INTERNATIONAL TELECOMMUNICATION UNION

ITU-T V.25*bis*

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TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES V: DATA COMMUNICATION OVER THE TELEPHONE NETWORK

Interfaces and voiceband modems

Synchronous and asynchronous automatic dialling procedures on switched networks

ITU-T Recommendation V.25*bis*

(Previously CCITT Recommendation)

ITU-T V-SERIES RECOMMENDATIONS

DATA COMMUNICATION OVER THE TELEPHONE NETWORK

1 – General
2 – **Interfaces and voiceband modems**
3 – Wideband modems
4 – Error control
5 – Transmission quality and maintenance
6 – Interworking with other networks

For further details, please refer to ITU-T List of Recommendations.

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). 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).

ITU-T Recommendation V.25 *bis* was revised by ITU-T Study Group 14 (1993-1996) and was approved by the WTSC (Geneva, October 9-18, 1996).

NOTE

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

2. The status of annexes and appendices attached to the Series V Recommendations should be interpreted as follows:

- an *annex* to a Recommendation forms an integral part of the Recommendation;
- an *appendix* to a Recommendation does not form part of the Recommendation and only provides some complementary explanation or information specific to that Recommendation.

CONTENTS

Recommendation V.25 *bis*

SYNCHRONOUS AND ASYNCHRONOUS AUTOMATIC DIALLING PROCEDURES ON SWITCHED NETWORKS

(revised in 1996)

1 Scope

1.1 This Recommendation specifies procedures for setting up data connections employing synchronous and asynchronous applications on switched networks. Users may wish to note that for asynchronous applications, an alternative procedure is specified in Recommendation V.25 *ter* which includes additional functionality for controlling and configuring DCEs. Means are provided in this Recommendation for the encapsulation of commands, indications and messages specified for the V.25 *ter* protocol.

1.2 This Recommendation describes the sequence of events involved in establishing a connection between an automatic calling data station[1)] and an automatic answering data station for DCEs specified for operation on switched networks. The system configuration is shown in Figure 1.

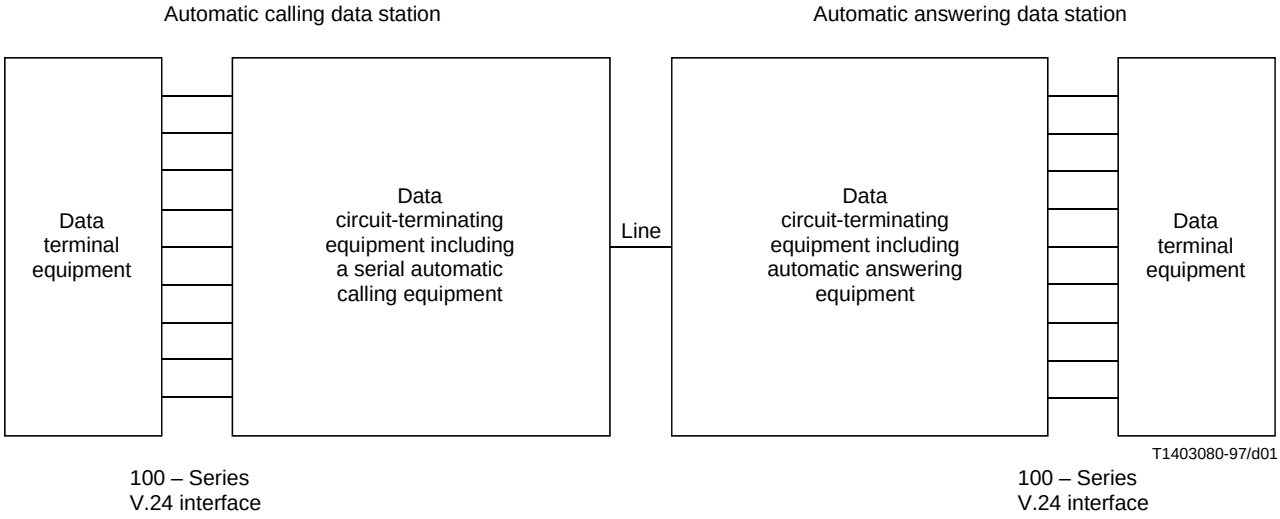

FIGURE 1/V.25 *bis*

1.3 The procedures are intended to be suitable for the following three types of call:

a) serial automatic calling data station to automatic answering data station;

b) manual calling data station to automatic answering data station;

c) serial automatic calling data station to manual answering data station.

It is intended that data terminal equipment designed to control automatic calling equipment in accordance with this Recommendation will also be suitable for use with manually controlled data circuit-terminating equipment, and also that data circuit-terminating equipment incorporating serial automatic calling equipment may be manually controlled where necessary.

1.4 The procedures described herein allow automatic calling equipment conforming to this Recommendation to interwork with automatic answering equipment conforming to Recommendation V.25.

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1) In this Recommendation, the term “data station” is synonymous with the term “terminal installation for data transmission”.

1.5 The data terminal equipment is responsible:

a) during call establishment:

i) for ensuring that the data circuit-terminating equipment is available for operation;

ii) for providing the telephone number or selecting a telephone number pre-programmed into the data circuit-terminating equipment;

iii) for deciding to abandon the call if it is unsuccessfully completed;

b) after call establishment:

i) for controlling data transfer;

ii) for initiating disconnect at calling or answering data stations.

1.6 This Recommendation deals with call establishment and clearing. Any specific use of Recommendation V.24 interchange circuits herein described only applies during these phases. The management of interchange circuits and the line during the data transmission phase is not part of this Recommendation.

Details of interface procedures following the OFF to ON transition of circuit 107 on entry of the data transmission phase can be found in the relevant modem Recommendations.

1.7 Annex A gives guidance on the maintenance facilities which may be associated with an automatic calling data circuit-terminating equipment. Methods for testing the automatic calling functions of the data circuit-terminating equipment are included.

2 Abbreviations and definitions

The following abbreviations are used in this Recommendation:

DCE Data Circuit-terminating Equipment

DTE Data Terminal Equipment

The following definitions apply to this Recommendation:

2.1 **command**: An instruction issued by the DTE to the DCE as part of the automatic calling procedure.

2.2 **indication**: An instruction or response issued by the DCE to the DTE as part of the automatic calling procedure.

NOTE – In this Recommendation the terms "indication" and "response" are not to be taken in the sense defined in Recommendation X.210.

2.3 **parameter**: A variable which may accompany Commands or Indications.

2.4 **automatic calling**: A procedure by which a DTE, by use of certain V.24 interchange circuits, instructs the DCE associated with it to perform the call establishment function.

3 General

An automatic calling and/or answering data station in accordance with this Recommendation can be operated in two modes:

– The "addressed call and/or answer authorized by the DTE (circuit 108/2)" mode gives a calling data station extensive facilities by means of instructions and indications exchanged between the DTE and the DCE on circuits 103 and 104. It gives an answering data station the capacity to accept "*a priori*" an incoming call.

– The "direct call and/or answer controlled by the DTE (circuit 108/1)" mode gives a calling data station the capacity of calling a number (or a sequence of numbers) pre-recorded in the DCE, by means of the 108/1 control circuit. It gives an answering data station the capacity of accepting incoming calls on a "per call" basis.

NOTE – Although automatic answering data stations as well as automatic calling and answering data stations may implement both modes of operation, they should be configured to operate in a specific one of the two modes.

4 Addressed call and/or answer authorized by the DTE (circuit 108/2)

4.1 Interface procedure

4.1.1 Interchange circuits involved

The interchange circuits used in this automatic calling/answering procedure are listed in Table 1. Their use during the automatic calling/answering procedures is described below.

