

TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

T.39
(10/97)

SERIES T: TERMINALS FOR TELEMATIC SERVICES

Application profiles for simultaneous voice and facsimile terminals

ITU-T Recommendation T.39

(Previously CCITT Recommendation)

### ITU-T T-SERIES RECOMMENDATIONS

### TERMINALS FOR TELEMATIC SERVICES

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#### **ITU-T RECOMMENDATION T.39**

### APPLICATION PROFILES FOR SIMULTANEOUS VOICE AND FACSIMILE TERMINALS

#### **Summary**

This Recommendation defines the procedures to be applied to allow Group 3 facsimile transmission simultaneously with at least speech and audio communication over the GSTN by making use of the capabilities of recommendations describing analogue or digital simultaneous voice and data transmission (Recommendations V.61, V.70 and H.324).

These procedures will allow:

- initiation of a facsimile call and enabling simultaneous speech communication during the call;
- initiation of a voice call and enabling simultaneous facsimile transmission during the call;
- initiation of a multimedia call and enabling simultaneous facsimile transmission during the call.

The use of simultaneous voice and fax capability is an option of Group 3 facsimile communication.

### **Source**

ITU-T Recommendation T.39 was prepared by ITU-T Study Group 8 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 16th of October 1997.

#### **FOREWORD**

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### APPLICATION PROFILES FOR SIMULTANEOUS VOICE AND FACSIMILE TERMINALS

(Geneva, 1997)

### 1 Scope

This Recommendation defines the procedures to be applied to allow Group 3 facsimile transmission simultaneously with at least speech and audio communication over the GSTN by making use of the capabilities of recommendations describing analogue or digital simultaneous voice and data transmission (Recommendations V.61, V.70 and H.324).

These procedures will allow:

- initiation of a facsimile call and enabling simultaneous speech communication during the call;
- initiation of a voice call and enabling simultaneous facsimile transmission during the call;
- initiation of a multimedia call and enabling simultaneous facsimile transmission during the call.

The use of simultaneous voice and fax capability is an option of Group 3 facsimile communication.

### 2 References

#### 2.1 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent editions of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- ITU-T Recommendation G.723.1 (1996), Speech coders: *Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s*.
- ITU-T Recommendation H.223 (1996), Multiplexing protocol for low bit rate multimedia communication.
- ITU-T Recommendation H.324 (1996), Terminal for low bit rate multimedia communication.
- ITU-T Recommendation H.245 (1997), Control protocol for multimedia communication.
- ITU-T Recommendation T.4 (1996), Standardization of Group 3 facsimile terminals for document transmission.
- ITU-T Recommendation T.30 (1996), *Procedures for document facsimile transmission in the general switched telephone network.*
- ITU-T Recommendation T.66 (1997), Facsimile code points for use with Recommendation V.8 bis.
- CCITT Recommendation T.90 (1992), Characteristics and protocols for terminals for telematic services in ISDN.
- ITU-T Recommendation V.8 (1994), Procedures for starting sessions of data transmission over the general switched telephone network.
- ITU-T Recommendation V.8 bis (1996), Procedures for the identification and selection of common modes of operation between data circuit-terminating equipments (DCEs) and between Data Terminal Equipments (DTEs) over the general switched telephone network and on leased point-to-point telephone-type circuits.
- ITU-T Recommendation V.34 (1996), A modem operating at data signalling rates of up to 33 600 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits.

- ITU-T Recommendation V.61 (1996), A simultaneous voice plus data modem, operating at a voice plus data signalling rate of 4800 bit/s, with optional automatic switching to data-only signalling rates of up to 14 400 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone type circuits.
- ITU-T Recommendation V.70 (1996), *Procedures for the simultaneous transmission of data and digitally encoded voice signals over the GSTN, or over a 2-wire leased point-to-point telephone type circuit.*
- ITU-T Recommendation V.75 (1996), DSVD terminal control procedures.
- ITU-T Recommendation V.76 (1996), Generic multiplexer using V.42 LAPM-based procedures.

