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TELEGRAPHY ALPHABETICAL TELEGRAPH TERMINAL EQUIPMENT

CONNECTION TO THE TELEX NETWORK OF AN AUTOMATIC TERMINAL USING A V.24 DCE/DTE INTERFACE

ITU-T Recommendation S.16

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) 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, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation S.16 was revised by the ITU-T Study Group IX (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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CONNECTION TO THE TELEX NETWORK OF AN AUTOMATIC TERMINAL USING A V.24 DCE/DTE INTERFACE

(Former Recommendation V.11, Mar del Plata, 1968; amended at Geneva, 1980; Malaga-Torremolinos, 1984 and at Helsinki, 1993)

1 General

1.1 This Recommendation describes a method of originating and answering calls on the 50-baud telex network by means of an automatic terminal that uses interchange circuits defined in Recommendation V.24 [1] for the interface between the data terminal equipment (DTE) and the data circuit terminating equipment (DCE). In addition this Recommendation covers manual calling with automatic switching to data processing or other off-line equipment and reply by teleprinter with automatic switching to a DTE.

1.2 A distinction is drawn between the two types of automatic calling in national telex networks – dial selection (using dial pulses in accordance with Recommendation U.2 [2]) and keyboard selection using 50-baud teleprinter signals [International Telegraph Alphabet No. 2 (ITA2)].

2 DCE/DTE interface

2.1 The interchange circuits used for the interface between the DCE and the DTE are defined in Recommendation V.24 [1] and comply with the technical specifications in either Recommendation V.28 [3] or Recommendation V.10 [4]. Thus the correspondance between the voltages and the significant states is as shown in Table 1.

TABLE 1/S.16

Correspondence between significant states

		Voltag	ge level		
Circuit condition	Logic level	Recommendation V.28	Recommendation V.10	Signal	Condition
ON	0	≥ +3 V	$\geq +0,3$ V	Start	А
OFF	1	≤ -3 V	\leq -0,3 V	Stop	Z

2.2 The circuits used for automatic reply (see Figures 1 and 2) are CT 102, 103, 104, 107, 108/2, 125 and 132.

2.3 The circuits used for automatic calling with dial selection (see Figure 1) are those listed in 2.2 supplemented by CT 202, 206, 207, 208, 209, 210, 211 and 213. The 200-series circuits are not connected directly to the DCE but to an automatic calling equipment (ACE) built into the DCE, which explains the presence of CT 202 to 213. These circuits may be used by a single DTE connected to a single DCE/ACE.

2.4 The circuits used for automatic calling with keyboard selection (see Figure 2) are those listed in 2.2 supplemented by CT 202, which is connected directly from the DTE to the DCE.

2.5 Where a DTE has access through a DCE to several telex lines of the public network, the DCE shall select for each call attempt one telex line and one only (which need not be the same one as for the preceding attempt) and in no case is the DCE allowed to present the same call simultaneously on more than one telex line. The calling and answering procedure and signalling between DTE and DCE are identical, after connection to a telex line, with those that are used when a DCE is connected to one telex line only, which are described in the diagrams below.

2.6 If several DTE are connected to the telex network through the same DCE, each DTE shall make its call attempts to the network using the procedure described in this Recommendation. On the other hand, when it is in the answering position for a call coming from the telex network, the DCE is responsible for handling the calls intended for the DTE concerned using the procedure described in Recommendation F.71 [5] on the interconnection of the telex network with private teleprinter networks. As soon as the DCE has selected the DTE concerned, the answering signal to the call at the DTE/DCE interface and the signalling on the telex line will be identical to those used in the case of a single DTE as described in the diagrams below.

2.7 In the timing diagrams below (see Annexes A to E), the ON condition in the interchange circuits is denoted by a solid line and the OFF condition by the absence of a line. For CT 103 and 104,* means that the DCE connects them to line and \emptyset means that the DCE disconnects them from the line.

3 Signalling

3.1 These interfaces may be used with the three following types of telex signalling:

- type A (keyboard selection);
- type B (keyboard selection);
- type B (dial selection).

3.2 The signalling between the DCE and the national telex exchange is not standardized by the CCITT. The signalling protocol shown in the timing diagrams (see Annexes A to E) are only examples to indicate the interdependence between the signalling on the subscriber lines and the status of the interchange circuits.