TABLE 1/V.25 *bis*

Interchange circuit		Direction	
Number	Name	from DCE	to DCE
103	Transmitted data		X
104	Received data	X	
106	Ready for sending	X	
107	Data set ready	X	
108/2	Data terminal ready		X
125	Calling indicator	X	

4.1.1.1 Circuit 103 – Transmitted data

The instructions issued by the DTE during the automatic calling procedure, known as *commands*, are transmitted to the DCE on this circuit.

4.1.1.2 Circuit 104 – Received data

Responses from the DCE to DTE Commands, known as *indications*, are transmitted to the DTE on this circuit. Optionally, circuit 104 may convey the echo of the commands transmitted on circuit 103.

4.1.1.3 Circuit 106 – Ready for sending

The DCE shall turn circuit 106 ON in response to the DTEs circuit 108/2 being ON.

The DCE shall turn circuit 106 OFF:

i) on connection to line when answering tone is detected;

ii) when the DCE aborts the call set-up under the control of DTE by turning 108/2 in the OFF condition.

4.1.1.4 Circuit 107 – Data set ready

The DCE shall turn circuit 107 ON:

i) at the end of the automatic call set-up procedure, to indicate to the DTE that the connection is established and the DCE connected to line;

ii) on completion of manual call set-up procedure.

The DCE shall turn circuit 107 OFF:

i) to indicate to the DTE that the connection has been cleared down during the data transfer phase (to be permitted where national regulations require it);

ii) in response to a clear request by the DTE turning OFF circuit 108/2.

4.1.1.5 Circuit 108/2 – Data terminal ready

The DTE turns circuit 108/2 ON:

i) to enable the DCE to set up a connection either manually or automatically;

ii) to indicate to the DCE that it is ready to accept an incoming call.

The DTE shall turn circuit 108/2 OFF:

i) to instruct the DCE to clear down the connection during data transfer;

ii) to instruct the DCE to abort the call set-up procedure;

iii) to indicate to the DCE that it is not ready to accept an incoming call.

4.1.1.6 Circuit 125 – Calling indicator

The DCE shall provide circuit 125 to indicate to the DTE an incoming call. This incoming call will override a call request prior to seizure of the line. The usage of circuit 125 in the DTE is optional.

4.1.1.7 Other interchange circuits

The state of other interchange circuits is not part of the procedure. However, to ensure maximum compatibility with existing equipment, the other interchange circuits provided should retain their normal function during the automatic calling procedure.

Particularly to ensure correct operation of the DTE, the condition of circuit 109 shall follow the condition of circuit 106.

The DTE may choose to hold circuit 105 ON during the automatic calling procedure, but the DCE is not required to recognize this condition.

4.1.2 Control information format

Call set-up is achieved by the use of interchange circuits 106, 107 and 108 together with messages exchanged between the DTE and the DCE on circuits 103 and 104. These messages consist of commands or indications from the DTE or DCE respectively, and may be accompanied by *parameters* where necessary. The commands/indications required for the automatic calling procedure are outlined in Tables 2 and 3 together with their parameters.

The use of commands/indications other than one of the call request commands (CR_) and the invalid indication (INV) is optional in the DTE and DCE respectively.

The commands/indications and their parameters are described below.

4.1.2.1 Call request commands

These commands from the DTE instruct the DCE to initiate a call set-up procedure. The commands shall include a suffix to indicate the type of call request concerned (see Table 3) and shall be accompanied by one or more of the following parameters:

i) the number to be dialled. (In applications where additional dial tones are required, separators, “wait tone”, etc., may be included in this number);

ii) the identification number of the data station;

iii) the DCE memory address which contains the number to be dialled, this having been previously programmed.

NOTE – Manufacturers should note that the response time to a Call Request Command is determined by the time required to execute line procedures (see 6.1).

4.1.2.2 Program commands

These commands from the DTE instruct the DCE to enter a programming state. The commands shall be accompanied by one or more of the following parameters:

i) the DCE memory address into which the number to be dialled is to be stored;

ii) the number which is to be stored;

iii) the identification number of the data station.

Where a DCE does not contain the programming capability, this DCE shall reply to a program command by an *invalid* indication.

Where a DTE is not capable of programming the DCE, it may still initiate call attempts using the *call request* command in the normal way.

4.1.2.3 List request commands

These commands from the DTE instruct the DCE to list the numbers that have been programmed in its memory with or without their status. The commands shall include a suffix to indicate the type of list concerned. The command may be accompanied by parameters to select items to be listed. These parameters are for further study.

4.1.2.4 Disregard incoming call command

This command from the DTE instructs the DCE not to answer the current incoming call which is, or has been, signalled from the DCE to the DTE.

4.1.2.5 Connect incoming call command

This command from the DTE instructs the DCE to connect an incoming call that has been disregarded due to a previous disregard incoming call command.

4.1.2.6 Call failure indication

This indication may be issued by the DCE in response to a *call request* command from the DTE and may be accompanied by a parameter stating the reason for the failure of the call.

The following parameters indicate the possible conditions that may result in a call failure on the GSTN:

i) engaged tone;

ii) number not stored;

iii) local DCE busy, (e.g. DCE involved in an operation invoked from the front panel);

iv) ring tone, (the remote end was ringing but the call is aborted on time-out);

v) abort call, (the call is aborted on time-out);

vi) answer tone not detected, (the other end was recognized as going off-hook but the V.25 answer tone was not detected);

vii) forbidden call, (call attempts to this number are blocked by the DCE due to national regulations) (see Note);

viii) other parameters dependent on national network variations.

NOTE – Procedure for clearance of forbidden call numbers is not covered in this Recommendation.

The provision of the *call failure* indication is optional in the DCE. For this reason, the DTE should also be capable of recognizing call failure by means of a time out.

4.1.2.7 Delayed call indication

This indication from the DCE may be implemented depending on national regulations. It informs the DTE that, for example, owing to repeated unsuccessful call attempts, call attempts to this number are blocked by the DCE for a time given by the accompanying parameter.

4.1.2.8 Incoming call indication

This indication may be provided by the DCE to inform the DTE that a ring tone has been detected on the telephone line.

NOTE – In the event of collision between an incoming call and a call request, the incoming call will have priority.

4.1.2.9 Valid indication

This indication may be provided by the DCE to acknowledge call request, program, disregard incoming call and correct incoming call commands, and to inform the DTE that the command has been accepted.

TABLE 2/V.25 *bis*

Set of commands and indications (Note 1)

Command/indication	DTE to DCE (command)	DCE to DTE (indication)	Parameters
Call request		X	– Number to be dialled
			– Memory address of the number to be dialled
			– Identification number
Program		X	– Number to be dialled
			– Memory address for the number to be dialled
			– Identification number
List request		X	– (Note 2)
Disregard incoming call	X		– None
Connect incoming call	X		– None
Echo command	X		– 0 = echo OFF
			– 1 = echo ON
Call failure		X	– Engaged tone
			– Number not stored
			– Local DCE busy
			– Ring tone (time out)
			– Abort call (time out)
			– V.25 answer tone not detected
			– Forbidden call (nationally dependent parameters)
Delayed call		X	– Time to permissible call request (minutes)
Incoming call		X	– None
Valid		X	– None
Invalid		X	– Optionally, error code
List		X	– Memory address
			– Number to be dialled
			– Status (Note 2)
			– Identification number
Call connecting		X	– (Note 2)

NOTE 1 – DTE manufacturers should note that a set of indications may not be implemented in a DCE, and allowance for this, by use of suitable time-outs, should be made.

NOTE 2 – This item is for further study.