#### 2.2 Informative references

- ITU-T Recommendation V.25 ter (1997), Serial asynchronous automatic dialling and control.

#### 3 Abbreviations

This Recommendation uses the following abbreviations:

AL-SDU Adaptation Layer Service Data Unit (see Recommendation H.223)

ANS V.25 answer tone

ANSam V.8 modulated answer tone

ASVD Analogue Simultaneous Voice and Data communication

ASVF Analogue Simultaneous Voice and Facsimile communication

CCITT International Telegraph and Telephone Consultative Committee

CRC Cyclic Redundancy Check

DCE Data Communication Equipment

DCN Facsimile disconnect signal

DSVD Digital Simultaneous Voice and Data communication

DSVF Digital Simultaneous Voice and Facsimile communication

DTE Data Terminal Equipment

GSTN General Switched Telephone Network

HDLC High-level Data Link Control, per ISO/IEC 3309

ISO International Organization for Standardization

ITU-T International Telecommunication Union – Telecommunication Standardization Sector (former CCITT)

LAPM Link Access Procedures for Modems (per Recommendation V.42)

LCN Logical Channel Number (per Recommendation H.223)

MSVF Multimedia Simultaneous Voice and Facsimile communication

SE Session Exchange (per Recommendation H.233)

SVF Simultaneous Voice and Facsimile communication

UNERM Unacknowledged Non-Error Recovery Mode

#### 4 Introduction

#### 4.1 Simultaneous voice and facsimile modulation schemes

Several schemes may be employed to provide simultaneous voice and facsimile transmission over the GSTN. These schemes all make use of modulation techniques for voice and data transmission defined by the V-Series Recommendations. Three Application Profiles are defined in this Recommendation. These are:

- ASVF, based on the V.61 scheme, which is an analogue simultaneous voice and data (ASVD) scheme;
- DSVF, based on V.70, which is a digital simultaneous voice and data (DSVD) scheme;
- and MSVF, based on the H.324 scheme, which is a multimedia terminal based scheme.

Wherever the term "voice" is used, it applies to the transmission of speech and other audio information such as may occur during voice transmission over the GSTN.

In SVF operation, the terms "calling" and "called" terminals do not necessarily correspond to actions in initiating and responding to SVF operation. This is especially true when SVF operation is initiated after a voice call has been established.

NOTE – One other simultaneous voice and data scheme is under study in Recommendation V.34 (draft Recommendation V.34Q). This may be included in future extensions of this Recommendation. It is expected to use similar Application Profiles to the V.61, V.70, or H.324-based profile depending on whether they are ASVD, DSVD, or H.324 based.

### 4.2 Overview of the V.61-based simultaneous voice and facsimile scheme (ASVF)

The V.61-based simultaneous voice and facsimile (ASVF) operation utilizes the modulation scheme standardized in Recommendation V.61 – A simultaneous voice plus data modem, operating at a voice and data signalling rate of 4800 bit/s, with optional automatic switching to data-only signalling rates of up to 14.4 kbit/s. The V.61 modulation scheme provides data only communication at rates up to 14.4 kbit/s, and data communication during voice operation in the direction of voice at a minimum rate of 4.8 kbit/s with automatic rate changes up to 14.4 kbit/s during silence. In the voice and data mode V.61 provides two full duplex virtual channels, one of which is used for voice communication; the other for any type of data, including facsimile.

This Application Profile describes how the data channel of a V.61 ASVD device may be used for facsimile transmission (ASVF) at the same rates as the defined data operations. The facsimile transmission method used is that described in Annex C/T.30, analogue mode (G3V). The use of V.8 *bis* is inherent in the ASVD procedure.

Facsimile terminals based on this application profile will be able to perform all standard Group 3 functions as well as any selected optional functions when connected to any other Group 3 terminal. The ASVF functionality is only available when the initial V.8 *bis* procedures identify the called terminal as possessing the same ASVF capabilities as those of the initiating terminal. The particular SVF mode chosen depends on the capabilities identified during the V.8 *bis* procedures. The SVF operation is only invoked upon request by the initiating or responding terminal, either at the initiation of or during the call. Likewise, SVF operation may be terminated at any time during the call.

