INTERNATIONAL TELECOMMUNICATION UNION

Amendment 1

ITU-T

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STANDARDIZATION SECTOR
OF ITU

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TERMINALS FOR TELEMATIC SERVICES

CHARACTERISTICS AND PROTOCOLS FOR TERMINALS FOR TELEMATIC SERVICES IN ISDN

Amendment 1 to
ITU-T Recommendation T.90

(Previously "CCITT Recommendation")

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

Amendment 1 to ITU-T Recommendation T.90 was prepared by the ITU-T Study Group 8 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 11th of November 1994.

The previous version of ITU-T Recommendation T.90 was approved on 25th of February 1992.

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NOTE

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

CONTENTS

CHARACTERISTICS AND PROTOCOLS FOR TERMINALS
FOR TELEMATIC SERVICES IN ISDN

Summary

This Recommendation defines the functional profile for base standards ISO/IEC 7776, 8208 and 8885 to provide the lower layers of the telematic services stack when operating on the ISDN. Attention is also paid to the terminal selection procedure related to telematic services using protocols other than the above e.g. group 3 document facsimile transmission over the ISDN.

Parameter values are recommended to ensure good throughput when operating via long delay connections such as satellite routes. Backward compatibility with the *Blue Book* version has been maintained.

Three methods of negotiating the lower layer parameter values have been included to satisfy various connection scenarios, e.g. completely within the ISDN or between the ISDN and other digital networks.

This Recommendation supplies the network layer definition in Recommendation T.70 for telematic terminals but not the transport layer definition which is still retained as the telematic transport layer definition.

Modifications

1)   In Table of Contents, add:

"Annex F – Terminal selection procedures for ISDN telematic terminal"

2)   Modify 1.1 as follows:

"1.1   General

The Integrated services digital network (ISDN) supports a wide range of voice and non-voice services and applications in the same network via a multipurpose usernetwork interface.

This Recommendation describes the requirements for telematic terminals, developed for ISDN application, and connected to an ISDN via an I-Series interface.

For example, teletex (defined in Recommendation T.60), group 4 facsimile (defined in Recommendation T.563) and videotex (defined in Recommendations T.102 and T.103).

Telematic terminals supporting both teletex and group 4 facsimile in mixed mode of operation (defined in Recommendation T.561) are also covered by this Recommendation.

The terminal selection procedure is defined with particular regard to telematic terminals supporting protocol stacks other than those used by the above-mentioned terminals e.g. group 3 document facsimile transmission on the ISDN according to Annex C/T.30.

Terminal requirements to support other telematic services are for further study.

Terminals developed for the provision of telematic services in circuit switched public data networks (CSPDNs), packet switched public data networks (PSPDNs) and public switched telephone networks (PSTNs), using terminal adaptors to access the ISDN are not covered by this Recommendation (see Note 1).

Interworking with existing telematic terminals connected to CSPDNs, PSPDNs and PSTNs, thereby maintaining the telematic service integrity, should be possible, but is outside the scope of this Recommendation (see Note 2).

This Recommendation includes several negotiation mechanisms for selection of terminals and optional parameters.

NOTES

1   For implementation guideline, consideration of incoming calls and information elements for facsimile terminals are described in Appendix I.

2   For rate adaptation function, see Appendix V."

3)   Add Annex F as follows:

Annex F

Terminal selection procedures for ISDN telematic terminals

(This annex forms an integral part of this Recommendation)

F.1   Introduction

This annex describes the terminal selection procedures for the telematic terminals, for example, the different types of digital facsimile terminals which may be attached to the ISDN. The annex extends the procedures defined in Annexes D and E. It does not replace these annexes but it is more flexible and should be used for future designs.

F.1.1   There are several mechanisms for terminal selection provided by the ISDN, e.g., sub-addresses or the full E.164 number used in a multiple subscriber number supplementary service.

In addition to the bearer capability, higher layer or lower layer compatibility checking can also be considered as mechanisms for terminal identification. However, these information fields are not universally available particularly on international connections or on calls which do not terminate in the ISDN at both ends. Therefore an in-band terminal identification mechanism has also been defined to maximize the probability of successful communication.

The in-band negotiation takes place by the exchange of XID frames. The format of these frames is defined in ISO/IEC 8885. A special XID format identifier (FI = 84H) has been allocated to telematic terminal negotiation by the ISO.

F.1.2   Terminal selection – General

Considering that there is more than one type of 64 kbit/s facsimile terminal in the ISDN, the following terminal selection procedure is specified. Figure F.1 shows the scope of selection for operation mode on ISDN.

This selection procedure includes backward compatibility to 64 kbit/s facsimile terminals based on the February 1992 version of Recommendation T.90 and the *Blue Book* 1988, and also provides function selection in multimode terminals.

F.1.3   ISDN facsimile calls are established via the D-channel and the terminal selection fields BC, LLC and HLC shall be used at the calling terminal. At the receiving terminal these fields may not be available. This procedure is referred to as out-band terminal selection. Tables F.1, F.2, F.3 define the parameter values for each type of terminal.

F.1.4   Once the ISDN connection has been established it is possible to undertake further negotiation via the B-channel. This negotiation process is based on the exchange of XID frames and is referred to as the in-band procedure. This is an extension of the technique described in Annex C and illustrated in Annex E. A different format identifier FI (FI = 84H) is used in the XID frame because it is carrying extra information to define telematic terminal types in addition to layer 2 parameters. The previous FI = 82H is defined for general usage, whereas the FI = 84H is defined for ITU-T Recommendations in the T-series.

The contents of the two types of XID frame are shown in Figure F.3 and the SDL diagrams illustrating the start-up procedure are in Figures F.5.