TABLE 3/V.25 *bis*

Encoding of commands and indications

Command/indication	IA5 characters	Parameter format				
Call request with:						
number provided:	CRN	CRN	Number to be dialled XXXXX XXXX			
number provided with the identification number:	CRI	CRI	Number to be dialled XXXXX . . XXXX	;	Identification number YY . . . .YY	
memory address provided:	CRS	CRS	Memory address XXXXX . . . XX			
Program:						
normal:	PRN	PRN	Memory address XXXXX . . XX	;	Number to be dialled XXXXX . . . XXXX	
identification:	PRI	PRI	identification number XXXXX XX			
List request of:						
stored number:	RLN	RLN	For further study ZZZ . . . . . Z			
forbidden numbers:	RLF	RLF	For further study ZZZ . . . . . Z			
delayed call numbers:	RLD	RLD	For further study ZZZ . . . . . Z			
identification number:	RLI	RLI				
Disregard incoming call:	DIC	DIC				
Connect incoming call:	CIC	CIC				
Call failure indication:	CFI	CFI	Failure type XX			
Delayed call:	DLC	DLC	Time duration (in minutes) XXX . . . XX			
Incoming call:	INC	INC				
Valid:	VAL	VAL				
Invalid:	INV	INV	Optionally, error type XX			
List of:			Memory address		Number to be dialled	Status (for further study)
stored numbers:	LSN	LSN	XXXX . . XX	;	YYYY . . YYY	; ZZZZ (Note)
forbidden numbers:	LSF	LSF	XXXX . . XX	;	YYYY . . YYY	; ZZZZ (Note)
delayed call numbers:	LSD	LSD	XXXX . . XX	;	YYYY . . YYY	; ZZZZ (Note)
identification number:	LSI	LSI	Identification number XXXX . . . . XX (Note)			
Call connecting:	CNX	CNX	ZZZ . . . . Z (for further study)			
Echo commands:	ECH	ECH	Status XX			
Extended (V.25 *ter*) command:	EXC	EXC	V.25 *ter* command body VVVV			
Extended (V.25 *ter*) indication:	EXI	EXI	V.25 *ter* indication or information XXXX			

NOTE – When the list request command invokes edition of an empty list, a list indication with no parameter may be issued.

4.1.2.10 Invalid indication

This indication shall be provided by the DCE when it receives an invalid command, or receives a command which it is incapable of executing either because it does not implement the function or because the function is invoked at a wrong time in the V.25 *bis* process. This indication may be accompanied by a parameter stating the reason for the invalid situation.

The following parameters indicate the possible conditions that may result in an invalid situation:

i) command unknown error;

ii) message syntax error;

iii) parameter syntax error;

iv) parameter value error.

4.1.2.11 List indications

A series of such indications may be provided by the DCE to list specific items stored in its memory according to the *list request* command previously made by the DTE. These indications will be accompanied by one or more of the following parameters:

i) the DCE memory address into which the number is stored;

ii) the number stored;

iii) the status of this number (for further study);

iv) the identification number of the data station.

NOTE – When the list request command invokes edition of an empty list, a list indication with no parameter may be issued.

4.1.2.12 Call connecting indication

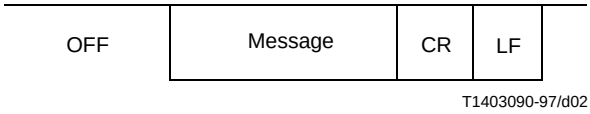
This indication may be provided by the DCE to inform the DTE that the connection procedures are about to be completed.

4.1.3 Format for commands and indications

Commands and indications may be encoded in the formats specified below, according to application. Extended (V.25 *ter*) commands, indication and information will consist of the body of the respective code as specified in 5.2.1/Rec. V.25 *ter*.

4.1.3.1 Asynchronous operation

The format for asynchronous operation shall be as shown in Figure 2.



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NOTE – In commands from the DTE the *new line* function may sometimes be encoded in a way other than CR + LF (see Recommendation 4.1.2.2/T.50) and allowance for this should be provided.

FIGURE 2/V.25 *bis*

In this mode of operation, data transmitted between the DTE and the DCE shall conform to the requirements for start-stop data transmission specified in Recommendation T.50 and ISO 1177. Parity may be even, odd, mark, space or not used. Each character shall have at least one complete stop element. The DCE shall, and the DTE should, accept commands using any combination of parity and stop elements supported during the data transfer phase. These shall include, as a minimum, the following combinations, as defined in Annex B/V.42, each of which consists of ten total bits (including the start element):

– 7 data bits, even parity, 1 stop element.

– 7 data bits, odd parity, 1 stop element.

– 7 data bits, space parity, 1 stop element.

– 7 data bits, mark parity, 1 stop element (7 data bits, no parity bit, 2 stop elements).

– 8 data bits, no parity, 1 stop element.

During the data transfer phase, the DCE shall be transparent to changes in data format; the use of a particular format during the exchange of commands and indications between the DTE and the DCE shall not restrict the use of other formats which are supported during the data transfer phase. However, DCE responses issued to indicate transition from data transmission phase to command state are issued using the same format and parity as the last command line issued by the DTE, and the DTE should therefore be prepared to recognize these responses even though the character format may have been changed.

The DCE shall be able to accept commands at either 1200 bit/s or 9600 bit/s. It is desirable that the DCE be able to accept commands and automatically detect the rate being used by the DTE at all rates supported by the DCE on the DTE-DCE interface. The DCE may provide a strap, switch or other facility to define the rate at which the DTE is operating; however, while the rate is so selected, the DCE shall continue to be capable of accepting commands at either 1200 bit/s or 9600 bit/s.

4.1.3.2 Synchronous character oriented operation

The format for synchronous character oriented operation shall be in accordance with ISO 1745, and shall be as shown in Figure 3.

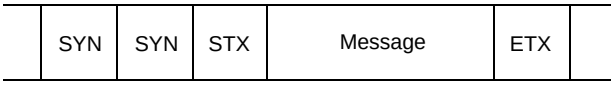


FIGURE 3/V.25 *bis*

Generally the command/indication is terminated by ETX. However, when a succession of indications is transmitted (e.g. succession of LSN indications), ETB should be used instead of ETX with all but the last indication of the succession, to indicate that other indications are coming.

In this mode of operation, consecutive 8-bit data units are used. The 8-bit data units are formed by a 7-bit IA5 character in accordance with Recommendation T.50 together with an eighth bit set indifferently either to “one” or “zero”, or the odd parity. No parity checking will be accomplished on reception.

The bit rate used for the data transfer shall apply.

4.1.3.3 Synchronous bit oriented operation

HDLC (High-level Data Link Control) format shall be used for synchronous bit oriented operation, and shall be as shown in Figure 4.

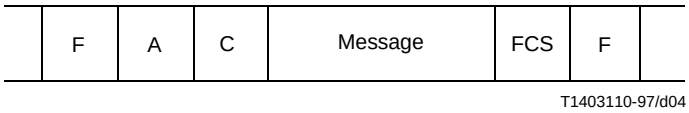


FIGURE 4/V.25 *bis*

The message is the information field of a UI frame transmitted with the global address. Generally the P/F bit is set to 1. Consequently, the A and C fields are generally as follows:

A = 11111111 C = 11001000

LSB MSB

However, when a succession of indications is transmitted (e.g. succession of LSN indications), the P/F bit should be set to 0, i.e. the control field is changed to:

C = 11000000

LSB MSB

with all but the last indication of the succession, to indicate that other indications are coming.

The introduction of other addresses is for further study.

Within the message, consecutive 8-bit data units are used and submitted to the HDLC framing (zero insertion). The 8-bit data units are formed by a 7-bit IA5 character in accordance with Recommendation T.50 together with an eighth bit set indifferently either to "one" or "zero", or the odd parity. No parity checking will be done on reception.