#### 4.3 Overview of the V.70-based simultaneous voice and facsimile scheme (DSVF)

The V.70-based simultaneous voice and facsimile (DSVF) operation utilizes the methods standardized in Recommendation V.70. This scheme provides one or more voice channels and one or more data channels multiplexed together and transmitted via a V.32 bis or V.34 modem.

This Application Profile for simultaneous voice and facsimile describes how the data channel of a DSVD device may be used for facsimile transmission at the same rates as the defined data operations. The facsimile transmission method used is that described in Annex C/T.30, analogue mode (G3V). The use of V.8 *bis* is inherent in procedures based on Recommendation V.70.

Facsimile terminals based on this application profile will be able to perform all standard Group 3 functions as well as any selected optional functions when connected to any other Group 3 terminal. The DSVF functionality is only available when the initial V.8 *bis* procedures identify the responding terminal as possessing the same DSVF capabilities as those of the initiating terminal.

### 4.4 Overview of the H.324-based simultaneous voice and facsimile scheme (MSVF)

The H.324 -based simultaneous voice and facsimile (MSVF) operation utilizes the methods standardized in the relevant H.324-Series of Recommendations, which include:

- The dual-mode 5.3/6.3 kbit/s Audio Codec (Recommendation G.723.1) encodes the audio signal from the microphone for transmission, and decodes the audio code which is output to the speaker. Other audio codecs of H.324 (e.g. G.729) are optional.
- The Control Protocol (H.245) provides end-to-end signalling for proper operation of the H.324 terminal, and signals all other end-to-end system functions including reversion to analogue speech-only telephony mode. It provides for capability exchange, signalling of commands and indications, and messages to open and fully describe the content of logical channels (such as of a dedicated T.30 facsimile channel).
- The Data Protocols (running over dedicated H.245 logical channels) support data applications such as electronic whiteboards, still image transfer, file exchange, database access, audiographics conferencing, remote device control, network protocols, etc. In this Recommendation, the T.4/T.30 facsimile protocols are used as Data Protocol after H.245 negotiation, selection and logical data channel opening.
- The Multiplex Protocol (H.223) multiplexes transmitted media components, such as video, audio, data (in this Recommendation facsimile) and the H.245 control stream into a single bit stream, and demultiplexes a received bit stream into various multimedia streams. In addition, it performs logical framing, sequence numbering, error detection, and error correction by means of retransmission, as appropriate to each media type.
- The modem (V.34) converts the H.223 synchronous multiplexed bit stream into an analogue signal that can be transmitted over the GSTN, and converts the received analogue signal into a synchronous bit stream that is sent to the Multiplex/Demultiplex protocol unit. V.25 *ter* is used to provide control/sensing of the modem/network interface, when the modem with network signalling and V.8/V.8 *bis* functional elements are a separate physical item. The use of V.8 *bis* is a mandatory part of the procedures.

This scheme provides – depending on the V.34 modem speed achieved – aggregate multimedia transmission speed up to 33.6 kbit/s. The obtained speed of facsimile transmission depends on the actual mix of all multimedia channels being used.

### 5 Operational modes

Facsimile terminals based on this Recommendation shall be able to perform all standard Group 3 functions as defined in Recommendations T.4 and T.30, as well as any supported optional functions when connected to any other Group 3 terminal. The SVF functionality is only available when the initial V.8 *bis* procedures identify the responding terminal as possessing the same SVF capabilities as those of the initiating terminal.

The following operational modes are possible in a SVF capable facsimile terminal:

- 1) initiation as SVF call;
- 2) switch to SVF call during voice call;
- 3) switch to voice only during SVF call;
- 4) SVF terminal to standard facsimile terminal:
- 5) voice only call.

Each of these operational modes will be described.

These procedures may be invoked by either the calling or called terminal. The terminal invoking the procedures is termed the *initiating* terminal, the other terminal is the *responding* terminal.

