

INTERNATIONAL TELECOMMUNICATION UNION



THE INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE



SERIES S: TELEGRAPH SERVICES TERMINAL EQUIPMENT

Start-stop terminals

CONNECTION TO THE TELEX NETWORK OF AN AUTOMATIC TERMINAL USING A V.24 [1] DCE/DTE INTERFACE

Reedition of CCITT Recommendation S.16 published in the Blue Book, Fascicle VII.1 (1988)

NOTES

1 CCITT Recommendation S.16 was published in Fascicle VII.1 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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 [1] DCE/DTE INTERFACE

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

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/S.16.

TABLE 1/S.16

Correspondence between significant states

Circuit condition		Voltag	ge level	Signal	Condition	
	Logie iover	Rec. V.28	Rec. V.10	Jigilai	Condition	
ON OFF	0 1	≥ +3 V < -3 V	≥ +0.3 V ≤ -0.3 V	Start Stop	A Z	

2.2 The circuits used for automatic reply (see Figures 1 and 2/S.16), 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/S.16) 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/S.16) 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 o/ means that the DCE disconnects them from the line.

	CT 102	Signal ground								
ľ	CT 103	Data (transmitted)	Data (transmitted)							
	CT 104	Data (received)	Data (received)							
	CT 108/2	Data terminal ready		1						
(E)	<u>CT</u> 107	Data set ready	Data set ready							
Ę I	CT 125	Calling indicator	Calling indicator							
าค	CT 132	Return to non-data mode		1						
ŭ	CT 202	Call request		Control						
nal equ	CT 206	Digit signal (2º)								
	CT 207	Digit signal (21)								
erm	СТ 208	Digit signal (2²)	Automatic							
tat	CT 209	Digit signal (2 ³)	calling	unit						
۵	CT 211	Digit present	equipment (ACE)							
	CT 210	Present next digit								
	CT 213	Power indication		ľ						
		CCITT-18912								
	1	Ĺ		L <u></u>						

Data circuit terminating equipment (DCE)

FIGURE 1/S.16

Interface for automatic calling (dial selection)

CT 103 Data (transmitted)	E
	ōI
	ē
CT 107 Data set ready	ent
E CT 108/2 Data terminal ready	Ē
CT 125 Calling indicator	edn
CT 132 Return to non-data mode	ting
CT 202 Call request	ē

FIGURE 2/S.16

Interface for automatic calling (keyboard selection)

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

a) 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.

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

c) 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.

d) 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.

e) 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.

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 (Annexes A to E below) 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.

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)
C	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 follow	wing abbreviations and signs are used in Annex	es A to E:

A/B	telex answer-back code
DCE	data circuit terminating equipment
DTE	data terminal equipment
ms	millisecond
SSSS	transfer sequence (see § 3.4 above)
S	second
WRU	"Who are you?" sequence (combination No. 4 in figure case)
*	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 (to Recommendation S.16) Automatic call by DTE (dial selection)

	Subs	Subscriber Interchange circuits										
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	A Z		Ţ			Ţ			
DCE switches CT 210 to ON DTE presents the first digit on CT 206, 207, 208 and 209 DTE switches CT 211 to ON DCE sends first digit to network DCE switches CT 210 to OFF DTE switches CT 211 to OFF										X		
DCE switches CT 210 to ON DTE presents the end-of-number (EON) signals										x		T
DTE switches CT 211 to ON DCE switches CT 210 to OFF and holds until call is cleared DTE switches CT 211 to OFF											T	Ţ
DCE receives the call-connected signal, switches CT 107 to ON and connects CT 103 and CT 104 through to line			*	*	Т							
If no answer-back signal is received after 3 s, DTE transmits WRU DTE receives A/B ^{a)} DTE sends SSSS sequence ^{b)} Exchange of data may start after 500 ms	R	R	R R	R				·				
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 CT 132 ON. Normal telex transmission may start after 2 s	R		R					I				
Clearing from calling DTE ^{c)} DCE receives clear-confirmation Free line		•	ø	ø 					↓			
DTE receives clear request from called DTE c) DCE returns clear-confirmation Free line		نے 										
			Ø	ø							CCITT	- 40 580

a) If an A/B simulator is provided in the DCE, then this must not respond to the WRU.
b) 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.
c) If the A/B simulator is located in the DCE and is disabled, it is re-enabled.