The transmission mode and the bit rate used for the data transfer shall apply.

4.1.4 Message format and encoding

The message format shall comprise:

i) a three-character command/indication (see Table 3);

ii) one or more parameters separated by ";" characters (see Tables 4 and 5); these parameters may include " " and "." as presentation characters (see Table 6).

A detailed description of the command/indication syntax is contained in Table 6. A general presentation of this syntax is offered in Appendix I.

4.1.5 Command/indication exchange protocol

The exchange of commands and indications between the DTE and the DCE can be regarded as asynchronous and balanced.

4.1.5.1 The following basic rules apply:

– Every command is to be followed by, at least, one indication or by circuit 107 going ON in the case of successful call.

– Several indications may be issued by the DCE one after the other, either of the same nature or of a different nature.

– The issue by the DTE of new commands other than DIC prior to the reception of the indication to the previous command may abort the execution of this previous command and should therefore be avoided.

TABLE 4/V.25 *bis*

Parameter encoding (Number to be dialled)

Alphabet for number to be dialled	IA5 coding
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
Wait tone	:
Pause (Note 1)	<
Separator 3 (Note 2)	=
Separator 4 (Note 2)	>
Dialling to be continued in pulse mode (Note 4)	P
Dialling to be continued in DTMF mode (Note 4)	T
Flash (Notes 3 and 4)	&

NOTE 1 – Usage and duration of this parameter are a national matter.
NOTE 2 – For national use.
NOTE 3 – The flash duration is a national matter.
NOTE 4 – Optionally accepted parameter.

TABLE 5/V.25 *bis*

Parameter encoding (Failure and error types)

Parameter	IA5 coding
Engaged tone	ET
Number not stored	NS
Local DCE busy	CB
Ring tone	RT
Abort call	AB
Answer tone not detected	NT
Forbidden call	FC
Command unknown/Unexpected error	CU
Message syntax error	MS
Parameter syntax error	PS
Parameter value error	PV

TABLE 6/V.25 *bis*

Detailed description of the V.25 *bis* command/indication syntax

description language:

a | b denotes the set (a, b)

a b denotes the set (ab)

a* denotes the set (e, a, aa, aaa, . . .)

(e = empty)

description:

message	=	command | indication
command	=	CR_command | PR_command | RL_command | DIC_command | CIC_command |
indication	=	LS_indication | CFI_indication | DLC_indication | INC_indication | VAL_indication | INV_indication | CNX_indication |
CR_command	=	CRN_command | CRI_command | CRS_command
PR_command	=	PRN_command | PRI_command
RL_command	=	RLN_command | RLF_command | RLD_command | RLI_command
LS_indication	=	LSN_indication | LSF_indication | LSD_indication | LSI_indication
CRN_command	=	'CRN' number
CRI_command	=	'CRI' number delimiter identification
CRS_command	=	'CRS' address
PRN_command	=	'PRN' address delimiter number
PRI_command	=	'PRI' identification
RLN_command	=	'RLN' | ('RLN' RL_parameter)
RLF_command	=	'RLF' | ('RLF' RL_parameter)
RLD_command	=	'RLD' | ('RLD' RL_parameter)
RLI_command	=	'RLI'
DIC_command	=	'DIC'
CIC_command	=	'CIC'
ECH_command	=	'ECH' parameter
EXC_command	=	'EXC' V.25*ter* command body
LSN_indication	=	('LSN' address delimiter number) | ('LSN' address delimiter number delimiter status) | 'LSN'
LSF_indication	=	('LSF' address delimiter number) | ('LSF' address delimiter number delimiter status) | 'LSF'
LSD_indication	=	('LSD' address delimiter number) | ('LSD' address delimiter number delimiter status) | 'LSD'
LSI_indication	=	'LSI' identification | 'LSI'
CFI_indication	=	'CFI' failure_type
DLC_indication	=	'DLC' time_duration
INC_indication	=	'INC'
VAL_indication	=	'VAL'
INV_indication	=	'INV' | ('INV' error_type)
CNX_indication	=	'CNX' | ('CNX' CNX_parameter)
EXI_indication	=	'EXI' V.25*ter* response
number	=	presentation* (digit | special) (digit | special | presentation)*
identification	=	presentation* digit (digit | presentation)*
address	=	presentation* digit (digit | presentation)*
failure_type	=	presentation* ('ET' | 'NS' | 'CB' | 'RT' | 'AB' | 'NT□')
RL_parameter	=	to be defined *****
time_duration	=	presentation* digit (digit | presentation)*
error_type	=	presentation* ('MS' | 'CU' | 'PS' | 'PV')
status	=	to be defined *****
CNX_parameter	=	to be defined *****
digit	=	'0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'
special	=	'&' | ':' | '>' | '<=' | 'P' | 'T'
presentation	=	' ' | '.'
delimiter	=	';'

4.1.5.2 Erroneous command/indication

– Whenever a command/indication is detected with a level II framing error (incorrect framing or FCS, see 4.1.3), this command/indication is disregarded.

– Whenever a DCE detects an error in the message of a command or receive a command which cannot be executed, it acknowledges negatively this command by issuing an *invalid* indication (INV). The letters within opcodes for commands and indications shall be upper case letters. Optionally, DCEs are allowed to accept the presence of corresponding lower case letters in place of specified upper case letters within the three-letter opcode of a command.

4.1.5.3 Command/indication succession

Table 7 lists for all the commands defined:

– the state of the interface in which the command may be issued;

– the state to which the interface moves after the issue of the command;

– the indications pertinent to that command;

– the state to which the interface moves after the issue of the indication;

– the consequence of this indication for the action initiated by the command.

NOTE – The state diagram of the interface is shown in Figure 5. In addition an SDL description of the message exchange, as per the Z.100-Series Recommendations, is offered in Annex B.