In the unusual case that there is some conflict between the in-band and out-band procedures, then, the in-band procedure has precedence because it takes place later in time.
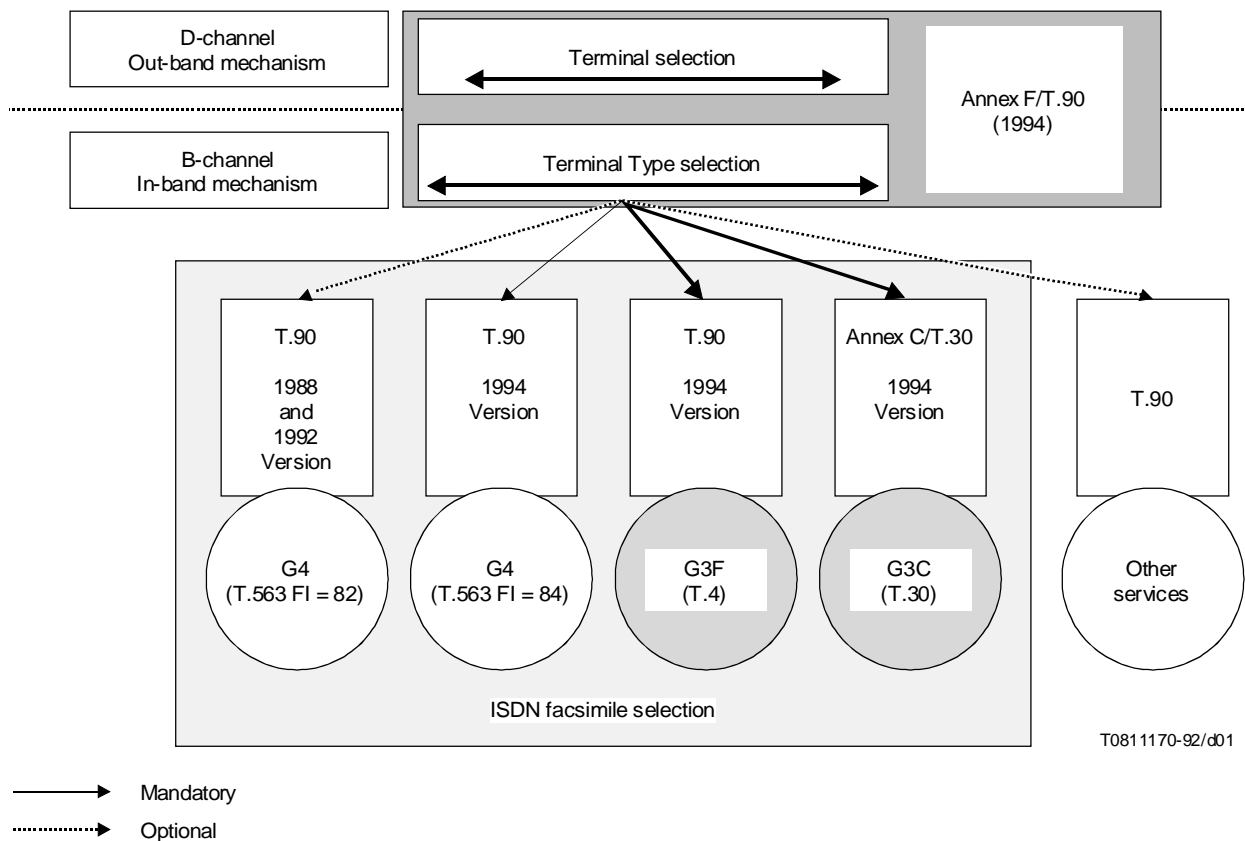
FIGURE F.1/T.90

The scope of selection procedure for mode of operation on ISDN

F.1.5 Where the D-channel information elements defining unambiguously the requested telematic service are not supported by the ISDN connection, the in-band procedure is required in the B-channel.

Terminal selection at the called side may have been performed on the Bearer Capability Information Element (BC-IE) only resulting from the only received BC-IE as the out-band compatibility information. The setting of the parameters of the BC-IE, however, is common to the various telematic services. Thus, unless at the calling side prior knowledge about the selection of the compatible terminal at the called side is available, this knowledge solely can be gained by applying the in-band negotiation procedure as per 1.4, which takes place after call establishment. However, this may lead to recognizing the non-availability of a compatible terminal, so that the required mode of communication cannot be established in this case. This results in the release of the potentially chargeable call, which, however, only lasted for the short time of the interrogation process.

Prior knowledge based on the called number or learned knowledge based on recent attempts to the same E.164 terminal number may be used to reduce the incidence of these occurrences.

F.2 D-channel aspects

F.2.1 The BC, LLC and HLC parameters for G3C and G3F facsimile terminals are given in Tables F.1, F.2 and F.3.

F.2.1.1 Table F.1 shows the BC (Bearer Capability) coding structure for G3C and G3F facsimile transmission.

TABLE F.1/T.90

BC coding structure for G3C and G3F facsimile transmission

Octet number	Information elements	Contents	G3C facsimile		G3F facsimile	
			Condition for calling side	Condition for called side	Condition for calling side	Condition for called side
1	Bearer capability information element identifier	Identifier	M	M	M	M
2	Length of the bearer capability contents	Length	M	M	M	M
3	Extension Coding standard Information transfer capability	Extension CCITT standardized coding Unrestricted digital information	M M M	M M M	M M M	M M M
4	Extension Transfer mode Information transfer rate	Extension Circuit mode 64 kbit/s	M M M	M M M	M M M	M M M
5	Extension Layer 1 identification User information layer 1 protocol		N N N	N N N	N N N	N N N
6	Extension Layer 2 identification User information layer 2 protocol		N N N	N N N	N N N	N N N
7	Extension Layer 3 identification User information layer 3 protocol		N N N	N N N	N N N	N N N

M   Sending is mandatory for calling side and checking of its presence and contents is mandatory for called side.

N   Calling side does not send the information elements and called side does not care for the information element.

F.2.1.2 Table F.2 shows the LLC (lower layer compatibility) coding structure for G3C and G3F facsimile transmission.

TABLE F.2/T.90

LLC coding structure for G3C and G3F facsimile transmission

Octet number	Information elements	Contents	G3C facsimile		G3F facsimile	
			Condition for calling side	Condition for called side	Condition for calling side	Condition for called side
1	Low layer compatibility information element identifier	Identifier	M	O	M	O
2	Length of the low layer compatibility contents	Length	M	O	M	O
3	Extension Coding standard Information transfer capability	Extension CCITT standardized coding Unrestricted digital information (Note 1)	M M M	O O O	M M M	O O O
4	Extension Transfer mode Information transfer rate	Extension Circuit mode 64 kbit/s	M M M	O O O	M M M	O O O
5	Extension Layer 1 identification User information layer 1 protocol		N N N	N N N	N N N	N N N
6	Extension Layer 2 identification User information layer 2 protocol	Extension Layer 2 identifier ISO 7776 DTE-DTE operation (Note 2)	N N N	N N N	M M M	O O O
7	Extension Layer 3 identification User information layer 3 protocol	Extension Layer 3 identifier ISO 8208 DTE-DTE operation (Note 2)	N N N	N N N	M M M	O O O

M   Sending is mandatory for calling side and checking of its presence and contents is mandatory for called side.