#### 5.1 Initiation as SVF call

The SVF call establishment procedures using V.8 *bis* are illustrated by Table 1 and the diagrams in Figures 1a and 1b. These figures are illustrative of the normal procedure and are not comprehensive. Reference should be made to Recommendation V.8 *bis* for implementation of all events and error conditions.

NOTE – In "Call Events" of Tables 1, 2 and 3 the "Selected SVF mode initialization" of the MSVF mode includes H.245 initialization, capability exchange and opening H.223 logical channels for voice and for facsimile.

Table 1/T.39 – Call establishment for SVF, with inclusion of V.8 bis signalling

Call event No.	Initiating station	Responding station
1	Equipment detects dial tone and dials desired number. To clearly indicate to normal telephone users that they are inadvertently connected, CNG will be transmitted during the time that signals are attempted to be connected.	
2		Equipment detects ring and answers the call
3		Transmit MR <sub>e</sub> and optionally, a recorded verbal announcement may be transmitted
4	Transmit ES <sub>r</sub> ; MS	
5		Transmit ACK
6	Select SVF mode using V.8 bis (Rec. V.61, V.70 or H.324)	Select SVF mode using V.8 bis (Rec. V.61, V.70 or H.324)
7	Selected SVF mode initiated	Selected SVF mode initiated
8	Begin T.30 duplex procedures	Begin T.30 duplex procedures

### 5.2 Switch to voice only during SVF call

#### 5.2.1 Switch to SVF call during voice call with known SVF capabilities

The SVF call establishment procedures during a voice call when SVF capabilities are known using V.8 *bis* are illustrated by Table 2 and the diagrams in Figure 2. This figure is illustrative of the normal procedure and is not comprehensive. Reference should be made to Recommendation V.8 *bis* for implementation of all events and error conditions.

#### 5.2.2 Switch to SVF call during voice call with unknown SVF capabilities

The SVF call establishment procedures during a voice call when SVF capabilities are not known using V.8 *bis* are illustrated by Table 3 and the diagrams in Figure 3. This figure is illustrative of the normal procedure and is not comprehensive. Reference should be made to Recommendation V.8 *bis* for implementation of all events and error conditions.