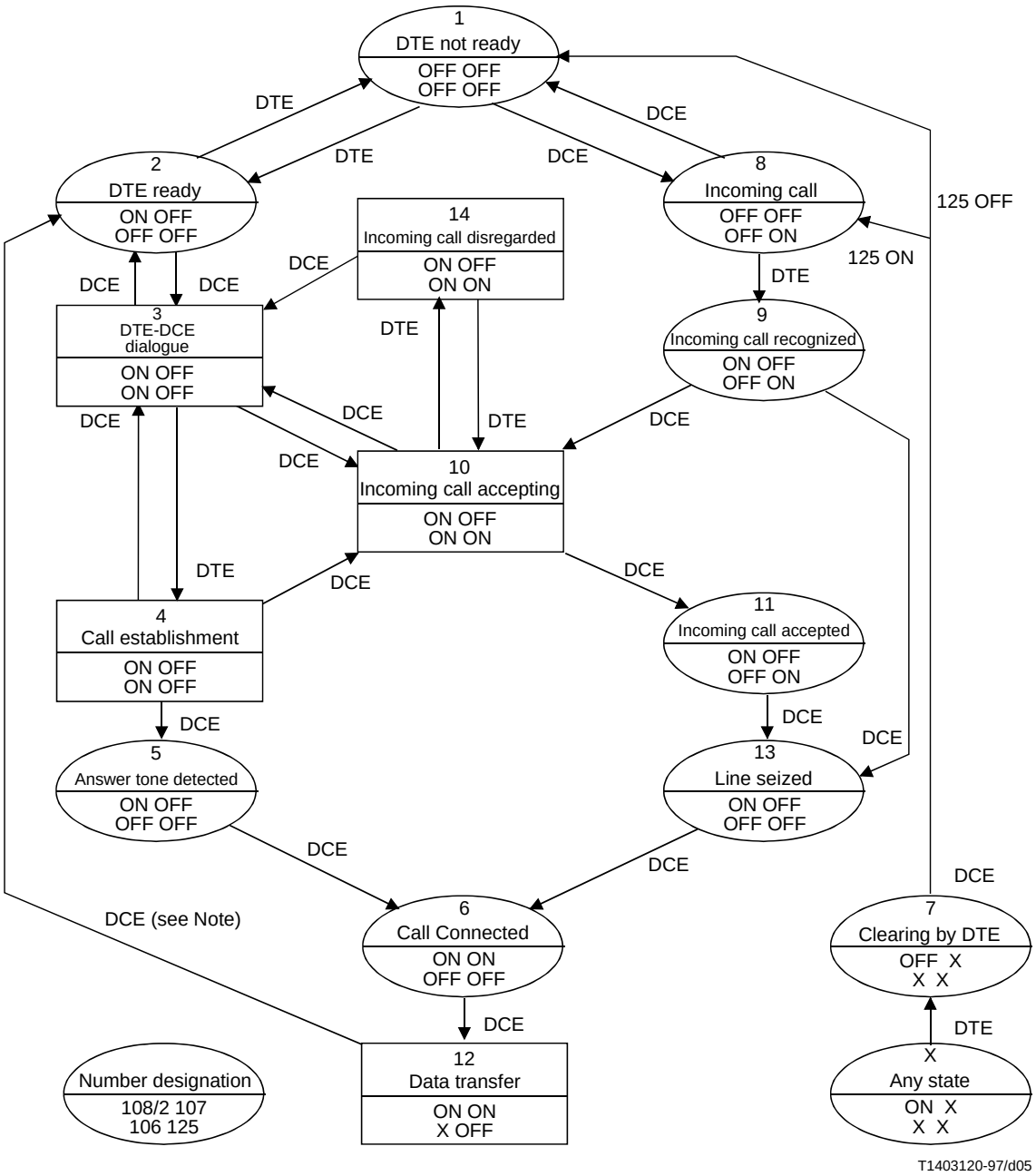
TABLE 7/V.25 *bis*

Commands, indications and their consequences

DTE command	From state	To state	DCE response	To state	Consequence
Call Request (CR_)	3	NC	VAL/CFI	4/3	Failed
			VAL/CNX	4/5	Accepted
			VAL/INC	4/10	Aborted
			VAL_	4/10	Aborted
			VAL/DLC	4/3	Failed
Program (PR_)[a)]	3/10/14	NC	VAL	NC	Accepted
			CNX(10)	11	Aborted
List Request (RL_)[a)]	3/10/14	NC	LS_	NC	Accepted
			CNX(10)	11	Aborted
Disregard Incoming Call (DIC)	10	NC	VAL	14	Incoming call not accepted
Connect Incoming Call (CIC)	14	NC	VAL/CNX	11	Incoming call accepted
			VAL	3	Incoming call not accepted
Any command	X	NC	INV	NC	Failed

NC No change

a) Reception of INC – circuit 125 turning ON or OFF and/or the issue of DIC – does not interfere with Program and List commands and their responses.



NOTE – Procedures after disconnection by the DCE are described in 4.4.3/V.24.

FIGURE 5/V.25 *bis*

Addressed call 108/2 response mode

4.2 Interface procedures at the calling data station

The DTE/DCE interface procedure for automatic calling and answering is shown in the state diagram in Figure 5.

The call set-up procedure is as follows:

- When the DTE is not ready to answer an incoming call or to enter the dialogue with the DCE, the interface is in state 1, *DTE not ready*.

- Prior to entering the dialogue with the DCE, the DTE shall signal 108/2 = ON and the interface is then in state 2, *DTE ready*.

- The DCE signals to the DTE that it is ready to enter the dialogue with the DTE by signalling 106 = ON, state 3, *DTE-DCE dialogue*. In this state, the DTE can issue commands and the DCE may issue indications.

- To initiate a call set-up, the DTE shall issue a *call request* command which should be acknowledged by the DCE either with an invalid or a valid indication. In the latter case the interface moves to state 4, *call establishment.* If the *call request* command contains a PSTN (Public Switched Telephone Network) number, the DCE shall proceed with the call set-up procedure. If it contains a DCE memory address, the DCE shall use its stored number.

- The DCE remains in state 4 during the dialling process.

- If the call is established and the answering tone is detected (see 6.1), a call connecting indication should be issued by the DCE, the interface moves to state 5, *answer tone detected*, and circuit 106 is turned OFF.

- If the call fails, the DCE may issue a *call failure* or a delayed call indication while in state 4 and return to state 3. During transmission of a calling station identification and the subsequent disconnection from the line following a call failure, the DCE may turn circuit 106 OFF and return to state 2, when it is not capable of handling new commands from the DTE.

- On completion of the line procedures (see 6.1), circuit 107 is turned ON and the interface moves to state 6, *call connected*. From this state the DTE may enter the *data transfer* phase, state 12, in the normal manner.

- While the DCE is in state 3 or state 4, prior to going *off hook*, an incoming call shall be signalled to the DTE using circuit 125 and/or using the *incoming call* indication. The interface then moves to state 10, *incoming call accepting*. If in this state the DTE wishes not to answer the incoming call, it may issue a *disregard incoming call* command. In this case the interface will move to state 14 and allow exchange of indications and commands other than *call request*. The collision of a call request with an incoming call before the latter has been detected is for further study.

- The DTE may clear a call or call attempt at any time by turning circuit 108/2 OFF, state 7, *clearing by DTE*. The interface will then move to state 1 or 8 for circuit 125 OFF or ON respectively.

4.3 Interface procedures at the answering data station

The DTE/DCE interface procedure for automatic calling and answering is shown in the state diagram in Figure 5. The procedure is as follows:

- When the DTE is not ready to answer an incoming call or to enter the dialogue with the DCE, the interface is in state 1, *DTE not ready*.

- Prior to entering the dialogue with the DCE, the DTE shall signal 108/2 = ON and the interface is then in state 2, *DTE ready*.

– The DCE signals to the DTE that it is ready to enter the dialogue with the DTE by signalling 106 = ON, state 3, *DTE-DCE dialogue*. In this state the DTE can issue commands and the DCE may issue indications.

– An incoming call is indicated to the DTE using circuit 125 and/or with an *incoming call* indication, and by this means the interface will move from state 3 or 4 to state 10, *incoming call accepting*. (In the case of state 4, the incoming call may only be detected prior to the DCE going *off hook*.)

– If an incoming call occurs when the DTE is in state 1, *DTE not ready*, the DCE moves to state 8, *incoming call*. The DTE may then turn circuit 108/2 ON, in response to this call or in order to enter the dialogue with the DCE. The interface thus moves to state 9, *incoming call recognized*. The DCE will respond by turning circuit 106 ON and thus also in this case the interface moves to state 10.

– While in state 10, the DTE may reject the incoming call by turning circuit 108/2 OFF or issue a *disregard incoming call* command which should be acknowledged by the DCE either with an invalid or valid indication. In the latter case, the interface will move to state 14 and allow exchange of indications and commands other than *call request*. If no *disregard incoming call* command has been issued within a period determined by national regulations, or when this command is reset by a subsequent *connect incoming call* command which should be acknowledged by the DCE either with an invalid or a valid indication, the DCE shall accept the incoming call, may issue a Call Connecting indication and move to state 11, *incoming call accepted* turning circuit 106 OFF, and from there to state 13, *line seized*, by turning circuit 125 OFF.

– Simple DCEs, having no programming capabilities, have in the past been provided which do not respond to the DIC and CIC commands.