O   If present, called side checks the information elements.

N   Calling side does not send the information elements and called side does not care for the information element.

NOTES

1   When octet 3a (bit 7) is omitted, out-band LLC negotiation is not possible.

2   The LLC IE may be transferred transparently by an ISDN between the called user and the calling user and may be used for parameter negotiation as described in Annex J/Q.931.

F.2.1.3 Table F.3 shows the HLC (high layer compatibility) coding structure for G3C and G3F facsimile transmission.

TABLE F.3/T.90

HLC coding structure for G3C and G3F facsimile transmission

Octet number	Information elements	Contents	G3C facsimile		G3F facsimile	
			Condition for calling side (Note 2)	Condition for called side	Condition for calling side (Note 2)	Condition for called side
1	High layer compatibility information element identifier	Identifier	M	O	M	O
2	Length of the high layer compatibility contents	Length	M	O	M	O
3	Extension	Extension	M	O	M	O
	Coding standard	CCITT standardized coding	M	O	M	O
	Interpretation	First high layer characteristics identification	M	O	M	O
	Presentation method of protocol profile	High layer protocol profile	M	O	M	O
4	Extension	Extension	M	O	M	O
	High layer characteristics identification	Facsimile group (Note 1)	M	O	M	O
4a	Extension		N	N	N	N
	Extended high layer characteristics identification		N	N	N	N

M   Sending is mandatory for calling side and checking of its presence and contents is mandatory for called side.

O   If present, called side checks the information elements.

N   Calling side does not send the information elements and called side does not care for the information element.

NOTES

2   In case of G3C mode of operation, facsimile group indicates "Group 2/3", and in case of G3F, it indicates "Group 4".

3   Two alternative sets of parameters may be specified according to the HLC selection mechanism in ascending order of preference.

F.3   B-channel aspects

F.3.1   XID procedures for in-band terminal selection procedure

F.3.1.1   General

The XID frame defined in this annex is used for the exchange of both data link information and terminal protocol identification information. XID command/response frames, XID information field structure, format identifier subfield and user data subfield shall use the definition in Annex C. Figure F.2 shows the selection mechanism using XID command/response.
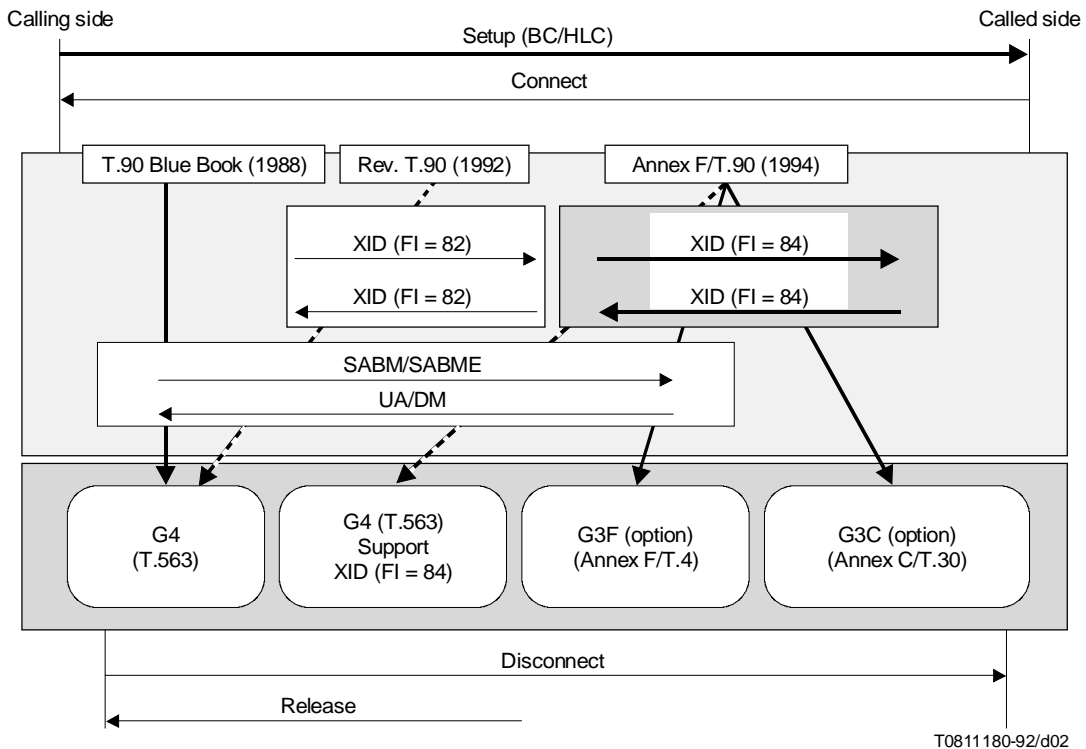

FIGURE F.2/T.90

Terminal selection mechanism for ISDN facsimile

The calling user may use the optional extension octets 6a, 6b, 7a, 7b and 7c of the LLC IE as encoded in Figure F.3 and Table F.1 to indicate a set of preferred layer 2 and layer 3 parameters. The absence of an extension octet shall indicate the use of the default values of all parameters unless in-band mechanisms for negotiation are invoked. Multiple alternative sets of parameters may be specified by the concatenation of multiple LLC IEs in order of preference.

Table F.1 defines the codepoints for currently defined protocols and parameter values defined by this Recommendation. Additional codepoints will be defined as and when alternate layer 2 and 3 protocols are defined. Recommended layer 2 and 3 parameter values, are given in Appendix VI.

F.3.1.2   The XID procedure defined in this annex is used only for telematic terminal applications in the IUT-T T-series. Figure F.3 shows the XID format for the terminal selection using format identifier (FI) = 84H.
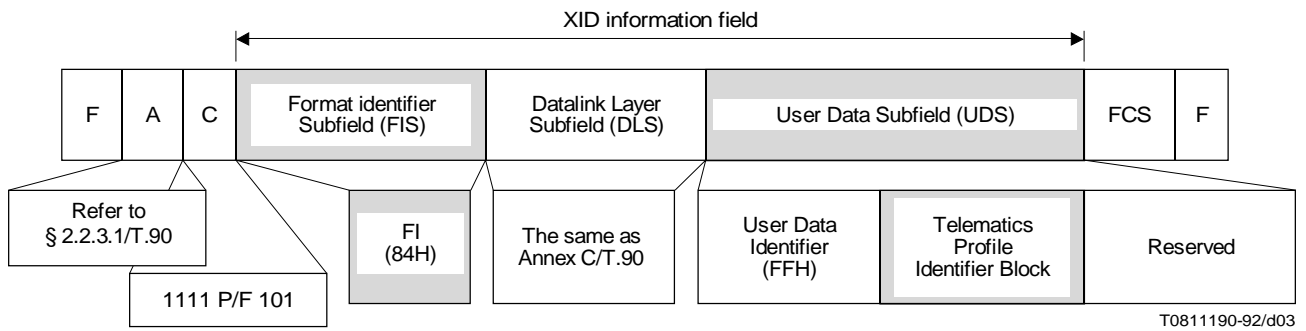
FIGURE F.3/T.90