ANNEX B

(to Recommendation S.16)

Automatic call by DTE

(keyboard selection)

	Т		Г [.]							
		iber S	Interchange circuits							
Call phases	Forward path	Backward path	103	104	107	108/	/2 125	132	202	
Free line		z	A Z	A 2	2					
Call from DTE, DCE sends call to network		_				ľ				
DCE receives call-confirmation and (where appropriate) proceed-to-select signal		 	*	*	▶ ⊤				T	
DTE sends selection signals	R		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			R							
 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		¥			1					
If exchange of A/Bs is initiated by the network :										
Case a) A/B simulator provided in DTE										
DTE receives WRU signal		\exists								
DTE returns its A/B			R			3				
Case b) A/B simulator provided in DCE		J								
DCE returns its A/B		Ĩ		Å	ł					
· · · · · · · · · · · · · · · · · · ·										
DTE sends SSSS sequence ^{a)}										
Exchange of data may start after 2 s								CCITT -	27550	

Automatic call by DTE (cont'd) (keyboard selection)

	Subscriber lines		ircuits	3		
Call phases	Forward path Backward path	103 104	107 108/2	125 1	32 202	
 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 DCE the DTE switches CT 132 ON Normal telex transmission may start after 2 s 					I	
Clearing from calling DTE ^{b)}	│ ┍╼┙┥╴┤╴		_ 上 -		_ • -	
DCE receives clear-confirmation signal			Ţ			
Free line						
DTE receives clear request from called DTE ^{b)}						
DCE returns clear-confirmation		ø ø	┛╌╎╴		╶╺┻┤	
Free line				cci	TT - 15942	

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-enabled.

ANNEX C

(to Recommendation S.16)

Teleprinter + DTE

(Manual call with manual or automatic switching to DTE)

	Subscriber lines	r Interchange circuits						
Call phases	Forward path Backward path	103 104 107 108/2 125 132 202						
Free line 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 The operator sends SSSS sequence Manual or automatic switching to DTE Exchange of data may start after 500 ms	R	*						
Clearing from calling DTE DCE receives clear-confirmation Free line		Ø Ø						
Calling telex operator clears: Manual switching to the telex line Operator clears DCE receives clear-confirmation Free line		8 8						
Clear request from called DTE DCE sends back clear-confirmation Free line		gi gi ccitt - 15953						

ANNEX D (to Recommendation S.16) Answering by DTE

		criber 1es	Interchange circuits						
Call phases	Forward path	Backward path	103	104	107	108/2	125	132	202
Free line	A Z	A Z	A Z	ΑZ				•	
Incoming call		L				Ì			
DCE returns call-confirmation			*	*	Ŧ	ł	—		
DTE receives WRU signal						<u> </u>			
DTE sends A/B	K		R						
If A/B exchange is initiated by the network, DTE receives calling terminal's A/B		R		R					
DTE receives SSSS sequence Exchange of data may start after 500 ms		R		R					
		i			+				
Clearing from calling DTE									
DCE returns clear-confirmation			ø	ø	T		T		
Free line									
Called DTE clears the call		•							
DCE receives clear-confirmation			ø	ø		Ł	T		
Free line					100 ms	↓			
When DTE is not ready to receive a call:	ł								
Free line									
DCE returns call-confirmation		٦							
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			Ť	T					
DCE receives clear-confirmation Free line			ø	ø			Ţ	CCITT -	15963

ANNEX E

(to Recommendation S.16)

Teleprinter answering

(with automatic switching to DTE)

	Subscriber lines	Interchange circuits						
Call phases	p pr							
	Forwar path Backwa	103 104 107 108/2 125 132 202						
Free line Incoming call								
DCE returns call-confirmation signal								
DCE or teleprinter receives WRU and returns A/B								
If A/B exchange is initiated by the network, DTE receives calling terminal's A/B								
DCE and the teleprinter receive SSSS, then, if CT 108/2 is ON, DCE connects DTE to line								
Exchange of data may start								
Clearing from calling DTE								
DTE returns clear-confirmation	┟┏┛┛╽╴╴╴╴	╶ _┫ ┥┫╗╌┷╌╌┥╌ ╸┷						
Free line								
Clearing by called DTE								
DCE receives clear-confirmation								
Free line								
If communication with tales to an it.								
special data signal is received	R							
DTE switches CT 132 ON								
DCE carries out switching								
CT 132 is switched OFF by DTE								
Normal telex transmission may start								
Telex operator clears down using standard procedure								
Free line		CC 171-27570						

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.

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