3.3 Automatic calling with type B signalling and dial selection is described in Annex A. Automatic calling with either type A or B signalling and keyboard selection is described in Annex B. The other annexes are common to all types of signalling.

3.4 The **SSSS** sequence (four times combination No. 19 in ITA2), if required, is transmitted either after the exchange of answer-back codes and through-connection, if network-controlled, or, otherwise, after reception of the call-connected signal. The purpose of the **SSSS** sequence is to indicate that the exchange of "data" is about to start and that no further "telex" signals that might disturb the exchange of data should be transmitted or interpreted. It enables the equipment that is required for the exchange of data, which may then commence after a 500 ms delay, as specified in Recommendation S.15. This sequence may be omitted where an exchange of messages in ITA2 is to take place, providing disabling of the answer-back function is not considered necessary.

3.5 In the event of reply by teleprinter, the last character of the **SSSS** sequence initiates automatic switching to the DTE.

3.6 A special data signal may be sent by the DTE to cause the distant terminal to return to the telex mode of operation.

3.7 The DTE must comply with Recommendation U.40 [6] concerning ineffective attempts. It must be able to interpret at least the following service signals: OCC, ABS, NA, NP, NC, NCH, DER.

	CT 102	Signal ground									
	CT 103	Data (transmitted)									
	CT 104	Data (received)									
	CT 108/2	Data terminal ready	Data terminal ready Data set ready								
Ξ	CT 107	Data set ready									
L D	CT 125	Calling indicator	Calling indicator								
nen	CT 132	Return to non-data mode									
dinp	CT 202	Call request		Control							
al ec	CT 206	Digit signal (2º)	Digit signal (2º) Digit signal (2 ¹)								
nim	CT 207	Digit signal (2 ¹)									
a tei	CT 208	Digit signal (2²)	Automatic								
Dat	CT 209	Digit signal (2 ³)	calling								
	CT 211	Digit present	equipment (ACE)								
	CT 210	Present next digit	(*****)								
	CT 213	Power indication	Power indication								
	•		Data circuit terr	minating							

equipment (DCE) T0900970-94/d01

FIGURE 1/S.16 Interface for automatic calling (dial selection)

()	CT 102	Signal ground	
DTE	CT 103	Data (transmitted)	Ø
ent (CT 104	Data (received)	E)
ipme	CT 107	Data set ready	mir (DC
nbə	CT 108/2	Data terminal ready	uit te nent
linal	CT 125	Calling indicator	uipm
tern	CT 132	Return to non-data mode)ata eq
Jata	CT 202	Call request	
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FIGURE 2/S.16

Interface for automatic calling (keyboard selection)

NOTES to Figures 1/S.16 and 2/S.16

1 CT 106 and 109, which are unnecessary for telegraph operation, have been suppressed. CT 107 indicates that the DCE is ready to receive the selection information.

2 With keyboard selection, the selection signals (start-stop ITA2) are of the same type as the "data" signals. They are therefore transmitted serially by the DTE on CT 103.

3 CT 108/2, which is mainly used to indicate that the DTE is ready to receive a call, also serves, when OFF, to initiate clearing of a call.

4 CT 203 is not essential since the proceed-to-select signal is indicated by CT 107 and, in the event of call collision in automatic calling, the simultaneous ON condition of CT 125 and 202 informs the DTE that it must abandon its call attempt to permit acceptance of the incoming call.

5 CT 202 may also be suppressed by assigning the calling function to CT 108/2. The latter, which should then be designated CT 108/1, would fulfil the functions of CT 108/2 and 202.

4 Modes of operation – Timing diagrams

4.2

4.1 The various modes of operation and equipment configurations are illustrated in the annexes below as follows:

Annex	Subject	Signalling									
А	Automatic call by DTE (dial selection)	Type B (dial selection)									
В	Automatic call by DTE (keyboard selection)	Types A and B (keyboard)									
С	Teleprinter + DTE (manual call with manual or automatic switching to DTE)	All types									
D	Answering by DTE	All types									
Е	Teleprinter answering (with automatic switching to DTE)	All types									
The following abbreviations and signs are used in Annexes A to E:											
A/B	Telex answer-back code										
DCE	Data circuit terminating equipment										
DTE	Data termi	nal equipment									
ms	Millisecond										
SSSS	Transfer sequence (see 3.4 above)										
S	Second										
WRU	"Who are you?" signal (combinations Nos. 30 and 4))									
*	CT 103 and 104 connected to line										
Ø	CT 103 and 104 disconnected from line										
	A broken line indicates that the circuit may be either	ON or OFF									