XID basic format for the terminal selection

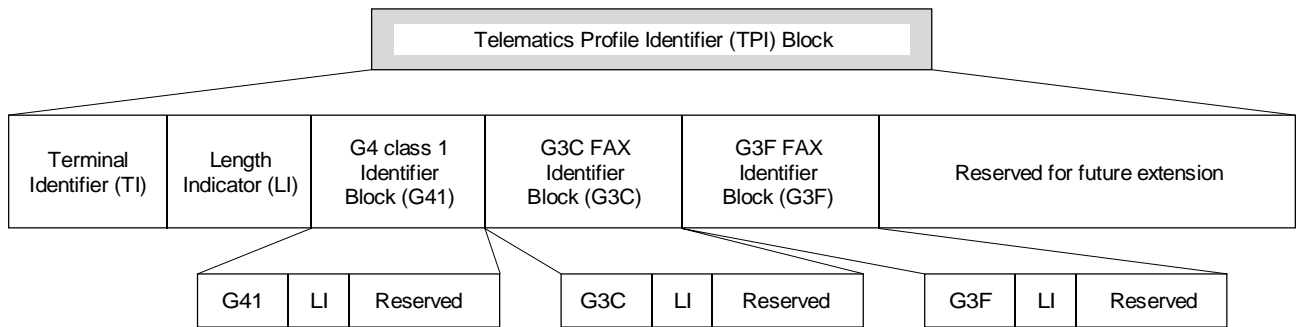**F.3.1.3** Figure F.4 shows the Data format for telematics profile identifier block.

FIGURE F.4/T.90

Data format for telematics profile identifier block

F.3.1.4 TPI coding

Bit	8 7 6 5 4 3 2 1	Content
	0 0 0 0 0 0 0 0	Reserved
	0 0 0 0 0 0 0 1	Terminal Identifier (TI)
	.	
	.	
	.	
	.	
	0 0 0 1 0 0 0 0	Reserved
	0 0 0 1 0 0 0 1	G4 Class 1 Identifier (G41)
	0 0 0 1 0 0 1 0	G3C FAX Identifier (G3C)
	0 0 0 1 0 0 1 1	G3F FAX Identifier (G3F)
	0 0 0 1 0 1 0 0	
	.	
	.	Reserved for future extension
	.	
	.	
	1 1 1 1 1 1 1 1	

Coding example: TPI format for G3C (without parameters) only.

TI	LI	G3C FAX Identifier	LI
0 0 0 0 0 0 0 1	0 0 0 0 0 0 1 0	0 0 0 1 0 0 1 0	0 0 0 0 0 0 0 0

NOTE – For multi-mode terminals, several identifiers (e.g. G4 class 1 and G3F) may be indicated.

F.3.2   Encodings for XID information field negotiation

F.3.2.1   Format identifier subfield

FI = 84 (hex) shall be used for the purpose of terminal selection and essential parameter negotiation.

F.3.2.2   Data link subfield

The codepoints for data link subfield shall be those defined in Annex C.

F.3.2.3   Principles and application rules relating to interoperability shall conform to C.5.

F.3.2.4   Application rules for protocol errors shall follow C.6.

F.3.2.5   Application rules for usage of XID (FI = 84)

F.3.2.5.1 The XID command/response is mandatory for G3C and G3F, and is optional for Group 4 Class 1.

F.3.2.5.2 The DLS (data link subfield) is optional for G3F and G4, and is not used for G3C.

F.3.2.5.3 For the address fields, the codes shall be as defined in 2.2.3.1:

–   Calling side: 03 (hex);

–   Called side: 01 (hex).

F.3.2.6   Operation of the exchange of XID frames

The calling station sends an XID frame with a TPI containing its possible modes of communication in order of preference. The called station sends an XID frame with a TPI containing only one mode of communication, the highest common mode between calling and called terminals or a list of modes that the called terminal can support. The transmitter has the choice of operating in the mode selected by the receiver or closing the connection.

NOTE – In order to indicate the priorities among those communication modes, the following four rules are applied.

Rule 1 – Sender terminal first transmits the terminal identifier for the most preferable communication mode, followed by next preferable mode.

Rule 2 – Receiver terminal selects one communication mode which is acceptable to the receiver and most strongly expected by the sender, and then responds to the sender terminal with a terminal identifier for that communication mode.

Rule 3 – If there are no acceptable modes, receiver terminal respond to sender terminal with all the terminal identifier(s) supported by the receiver. The sender may then retry sending, using another mode.

Rule 4 – In order to exchange such information, sender terminal uses XID (P = 1) command, and receiver terminal uses XID (F = 1) response.

Figure Note 1 shows an example sequence in which a communication mode is successfully accepted by the receiver. In this figure, mode A is most strongly expected by the sender, followed by B, C and D. Receiver terminal responds to the sender terminal with mode C, because this mode is the one out of two common modes C and D and more strongly expected than mode D by the sender.
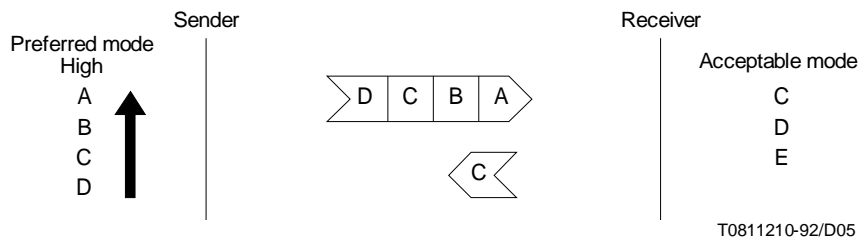

FIGURE NOTE 1

TPI negotiation (accepted)