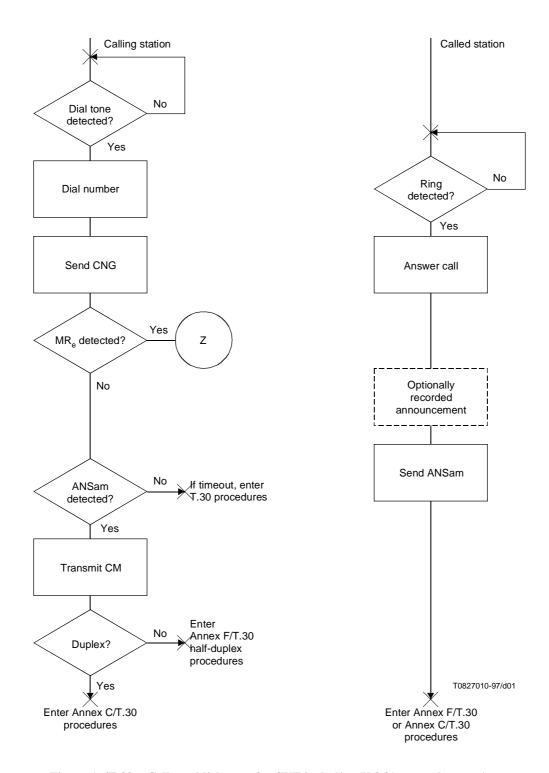


Figure 1a/T.39 – Call establishment for SVF including V.8 bis procedures – 1

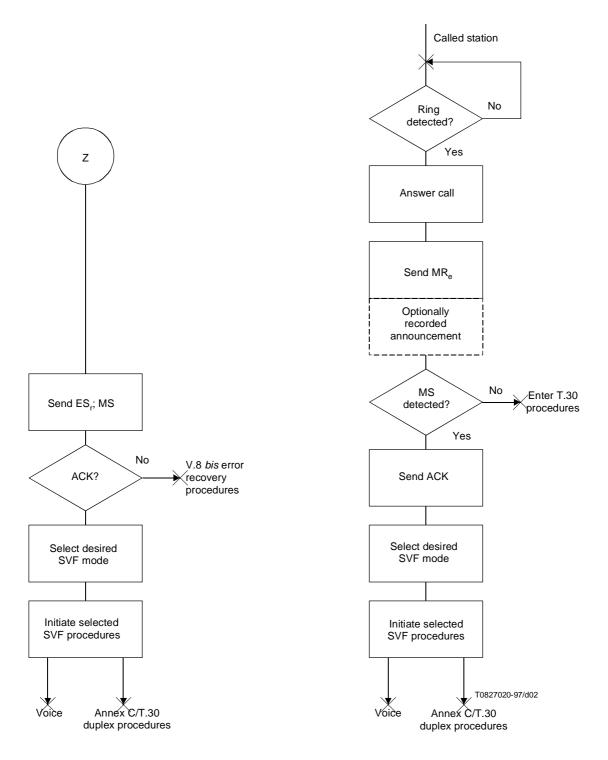


Figure 1b/T.39 - Call establishment for SVF using V.8 bis procedures

Table 2/T.39 – Call establishment for SVF during a voice call, with inclusion of V.8 bis signalling when SVF capability is known

Call event No.	Initiating station	Responding station
1	Calling party detects dial tone and dials desired number	
2		Called party detects ring and answers the call
3	Voice call in progress	Voice call in progress
4	Transmit ES <sub>i</sub> ; MS	
5		Transmit ACK
6	Select SVF mode (Rec. V.61, V.70 or H.324)	Select SVF mode (Rec. V.61, V.70 or H.324)
7	Selected SVF mode initiated	Selected SVF mode initiated
8	Begin T.30 duplex procedures	Begin T.30 duplex procedures

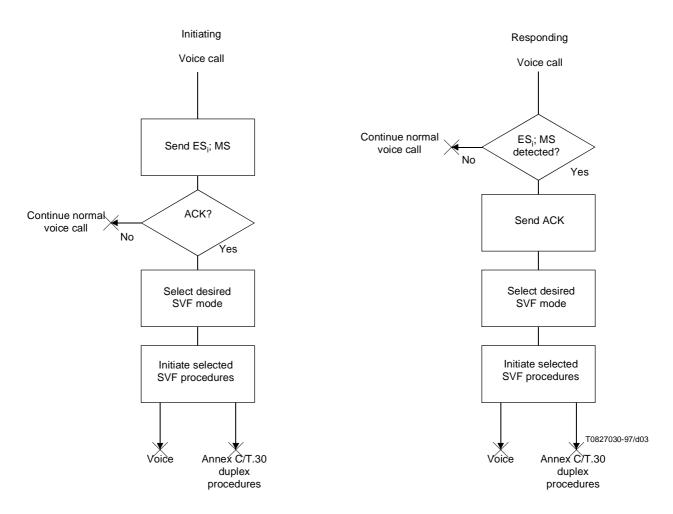


Figure 2/T.39 - Call establishment for SVF during voice call with known SVF capabilities

Table 3/T.39 – Call establishment for SVF during a voice call using when SVF capabilities are not known, with inclusion of V.8 *bis* signalling

Call event No.	Initiating station	Responding station
1	Calling party detects dial tone and dials desired number	
2		Called party detects ring and answers the call
3	Voice call in progress	Voice call in progress
4	Transmit MR <sub>d</sub>	
5		Transmit CL, MS
6	Transmit ACK	
7	Select SVF mode (Rec. V.61, V.70 or H.324)	Select SVF mode (Rec. V.61, V.70 or H.324)
8	Selected SVF mode initiated	Selected SVF mode initiated
9	Begin T.30 duplex procedures	Begin T.30 duplex procedures