– In this case the DCE will connect the incoming call immediately or after a predetermined period dependent on national regulations, thus moving directly from state 9, *incoming call recognized* to state 13, *line seized*.

– On completion of the line procedures (see 6.1), circuit 107 is turned ON and the interface moves to state 6, *call connected*. From this state, the DTE may enter the *data transfer* phase, state 12 in the normal manner.

5 Direct call and/or answer controlled by the DTE (circuit 108/1)

The *direct call* operating mode provides the DTE with the facility of setting up a call on the PSTN to a predefined data station, without a message exchange between the DTE and the DCE. The PSTN number to be called (or sequence of PSTN numbers) is recorded in the DCE. This Recommendation does not cover the method for recording the number in the DCE.

5.1 Interchange circuits involved

The interchange circuits used in this automatic calling/answering procedure are listed in Table 8.

TABLE 8/V.25 *bis*

Interchange circuit		Direction	
Number	Name	from DCE	to DCE
107	Data set ready	X	
108/1	Connect data set to line		X
125	Calling indicator	X	

5.1.1 Circuit 107 – Data set ready

The DCE shall turn circuit 107 ON:

i) at the end of the automatic call set-up procedure, to indicate to the DTE that the connection is established and the DCE connected to line;

ii) on completion of manual call set-up procedure.

The DCE shall turn circuit 107 OFF:

i) to indicate to the DTE that the connection has been cleared down during the data transfer phase (to be permitted where national regulations require it);

ii) in response to a clear request by the DTE turning OFF circuit 108/1 while in the data transfer state.

5.1.2 Circuit 108/1 – Connect data set to line

The DTE shall turn circuit 108/1 ON:

i) to instruct the DCE to seize the line, dial the pre-recorded number and execute the connection procedure on the PSTN as the caller party;

ii) to instruct the DCE to seize the line and execute the connection procedure on the PSTN as the called party if circuit 125 is in the ON condition.

The DTE shall turn circuit 108/1 OFF:

i) to instruct the DCE to clear down the connection during data transfer;

ii) to instruct the DCE to abort the call set-up procedure;

iii) to indicate to the DCE that it is not ready to accept an incoming call.

5.1.3 Circuit 125 – Calling indicator

The DCE shall provide circuit 125.

5.2 Interface procedure at the calling data station

The state diagram shown in Figure 6 displays the allowed transitions between the different interface states. The call set-up appears on the left side of Figure 6 and proceeds as follows:

– The DTE, whenever it wishes to initiate a call, checks that circuit 125 is in the OFF condition, then turns ON circuit 108/1. A timer (T1) is started on the transition from state 1, *idle* to state 2.

– The DCE turns ON circuit 107 when it has recognized the successful establishment of the call, thus moving to state 3, *data transfer*.

– If the first call attempt is unsuccessful, the DCE may make further attempts according to its programming and national regulations. During this period, the interface remains in state 2.

– When in state 1, the DCE will turn circuit 125 ON whenever an incoming call occurs, and the interface moves to state 5, *incoming call*. State 6, *incoming call accepted*, is reached when the DTE turns ON circuit 108/1 to accept the call, which in turn leads to state 7, *answering station connecting*. The DCE may abort the incoming call by turning OFF circuit 108/1 when in state 7, and return to state 1.

– When in state 2, the DCE will turn circuit 125 ON whenever an incoming call has been detected prior to the DCE seizing the line. The interface then moves to state 6 as incoming calls have priority over call set-

up attempts. The DCE should remain in state 6 for at least 100 ms (this value is for further study) before entering state 7, to allow the DTE to recognize the ON condition on circuit 125.

– While in state 2, the DTE can abort the call attempt by turning OFF circuit 108/1. This may be done if timer T1 expires with circuit 107 remaining in the OFF condition.

NOTE – Time-out T1 could range from 1 to 5 minutes depending on the programming of the DCE and national regulations.

5.3 Interface procedure at the answering data station

This mode provides the DTE with the facility of accepting an incoming call on a "per call" basis.

This operating mode is shown on the right hand side of the state diagram shown in Figure 6 and proceeds as follows:

– The DCE turns ON circuit 125 whenever it detects a ringing signal on the line and moves from state 1, *idle*, to state 5, *incoming call*.

– If the DTE does not want to accept the call, it may hold circuit 108/1 in the OFF condition. After the end of the ringing signal, the interface returns to state 1.

– If the DTE wishes to accept the call, it turns circuit 108/1 ON, and moves from state 5, *incoming call*, to state 6, *incoming call accepted*, and then to state 7, *answering station connecting*.

– In state 7, *answering station connecting*, the DCE accepts the call as detailed in clause 6. While in this state the DTE may abort the connection by turning OFF circuit 108/1.

– On completion of the connection procedure, the DCE turns ON circuit 107, moving then from state 7, *answering station connecting*, to state 3, *data transfer*.

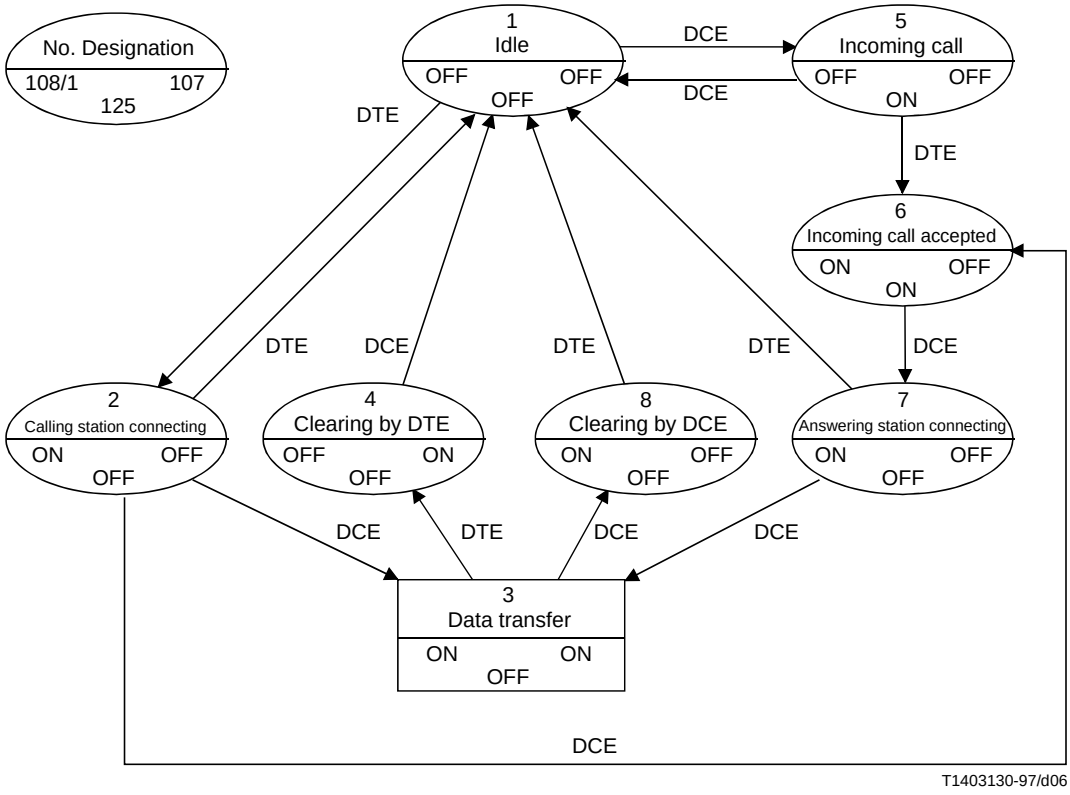


FIGURE 6/V.25 *bis*

Simplified procedure for direct call 108/1 answer mode

6 Line procedures

6.1 Line procedure at the calling DCE

- Whenever the DCE has received the *call request* (see Figures 5 and 6), the DCE seizes the line by going *off hook*.
- Dialling may proceed when dial tone has been detected, or, where national regulations permit this, after a fixed time delay. The value of this delay will be dependent on the national network.
- On completion of dialling, or, where possible, on recognizing the other end going off hook, a calling tone as specified in Recommendation V.25 is transmitted.
- During interruptions of the calling tone, the DCE monitors the line in order to detect call progress tones from the network and/or the answering tone, as specified in Recommendation V.25 provided by the remote DCE. If no answering tone is detected within a time-out, the DCE may go on hook and may issue an appropriate *call failure* indication. It may also issue *call failure* indication on recognition of specific signalling tones from the network.
- When the answering tone has been recognized by the DCE as detailed in Recommendation V.25, the DCE should issue a call connecting indication and then turn circuit 106 to the OFF condition.
- All other actions, including the turning ON of circuit 107 and the completion of the connection procedure, are as detailed in Recommendation V.25.