Figure Note 2 shows an example sequence in which connection is rejected by the receiver terminal. The Receiver terminal responds to the sender terminal with all terminal identifiers E and F according to the Rule 3, because there are no common modes between sender and receiver terminals.
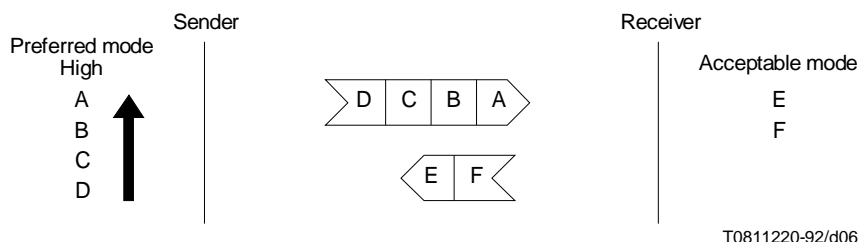
FIGURE NOTE 2

TPI negotiation (rejected)

F.3.3   The SDL diagram for terminal selection procedure for 64 kbit/s facsimile terminals on ISDN: Figure F.5 shows the SDL diagram for terminal selection and Figure F.6 shows the SDL diagram for Annex C/T.30 initial identification procedure (called side), if exiting the terminal selection procedure via the "direct to G3C" exit.
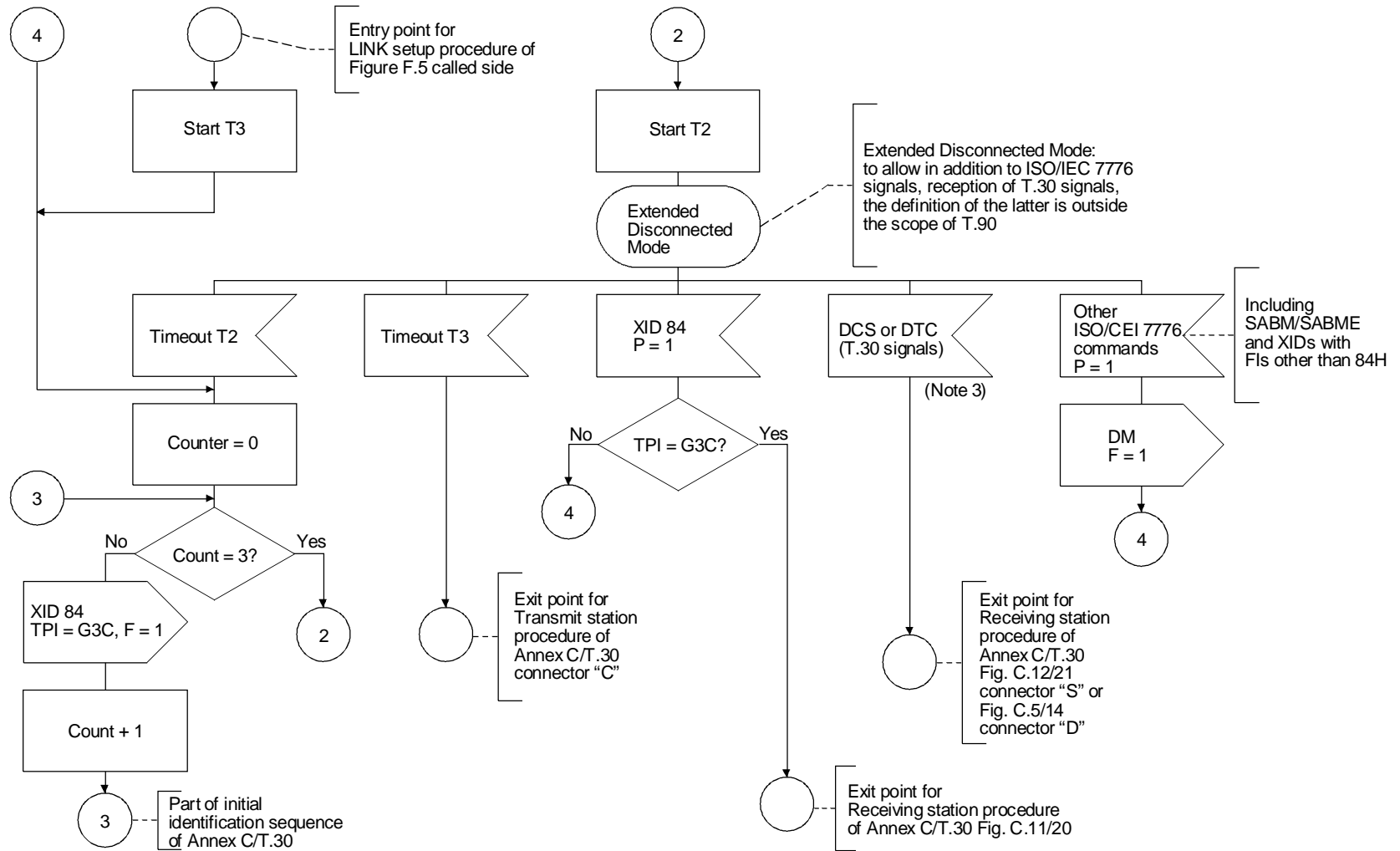
FIGURE F.5/T.90