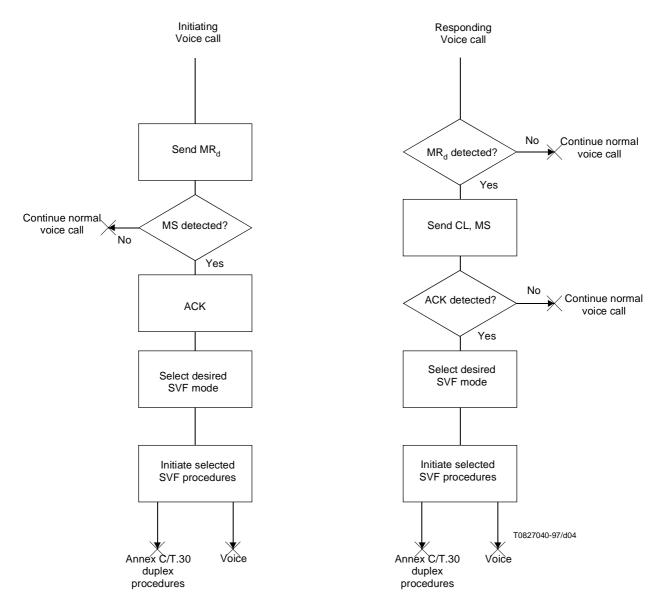


Figure 3/T.39 - Call establishment for SVF during voice call, SVF capability not known

### 5.3 Switch to voice only during SVF call

The user terminates the facsimile transmission. SVF procedures terminate when the facsimile DCN signal is received.

In MSVF, after the facsimile transmission is terminated the used logical channel will be closed, and the voice only mode will be entered.

#### 5.4 SVF terminal to standard facsimile terminal

In this instance the called terminal will not respond to the V.8 *bis* signal indicating SVF capability and default to normal T.30 procedures.

### 5.5 Voice only call

In this case no ES is sent and normal voice telephony takes place, even though the SVF capable facsimile terminal is connected to the line.

### **6** Facsimile operation during SVF

All SVF terminals shall use Annex C/T.30 protocol for facsimile procedures.

In SVF using V.61 the facsimile procedures will take place on the data channel.

In SVF using V.70 or H.324 the facsimile procedures will take place on a dedicated logical channel.

#### 6.1 Indications for Recommendation T.30

This subclause specifies Annex C/T.30 duplex analogue mode (G3V) elements mandatory to SVF operation.

The DIS/DCS and DTC settings for the bits of Table 2/T.30 indicated shall be according to Table 4 for SVF.

**Table 4/T.39** 

Bit No.	DIS/DTC	DCS
7	Set to "1" (Frame size = 64 octets preferred)	Invalid
28	Set to "0"	1 (Frame size = 64 octets)
66	Set to "0"	Set to "0"
67	1 (Duplex and half duplex operation)	1 (Duplex operation)

The timer settings shall be as specified in Table C.2/T.30.

#### 6.2 Indications for Annex F/T.90

Transmission of the XID is optional. When the XID is transmitted the Telematics Profile Indicator (TPI) block in the XID information field shall indicate G3V as the facsimile type identifier.

#### 6.2.1 UDS information for ASVF

The User Data Subfield (UDS) of the XID information field may be employed to indicate the data rates to be used in transmission over the channel. In order to be able to designate minimum and maximum available data rates, where the data rates may be variable, two pair of G3V parameter octets are defined to carry this information. The first pair indicates the minimum channel data rate, and the second pair indicates the maximum data rate. The first octet in each pair is the most significant of the octet pair. The value encoded in each pair is the channel rate in bits per second, divided by (decimal) 100. Thus for example, a 28.8 kbit/s channel rate is coded by the ordered pair 01H, 20H.

The data rate in the data-only mode and during audio silence is set based on channel conditions, in the same manner as in V.17. Recommendation V.17 provides data rates of 4.8 to 14.4 kbit/s. The minimum data rate during audio is 4.8 kbit/s in the direction of the audio.