The policy for handling unsuccessful calls may be dependent on the national networks. In this respect, a first level action by the call originating data station, which could involve blocking, by either the DCE or the DTE, of call attempts is not part of this Recommendation.

A second level action, which could permit the Administrations to trace erroneous calls when a subscriber complains, should be, where required by the Administration, implemented in the following way:

6.1.1 **Calling station identification** (where required by the Administration)

To enable the Administrations to have means to trace the originator of erroneous calls, an identification message has to be transmitted on the line by the call originating data station.

6.1.1.1 Criteria for transmission of identification information

The calling station identification information should be transmitted after the transmission of the calling tone when:

- the answering tone is not received within a time interval T2 from the end of the last digit dialled; or
- the answering tone is not received within a time interval T3 from detection of the remote end by DCE going *off hook*.

The choice of time-outs T2 and T3 and their durations is dependent on national regulations.

Whenever the DCE enters the transmission of the identification information on the line, it will defer the execution of any *clearing request* made by the DTE which puts circuit 108 in the OFF condition until the transmission of this identification information is completed.

The complete identification information should be transmitted successively 3 times or more.

6.1.1.2 Modulation method

The identification signal should be asynchronously frequency modulated with the frequencies 1300 Hz (mark) and 2100 Hz (space) in such a way that it is possible to receive this signal with a modem according to Recommendation V.23.

The modulation rate should be 1200 bauds. In cases where this rate cannot be realized, a modulation rate of 300 bauds should be used.

6.1.1.3 Format of identification information

The identification information should be encoded according to International Alphabet No. 5 with one start bit, one stop bit and an even parity bit according to Recommendations T.50 and V.4. The first digits of the identification number should contain the country code of the subscriber's telephone number.

6.1.1.4 Implementation

In addition to the contents of this Recommendation, the regulations of the national Administrations must also be complied with. The additional requirements may be:

- the use of the CRI command with or without the identification number;
- generation and storage of the identification number;
- complete structure and content of the identification number (except the first two digits);
- recording and detection of the identification information.

6.2 Line procedure at the answering DCE

- When ringing is received on the line, the DCE turns ON circuit 125 and where implemented, issues an *incoming call* indication if circuits 108/2 and 106 are in the ON condition.
- If circuit 108/1 or circuit 108/2 is OFF, the DCE waits for circuit 108 to be turned ON.
- If circuit 108/2 is ON, and the *disregard incoming call* command is not received within a period of time determined by national regulations, the DCE may issue, where implemented, a call connecting indication and then goes off hook.
- When circuit 108/1 is ON, the DCE goes *off hook* after a period of time determined by national regulations.
- If circuit 108 is not turned ON, then the call is not answered.
- Whenever the DCE goes *off hook*, it turns OFF circuit 106 if not already OFF.
- After going *off hook*, the DCE completes the connection procedure and turns circuit 107 ON, as detailed in Recommendation V.25.

7 Manual calling and answering

The operational procedures for manual calling to an automatic answering data station, and automatic calling to a manual answering data station, are the same as detailed in clauses 6/V.25 and 7/V.25, with the exception that circuit 106 has to be turned OFF before turning ON circuit 107, in the mode *addressed call and/or answer authorized by the DTE*.

Where the answering data station is expected to have a manual answering mode, this may be indicated to the calling DCE. The method for doing this is for further study.

8 Use of V.25 *ter* commands and indications

Optionally, the DCE may accept and execute commands and may issue responses as specified in Recommendation V.25 *ter*. The command format consists of the respective V.25 *ter* command, preceded by the EXC command as specified in Table 6/V.25 *ter*. A list of applicable commands can be found in Table IV.2/V.25 *ter*.

If this option is provided, the DCE shall be capable of responding with the indications specified in Table IV.3/V.25 *ter*. The response format consists of the respective V.25 *ter* response, preceded by the EXI indication as specified in Table 6.

The option, if provided, shall be applicable for all three formats for commands and indications specified in 4.1.3.

Annex A

Test facilities

Guidance on maintenance facilities

This Annex contains information on test facilities thought to be desirable in relation to implementations of V.25 *bis* automatic calling procedures.

The adoption of such procedures and especially the provision of centralized maintenance facilities by Administrations may not be assumed.

In order to enable a fault to be located in either the DTE or the DCE, the DTE should not be involved in the test. The test may be initiated, e.g. by pressing a button on the DCE, whereas indication of the test result may be presented, e.g. by means of a visual indicator.

The actual test consists of two stages: a DCE self-test and a test in cooperation with a maintenance centre. In which order these two stages are activated is not specified in this Recommendation. The test of the modem part of the DCE will not be part of this Recommendation, but should be performed separately according to Recommendation V.54.

A.1 DCE self-test stage

In this stage, the DCE will test as many functions and hardware as reasonably possible.

The test should comprise a loop at the DTE-DCE interface similar to V.54 loop 2 including all circuits normally exercised during the call set-up and clear phase. Further parts of the test depend on the DCE implementation, e.g. in case of a microprocessor-based design a functional test of the CPU, RAM and ROM would be appropriate.

A.2 DCE test with maintenance centre

In this stage, the procedure is as follows:

A.2.1 The user sets up manually a call with the Maintenance Centre (MC).

A.2.2 On answering the call, the MC will send an answering tone of appropriate length to ensure detection by the DCE.

A.2.3 As soon as the answering tone is detected, the DCE should be connected with the line.

A.2.4 After detecting the end of the answering tone, the DCE starts sending the dialling digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 in accordance with the regulations of the Administration involved.

NOTE – They shall have the same spacing as during the automatic call set-up.

A.2.5 In case not all numbers are detected faultlessly, the MC will send a 2100 Hz tone for 0.4 ± 0.1 s indicating a negative test result and disconnect from the line.

A.2.6 On detecting the 2100 Hz tone, the DCE will end the test procedure and indicate a negative test result.

A.2.7 If all numbers are received correctly, the MC will send a 1300 Hz tone for 0.4 ± 0.1 s and start sending towards the DCE signalling tone to be defined by the Administration involved.

A.2.8 At the end of this sequence, a 2100 Hz tone will be sent for 0.4 ± 0.1 s and the MC will disconnect.

A.2.9 The DCE receiving the 2100 Hz tone will give a positive or negative indication depending on the test result and end the procedure.

NOTE – For pulse dialling, the open contact shall be coded by a 2100 Hz tone and the closed contact by no signal at all.