SDL diagram for terminal selection (calling side)
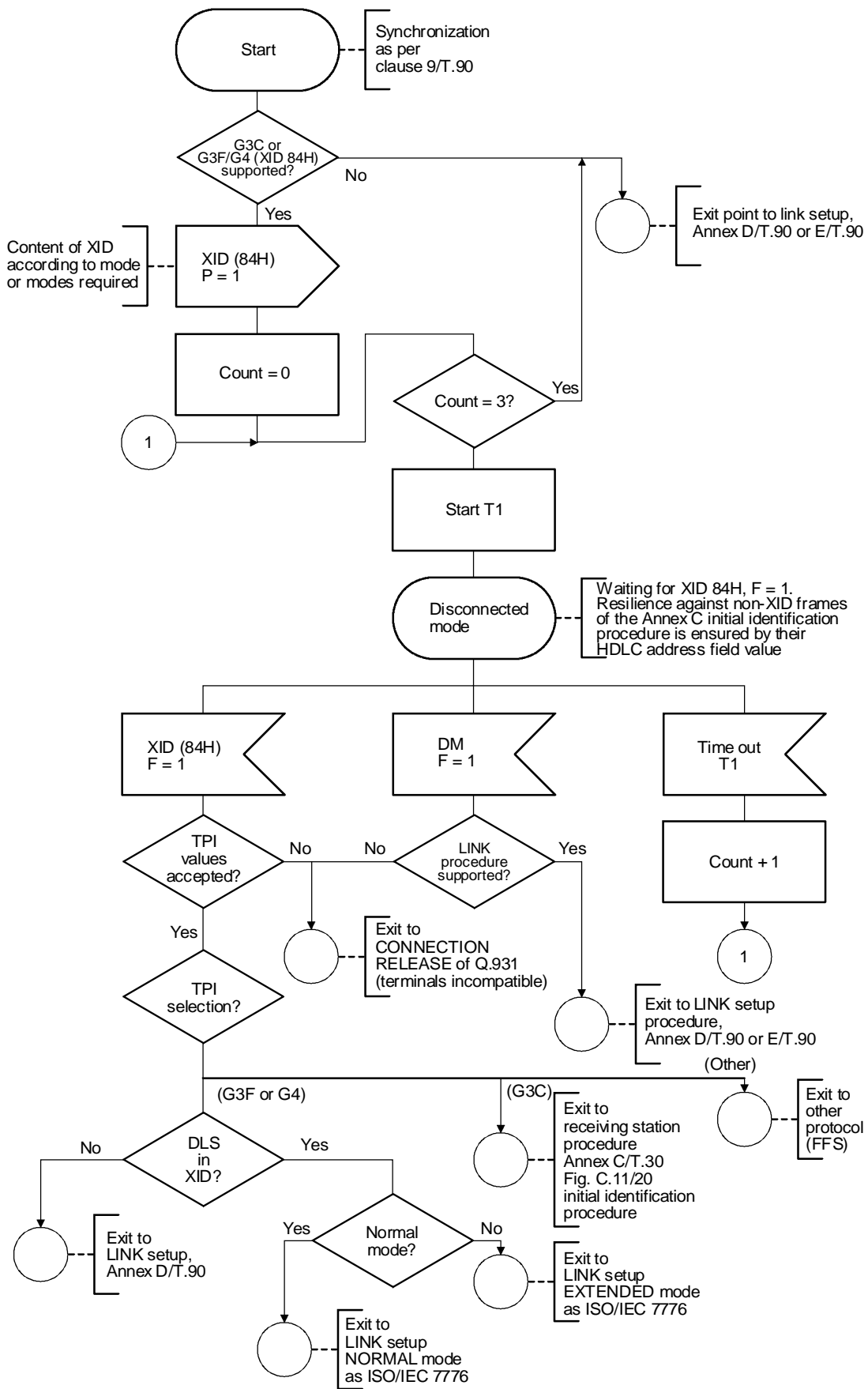
T0815110-94/d07
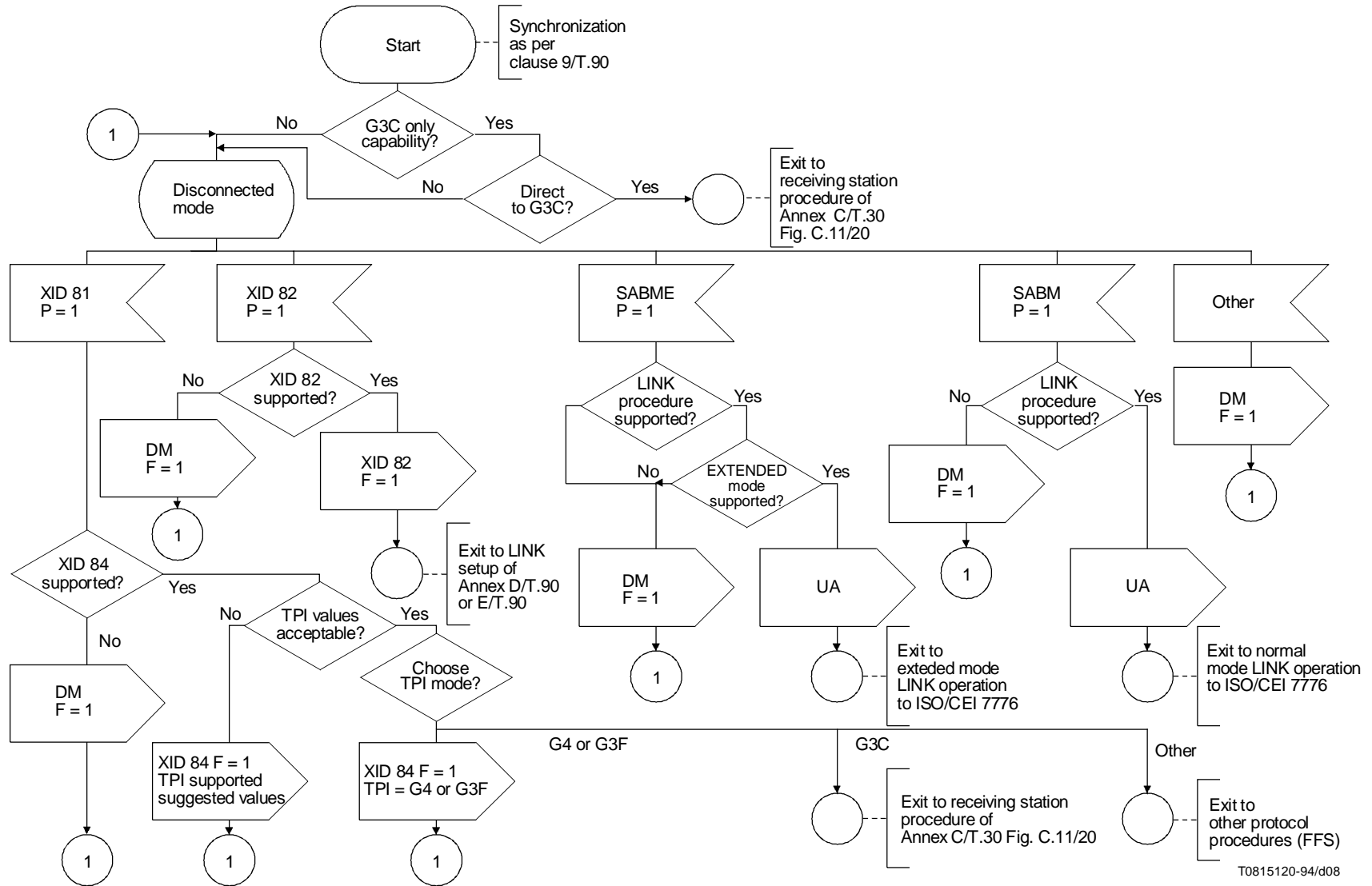
FIGURE F.5/T.90

SDL diagram for terminal selection procedure (called side)

T0815120-94/d08

NOTES

T0815130-94/d09

1   T2 duration is the same as T9 in Annex C/T.30.

2   T3 duration is the same as T6 in Annex C/T.30.

3   This case applies if the input signal "XID 84 P = 1" did not arrive due to an error being encountered.

FIGURE F.6/T.90

SDL diagram for Annex C/T.30 initial identification procedure (called side)
if exiting the terminal selection procedure via the "direct G3C" exit

F.3.4 Table F.6 shows the possible interworking cases for 64 kb/s facsimile modes on ISDN.