Table 5 contains a coding example of XID content, based on Annex F/T.90:

Table 5/T.39 – Example coding of TPI content for SVF in the XID information field for ASVF

Octet(s)	Content	Value	Notes
1	Flag	7EH	
2	Address	01H	The address of the called terminal is 01H.
3	Control	F5H	The Poll/Final bit should be set to 0, therefore the octet value is as stated.
4	Format Identifier Subfield	84H	XID format identifier. The Datalink Layer Subfield (DLS), which would follow this octet, is null.
5	User Data Identifier	FFH	Start of User Data Subfield (UDS).
6	Telematics Profile Identifier	01H	Start of Telematics Profile Identifier (TPI) Block.
7	Length Indicator	06H	Length of balance of TPI block, and therefore specific to this example.
8	Group 3C (G3V) analogue network mode	14H	Coding for the G3V analogue network mode. See 3.1.4/T.90. Note that the most significant octet precedes the least significant octet for both rate parameters, and rate units are 100s of bit/s.
9	Length Indicator	04H	Length of G3V rate parameters.
10-11	Minimum Data Rate, bit/s	00H, 30H	Minimum data rate of 4800 bit/s indicated.
12-13	Maximum Data Rate, bit/s	00H, 90H	Maximum data rate of 14 400 bit/s indicated.
14-15	FCS	xxH, xxH	
16	Flag	7EH	

#### 6.2.2 UDS information for DSVF and MSVF

UDS information is not used by DSVF and MSVF.

#### 6.3 Indications for Recommendation V.76

Error correction is inherent in the use of Annex C/T.30 for facsimile communication. Therefore, the Unacknowledged Non-Error Recovery Mode (UNERM) of V.76 shall be used to effect simultaneous voice and facsimile transmission when in DSVF mode.

The use of the Suspend/Resume operation of Recommendation V.76 is optional in DSVF.

#### 6.4 Operation on H.324

H.324 SVF terminals are required to offer at least one voice channel and one data channel carrying T.30 facsimile procedures and shall signal their capability to support these channels in their H.245 **AlternativeCapabilitySet**.

The use of V.8 bis signalling is mandatory for H.324 SVF terminals.

Interworking with basic Group 3 facsimile machines is provided by emulating T.30 procedures. All H.324 based SVF terminals shall interwork with Basic Group 3 facsimile machines.

Facsimile procedures in SVF operation shall be carried using the HDLC Frame Tunneling data protocol of H.324 and using the T.30 data application codepoint defined in Recommendation H.245. The facsimile data channel shall be carried over the H.223 multiplex using the AL1 adaptation layer in the segmentable mode. The data channel carrying the T.30 procedures shall be opened using the bidirectional logical channel procedures of H.245.

Error correction is inherent in the use of Annex C/T.30 for facsimile communication. Therefore, the HDLC Frame Tunneling data protocol of H.324 shall be used to effect simultaneous voice and facsimile transmission when in MSVF mode.

NOTE – When T.434 file transfer is desired during an SVF session, it should preferably be done as a T.30 optional capability.

#### 6.5 Indications for V.8 bis

In addition to indicating any other terminal capabilities, SVF capable terminals shall use the following indications.

#### 6.5.1 Indications for SVF using V.61

Octet 1 of the Standard Information Field – Simultaneous Voice and Data {NPar(2)} Coding for the simultaneous voice and data function shall indicate V.61 (bit 2).

Octet 1 of the Standard Information Field – T.30 facsimile {NPar(2)} coding shall indicate V.61 (ASVF-bit 4).

#### 6.5.2 Indications for SVF using V.70

Octet 1 of the Standard Information Field – Simultaneous Voice and Data {NPar(2)} Coding for the simultaneous voice and data function shall indicate V.70 (bit 1).

Octet 1 of the Standard Information Field – T.30 facsimile {NPar(2)} coding shall indicate V.70 (DSVF-bit 5).

#### 6.5.3 Indications for SVF using H.324

Octet 2 of the Standard Information Field – T.30 facsimile {NPar(2)} coding shall indicate H.324 (MSVF-bit 1).

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