Annex A

Automatic call by DTE

(Dial selection) (This annex forms an integral part of this Recommendation)

	Subs lir	criber nes				Inte	erchan	ge circ	uits			
Call phases	Forward path	Backward path	103	104	107	108/2	125	132	202	206 207 208 209	211	210
Free line Call from DTE DCE sends call to network DCE receives call-confirmation and proceed-to-select signal	A Z		A Z			T			T			
DCE switches CT 210 to ON	┝╍╍┢╵											- —
DTE presents the first digit on to T 206, 207, 208 and 209										Х		
DTE switches CT 211 to ON											—	
DCE sends first digit to network 5 DCE switches CT 210 to OFF DTE switches CT 211 to OFF Y												\bot
DCE switches CT 210 to ON												—
DTE presents the end-of-number (EON) signals										Х		
DTE switches CT 211 to ON DCE switches CT 210 to OFF and holds until call is cleared											Т	
DTE switches CT 211 to OFF												
DCE receives the call-connected signal, switches CT 107 to ON and connects CT 103 and CT 104 through to line		L	*	*	Т							
If no answer-back signal is received after 3 s, DTE transmits WRU signal	K		K									
DTE receives A/B ^{a)}		Ц		K								
DTE sends SSSS sequence ^{b)} Exchange of data may start after 500 ms	$ \square $		\square									
If calling DTE wishes to revert to the normal telex, mode, the DTE sends a special data signal. Where a) the A/B simulator is located in the DTE, the simulator is re-enabled, b) the A/B simulator is located in the DCE, DTE switches CE 132 ON. Normal telex transmission may start after 2 s								I				
Clearing from calling DTE ^{c)}			Ø	Ø					╧			
		₋└─┐		·		▶⊥						
DTE receives clear request from called DTE ^{c)} DCE returns clear-confirmation				<u>ب</u>								
Free line	╎┌─┘		Ø	Ø					₊⊥			
a) If an A/B simulator is provided in the DCE, then	this n	nust no	t resp	ond to	the WF	RU sig	nal.					
^{b)} This SSSS sequence is recognized by: a) the DTE if the Λ/R simulator is located	in the	ΟΤΕ ·										
b) the DCE, il the A/B simulator is located	in the	DCE.										

In either case, the A/B simulator is disabled.

^{c)} If the A/B simulator is located in the DCE and is disabled, it is re-enabled.

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Annex B

Automatic call by DTE

(Keyboard selection)

(This annex forms an integral part of this Recommendation)

	Sub I	scrik ines	ber			Interchange circuits							
Call phases	Forward	Backward	path	103	104	107	108/2	125	132	202			
Free line			Z	A Z	A Z				1				
Call from DTE, DCE sends call to network DCE receives call-confirmation and (where appropriate) proceed-to-select signal		-	 	*	*	•				•_			
DTE sends selection signals				R									
 a) Case where call-connected signal is received: DTE receives call-connected signal If WRU signal is not sent automatically by network, DTE sends it 				K									
 b) Case where call-connected signal is replaced by A/B of called terminal: In cases a) and b), DTE receives called terminals A/B 					K								
If exchange of A/Bs is initiated by the network: Case a) A/B simulator provided in DTE DTE receives WRU signal DTE returns its A/B				K	K								
Case b) A/B simulator provided in DCE DCE receives WRU signal DCE returns its A/B					K								
DTE sends SSSS sequence ^{a)} Exchange of data may start after 2 s				K									

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	Sub li	sci	riber s		Interchange circuits								
Call phases	Forward		Backward path	_	103	104	107	108/2	125	132	202		
If calling DTE wishes to return to the normal telex mode, the DTE sends a special data signal. Where: a) the A/B simulator is located in the DTE the simulator is re-enabled, b) the A/B simulator is located in the DEC the DTE switches CT 132 ON Normal telex transmission may start after 2 s	AZ		A Z			A Z				T			
Clearing from calling DTE ^{b)} DCE receives clear-confirmation signal Free line		-			Ø	Ø					•		
DTE receives clear request from called DTE ^{b)} DCE returns clear-confirmation Free line					Ø	Ø	▶				•		
 a) This SSSS sequence is recognized by: a) the DTE, if the A/B simulator is located in the DTE; b) the DCE, if the A/B simulator is located in the DCE. In either case, the A/B simulator is disabled. b) If the A/B simulator is located in the DCE and is disabled, it is re-e 	nable	ed.	•		•			•	т	090101	0-94/405		