TABLE F.6/T.90

Interworking table

From \ To	G4/1 (FI = 82H)	G4/1 (FI = 84H)	G3F	G3C	G4/1 + G3F	G4/1 + G3C	G4/1 + G3F + G3C
G4/1 (FI = 82H)	4	4	4	X	4	4	4
G4/1 (FI = 84H)	4	4	4	X	4	4	4
G3F	4	4	4	X	4	4	4
G3C	X	X	X	C	X	C	C
G4/1 + G3F	4	4	4	X	4	4	4
G4/1 + G3C	4	4	4	C	4	4 or C	4 or C
G4/1 + G3F + G3C	4	4	4	C	4	4 or C	4 or C

4	G4 Protocol
C	G3C Protocol
X	No communication

Figures F.1-1 to F.4-3 show a number of examples selected from Table F.6. Table F.7 defines the combination of calling and called modes for Figures F.1-1 to F.4-3.

TABLE F.7/T.90

Examples of the combination for communication sequence

Calling side \ Called side	G4	G4 (82H)	G4 (84H) or G3F	G3C	G4(84H) + G3C or G3F + G3C
G4	*	*	Fig. F.1-1	Fig. F.1-2	Fig. F.1-1
G4 (82H)	*	*	Fig. F.2-1	Fig. F.2-2	Fig. F.2-1
G4 (84H) or G3F	Fig. F.3-1	Fig. F.3-2	Fig. F.3-3	Fig. F.3-4	Fig. F.3-3
G3C	Fig. F.4-1	Fig. F.4-1	Fig. F.4-2	Fig. F.4-3	Fig. F.4-3
G4 (84) + G3C or G3F + G3C	Fig. F.3-1	Fig. F.3-2	Fig. F.3-3	Fig. F.4-3	Fig. F.3-3 or Fig. F.4-3

NOTES

1   The "*" means that this combination is defined in T.90.

2   The "G4 (82H)" means that it is G4 facsimile supports T.90 (1992).

3   The "G4 (84H)" means that it is G4 facsimile supports XID (84H)

4   The combination "G4 (84H) + G3F + G3C" is not shown because both "G4 (84H)" and "G3C" use the same XID procedure to determine the appropriate mode.

5   The description of "Fig. F.3-3 or Fig. F.4-3" is as follows:

    a   Fig. F.3-3 – This sequence applies when XID exchange results in the use of G4/G3F or G3C procedure.

    b   Fig. F.4-3 – This sequence applies when XID exchange results in the use of G3C or G4/G3F procedure.

6   Terminals which support XID (84H) may also support XID (82H).
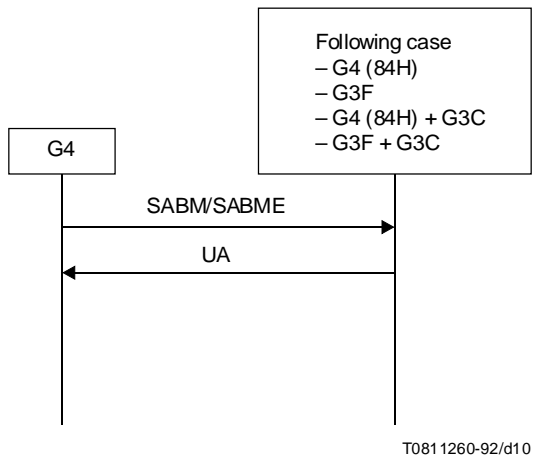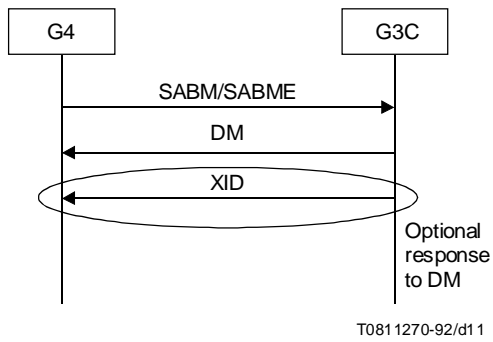
T0811260-92/d10