Annex B

SDL Description of the addressed call – 108/2 Response Mode

This Annex provides an SDL description, as per the Z.100-Series Recommendations, of the message exchanges specified in this Recommendation for the addressed call – 108/2 response mode. This part of the automatic calling procedure is specified in clause 4 and Figure 5, which have to be taken as the master in case of any ambiguity.

The process described hereafter in Figure B.2, the key of which is Figure B.1, is invoked when the DCE enters state 3 "DTE-DCE dialogue", or state 10 "Incoming call accepting". It is terminated when the DCE enters state 5 "Answer tone detected", or state 11 "Incoming call accepted".

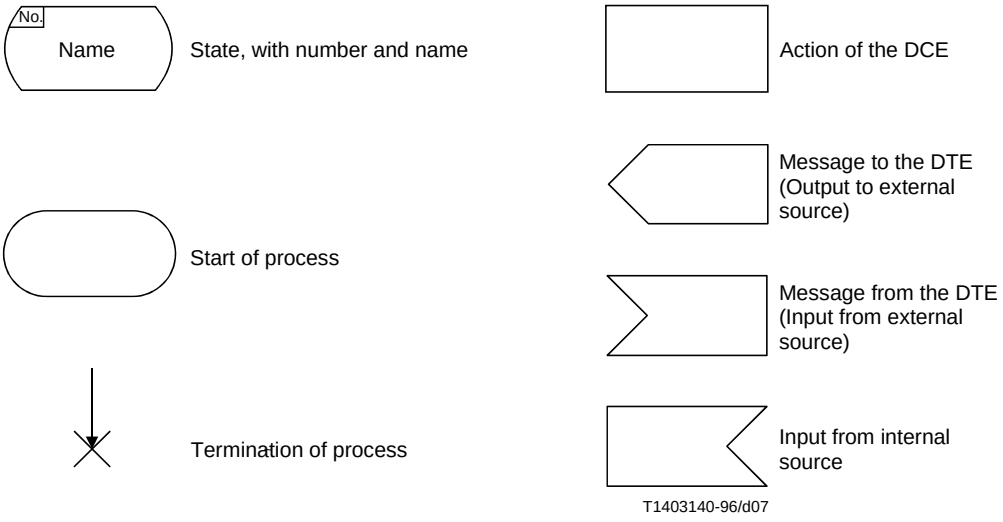
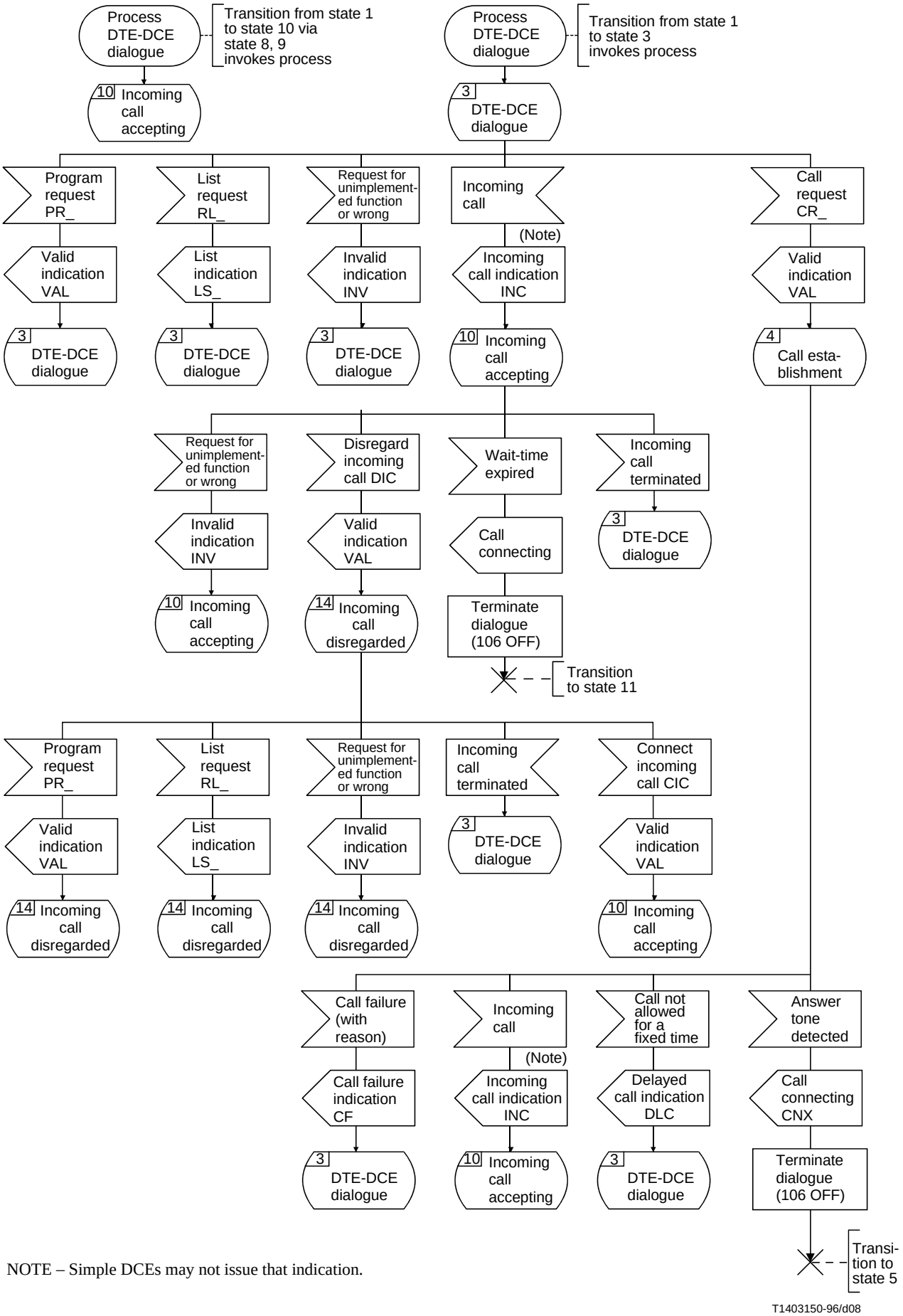


FIGURE B.1/V.25 *bis*

Key to SDL diagram in Figure B.2/V.25 *bis*



NOTE – Simple DCEs may not issue that indication.

FIGURE B.2/V.25 *bis*

Detailed SDL diagram, DCE-side

Appendix I

General description of the V.25 *bis* command/indication syntax

Table I.1 is a general presentation of the V.25 *bis* message syntax which is offered for guidance in the development of any application where harmonization with Recommendation V.25 *bis* is sought. (Detailed description of the V.25 *bis* syntax is presented in Table 6.)

TABLE I.1/V.25 *bis*

General description of the V.25 *bis* message syntax

description language:		
a | b		denotes the set (a, b)
a b		denotes the set (ab)
a*		denotes the set (e, a, aa, aaa, . . .)
		(e = empty)
description:		
message	=	(opcode) | (opcode parameter_list)
opcode	=	letter letter letter
parameter list	=	parameter (delimiter parameter)*
parameter	=	(letter | digit | special | presentation) (letter | digit | special | presentation)*
letter	=	'A' | 'B' | 'C' | 'D' | 'E' | 'F' | 'G' | 'H' | 'I' | 'J' | 'K' | 'L' | 'M' | 'N' | 'O' | 'P' | 'Q' | 'R' | 'S' | 'T' | 'U' | 'V' | 'W' | 'X' | 'Y' | 'Z
digit	=	'0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'
special	=	'&' | ':' | '>' | '<' | '=' | 'P' | 'T'
presentation	=	' ' | '.'
delimiter	=	';'

NOTE – The syntax of the parameters depends on the message and should be specified in the message description.

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