Annex C

Teleprinter + DTE

(Manual call with manual or automatic switching to DTE) (This annex forms an integral part of this Recommendation)

	Subs lir	criber nes			Interchange circuits					
Call phases	Forward path	Backward path	103	104	107	108/2	125	132	202	
Free line	A Z	A Z	A Z	A Z	•					
The operator calls the telex centre										
DCE receives call-confirmation signal The operator sends selection signals and sets up call in the usual way										
The telex terminal equipment receives called terminal's A/B		K								
The operator sends SSSS sequence	K					+				
Manual or automatic switching to DTE			*		*⊤					
Exchange of data may start after 500 ms										
		İ	ĺ	ĺ						
Clearing from calling DTE DCE receives clear-confirmation			Ø	ø	<u> </u>	¥				
Free line					100 ms					
Calling telex operator clears:			Î							
Manual switching to the telex line			Ø	Ø						
Operator clears										
DCE receives clear-confirmation										
Free line										
Clear request from called DTE										
DCE sends back clear-confirmation			Ø	_⊗ 		ł				
						l				

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Annex D

Answering by DTE (This annex forms an integral part of this Recommendation)

	Subs	criber nes		Interchange circuits							
Call phases	Forward	Backward path	103	104	107	108/2	125	132	202		
Free line	a z	A Z	A Z	A Z	1			I	I		
Incoming call		L									
DCE returns call-confirmation			*	*	Т		Т				
DTE receives WRU signal		\square		\square		÷					
DTE sends A/B	$ \square$		K								
If A/B exchange is initiated by the network, DTE receives calling terminal's A/B		R		K							
DTE receives SSSS sequence		K		K							
Exchange of data may start after 500 ms											
Clearing from calling DTE DCE returns clear-confirmation			Ø								
Free line											
Called DTE clears the call DCE receives clear-confirmation Free line			Ø	Ø	100 ms						
When DTE is not ready to receive a call:			1								
Free line											
Incoming call		ή									
DCE returns call-confirmation If CT 108/2 is not switched to ON in the 2 s following the switching of CT 125 to ON, DCE clears the call			*	*			T				
DCE receives clear-confirmation Free line			Ø	Ø							

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Annex E

Teleprinter answering

(With automatic switching to DTE) (This annex forms an integral part of this Recommendation)

	Subs	scribe nes	r	Interchange circuits							
Call phases	Forward	Backward	parri	103	104	107	108/2	125	132	202	
Free line Incoming call	A Z	а : 	z 	A Z	A Z						
DCE returns call-confirmation signal							2s	ŧΤ			
DCE or teleprinter receives WRU signal and returns A/B		\boxtimes	ן ז				_ <u>,</u>	⊻∣			
If A/B exchange is initiated by the network, DTE receives calling terminal's A/B		\boxtimes] 1								
DCE and the teleprinter receive SSSS, then if CT 108/2 is ON, DCE connects DTE to line		\boxtimes]								
Exchange of data may start				*	*	Τ					
Clearing from calling DTE											
DTE returns clear-confirmation				Ø	Ø			▶⊥			
Free line											
Clearing by called DTE		•		Ø	Ø		 ↓				
DCE receives clear-confirmation					ŀ	100 ms					
Free line							1				
If communication with telex terminal is necessary, a special data signal is received		\boxtimes]		K						
DTE switches CT 132 ON									Т		
DCE carries out switching				Ø	Ø						
CT 132 is switched OFF by DTE											
Normal telex transmission may start			 								
Telex operator clears down using standard procedure											
Free line			1								

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References

- [1] CCITT Recommendation *List of definitions for interchange circuits between data terminal equipment and data circuit terminating equipment*, Rec. V.24.
- [2] CCITT Recommendation *Standardization of dials and dial pulse generators for the international telex service*, Rec. U.2.
- [3] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits*, Rec. V.28.
- [4] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications*, Rec. V.10.
- [5] CCITT Recommendation Interconnection of private teleprinter networks with the telex network, Rec. F.71.
- [6] CCITT Recommendation *Reactions by automatic terminals connected to the telex network in the event of ineffective call attempts or signalling incidents*, Rec. U.40.