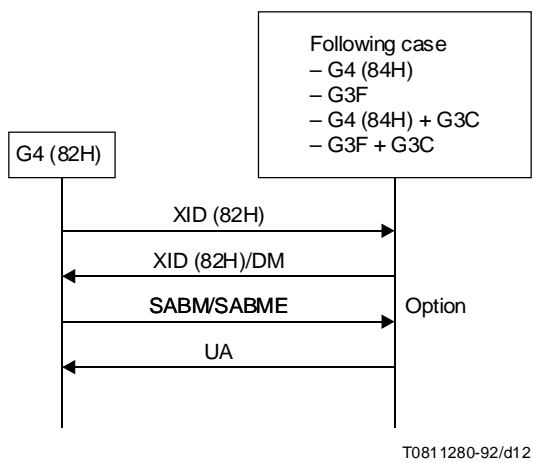FIGURE F.1-1/T.90

T0811270-92/d11

FIGURE F.1-2/T.90

T0811280-92/d12

FIGURE F.2-1/T.90

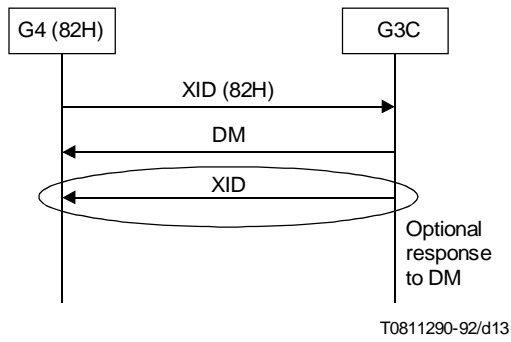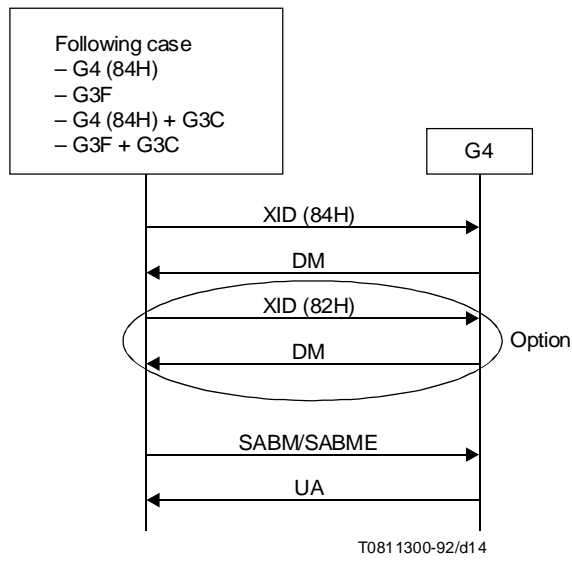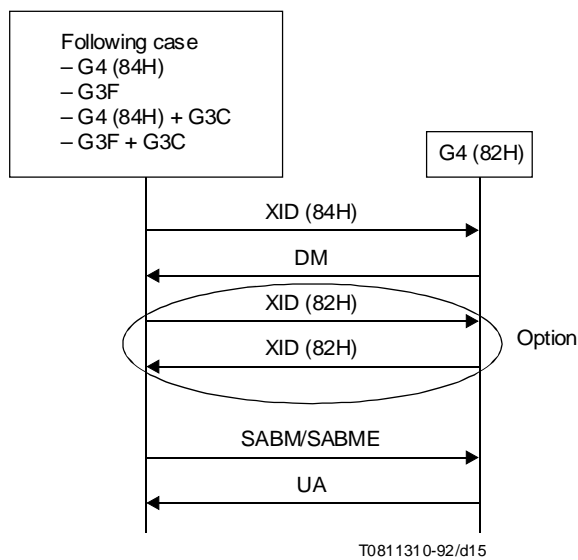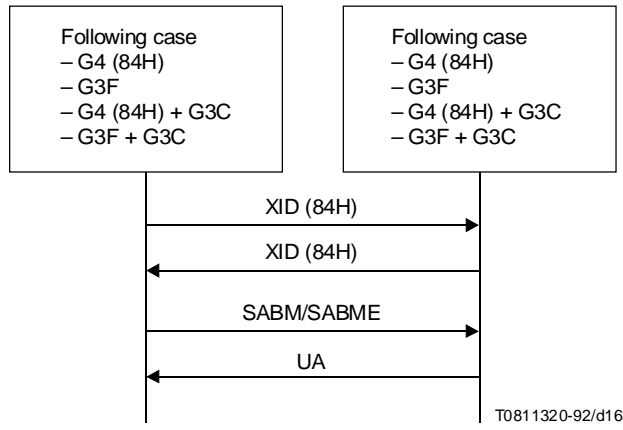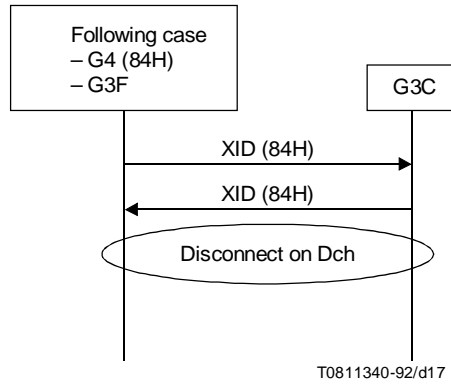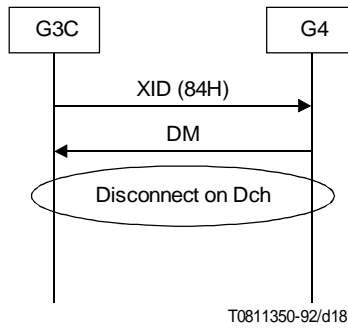FIGURE F.2-2/T.90

FIGURE F.3-1/T.90

FIGURE F.3-2/T.90

Following case
– G4 (84H)
– G3F
– G4 (84H) + G3C
– G3F + G3C

Following case
– G4 (84H)
– G3F
– G4 (84H) + G3C
– G3F + G3C

XID (84H)

XID (84H)

SABM/SABME

UA

T0811320-92/d16

FIGURE F.3-3/T.90

Following case
– G4 (84H)
– G3F

G3C

XID (84H)

XID (84H)

Disconnect on Dch

T0811340-92/d17

FIGURE F.3-4/T.90

G3C

G4

XID (84H)

DM

Disconnect on Dch
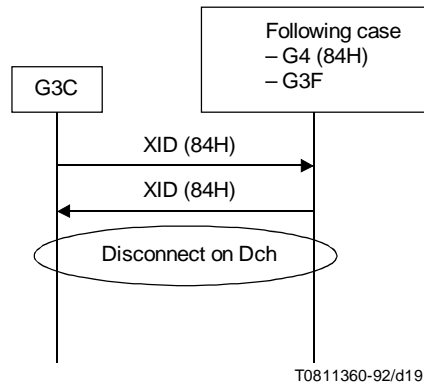
T0811350-92/d18

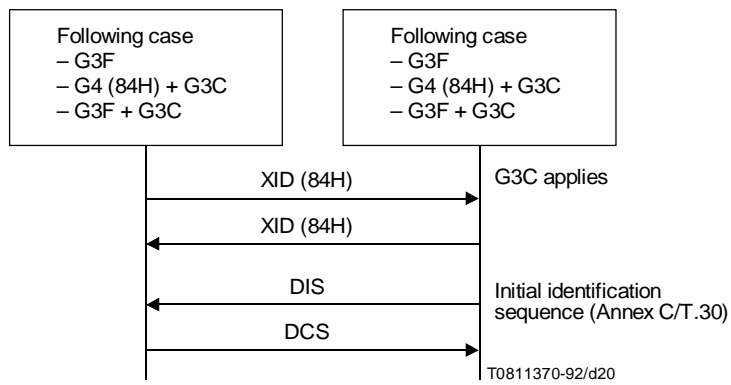FIGURE F.4-1/T.90

FIGURE F.4-2/T.90

FIGURE F.4-3/T.90

F.4   Interworking between G3C or G3F terminals and G3 terminals

Interworking between G3C or G3F terminals and G3 terminals using multiple BC, LLC, HLC and/or MUB (multi use bearer) service are for further study.

F.5   Definition of the usage of supplementary services

Definition of the usage of supplementary services, such as subaddress, DDI, etc. is for further study.