (eg, 16 kbit/s audio and about 46.4 kbit/s video).

Type B ("Vp 128") Note: two B-channels (eg, 64 kbit/s audio plus, 64 kbit/s video)
or
(eg, 16 kbit/s audio plus about 109.6 kbit/s video)

Type BB ("Vp-BB"): a broadband system (high quality audio and high bit-rate video).

(Separate Recommendations AV321, 322 ... will be formed for those systems finally selected for standardisation.)

NOTE: It is desired to standardise only one configuration for Type B from engineering point of view. This matter is, however, subject to market/service requirements.
There must be provision for basic interworking of audiovisual facilities between all such systems standardised, albeit at the qualities applicable to the lower bit rate (Note 3).

3.4 Videophone Vp 64

Use of AV221 frame structure; use of video coding system Rec H12Y (proposed assignment for video coding Recommendation at 45-128 kbit/s); use of audio coding to Rec G72N (16 kbit/s); identified subset of C&I from Rec AV230 (audiovisual system control and indications).

3.5 Videophone Vp 128

Here are two examples listed. Choice of one of these or other configurations is for further study.

1. Example of 16 kbit/s Audio

Synchronisation of two B-channels (use of AV221 frame structure in both channels); audio coding to Rec G72N; video coding to Rec H12Y (proposed assignment for video coding at 45-110 kbit/s); C&I to Rec AV230.

2. Example of 64 kbit/s Audio-Plus

Use of frame structure AV221; audio coding to Rec G722 (48-64 kbit/s ADPCM 7kHz); video coding to Rec H12Y; C&I to Rec Y230.

3.6 Broadband Videophone

Frame structure; audio coding to Rec G722?; video coding to Rec H12(m) - (refers to high-bit-rate video coding for local networks); C&I to Rec AV230.

3.7 Call Control Arrangements

Establishment of audio call prior to establishment of second channel if applicable.

3.8 Optional Enhancements

(to be completed)

4. TERMINAL REQUIREMENTS

4.1 Audio

Microphones and sound system; loudspeakers; echo; audio alignment.

4.2 Video

Cameras; monitors; lighting; video alignment.

4.3 Control and Indications (C&I)

C&I are chosen from the general audiovisual set contained in Rec AV230. Very few C&I are needed for the basic videophone service.

AIA - indicate audio active: not-AIA shows that the source has been muted; AIA does not indicate whether anyone is actually speaking.

VIA - indicate video active; not-VIA is important, indicating that the video source has deliberately been suppressed - there is no transmission fault involved.

VRA - ready to activate video: required if mutual readiness of terminals to transmit/receive video is necessary prior to setting up a suitable signal path or activating the exchange on an existing path.

4.4 Optional Enhancements

Equipment requirements (to be completed).

Control and indications: appropriate C&I to be selected from AV230.

5. INTERWORKING

The mechanisms for interworking with other services are described in this section. References made to general mechanisms as set out in Rec AV240, AV241 ...

5.1 Interworking Between Different Videophone Terminal Types

Videophones Vp 64 and Vp 128
Videophones Vp 64 and Vp-BB
Videophones Vp 128 and Vp-BB

5.2 Interworking With Telephony

Interworking with ISDN telephones
Interworking with PSTN telephones

5.3 Interworking With Videoconferencing

Videophones Vp 64/Vp 128 and videoconference VC 384
Videophone Vp-BB and videoconference VC 384
Videophones Vp 64/Vp 128 and videoconference VC-BB
Videophone Vp-BB and videoconference VC-BB

5.4 Interworking With Audiographic Teleconferencing

5.5 Interworking With Video Surveillance

APPENDIX 1

NOTE 1: It is anticipated that this Recommendation will be split into a number of Recommendations AV321, 322 ... each of which would cover a single videophone service (narrowband, broadband ...). However large parts of these Recommendations would have identical wording, while in the points of divergence the actual choices between alternatives have not yet been made; for the time being therefore it is convenient to treat all the text in a single document.

NOTE 2: In order to reduce the average bit rate of audio signals, voice activation can be introduced (in which case the audio signals are no longer continuous!).

NOTE 3: Such provision must be in the network, if it is not possible in the terminals.

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