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PART I

Series U Recommendations

TELEGRAPH SWITCHING

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SECTION 1

GENERAL

Recommendation U.1

SIGNALLING CONDITIONS TO BE APPLIED

IN THE INTERNATIONAL TELEX SERVICE

(former CCIT Recommendation E.1, Arnhem, 1953; amended at Geneva, 1956, New Delhi, 1960,

Geneva, 1964, Mar del Plata, 1968, Geneva, 1972, 1976, 1980, Malaga-Torremolinos, 1984 and Melbourne, 1988)

The CCITT,

considering

(a) that signalling conditions in the international telex service require accurate definition of the signals to be used on international telex circuits in putting through, supervising, clearing, and charging for international telex calls;

(b) that these signals must be such as to take into account that there are some fairly important differences in make-up between the telex networks of different countries. In some countries, selection is done by dialling, in others by means of start-stop signals. Some networks use direct selection while others use register translators. Between some networks, subscriber automatic selection is used whilst, in relations with other networks, semi- automatic or manual selection is still being used;

(c) that hence it has not been possible to lay down uniform signals for all international telex relations. While, for certain signals, it has been possible to lay down rules valid for all relations, for others the choice has been left between two types of signals known as type A and type B, within each type it has sometimes been necessary to provide alternative forms for certain signals. The signals with regard to which there is a choice are described in Tables 1a/U.1, 1b/U.1 and 2/U.1 below;

(d) that it is intended that the signalling with which this Recommendation deals should apply as far as possible when telex circuits make use of transmission devices having multiplex and signal regeneration facilities. In the case of operation over error-corrected radio circuits, Recommendaton U.20 lays down the conditions for adapting the signalling defined in Recommendation U.1. In the case of operation over channels using synchronous multiplex equipment in accordance with Recommendation R.44, Recommendation U.24 lays down the conditions for adapting the signalling defined in Recommendation U.1. When the signals defined in Recommendation U.1 are transmitted via code and speed dependent systems in accordance with Recommendation R.101, Recommendation U.25 lays down the permitted variations to the signals defined in Recommendation U.1. When the signals defined in Recommendation U.1 are transmitted via regenerative repeaters the signals received from these transmission devices may lie outside the tolerances stated in this Recommendation, and the permitted variations are shown in Recommendation U.5;

(e) that additional signalling standards (types C and D) have been defined for use on international telex networks. Details of these methods of signalling are laid down in Recommendations U.11 and U.12;

(*f*) that it has been necessary to define the rules for interworking Type D signalling with Types A, B and C signalling in Recommendation U.15, *unanimously declares the view*

1 Signalling types

1.1 In general, as far as signalling over international telex circuits is concerned, the outgoing country should conform to the signalling requirements of the incoming country. Nevertheless, when in the case of fully automatic service this requirement would entail considerable difficulty, alternative arrangements may be adopted by agreement between the two Administrations concerned.

1.2 The signals shown in §§ 2 to 10 below shall be employed under the conditions indicated.

Note — Both the forward and backward path signals are described at the moment of their emission on the international circuit.

1.3 The characteristics of the signals defined in §§ 4, 5, 7 and 10 below can be divided into two basic groups — type A and type B — as given in Tables 1a/U.1, 1b/U.1 and 2/U.1.

H.T. [T1.1]

TABLE 1a/U.1

International telex circuits terminated on distant automatic switching equipment with semi-automatic working to subscribers

Signal	Type A	Type B
{		
Call-confirmation		
(see §§ 4 and 5.1 of the text)		
}	Permanent stop polarity	{
25-ms pulse of stop polarity (between 17.5 and 35 ms)		
}		
{		
Proceed-to-select		
(see § 5.1 of the text)		
}	Teleprinter signal(s)	{
25-ms pulse of stop polarity (between 17.5 and 35 ms)		
}		
{		
Selection		
(see § 6 of the text)		
}	Teleprinter signal(s)	{
Dial pulses, or teleprinter signals		
}		
{		
Call-connected		
(see § 7 of the text)		
}	{	
Teleprinter signals		
Note		
— The teleprinter signals may be preceded by a 150-ms		
(± 11 ms) pulse of start polarity		
}	{	
Stop polarity for at least two seconds		
}		
{		
Busy		
(see § 10.1 of the text)		
}	{	
Teleprinter signals followed by clearing signal		
}	{	
ii		
i)		
165-260-ms pulse of stop polarity followed by start polarity		
for 1500 ms (tolerance ± 30%) (see Note)		
i		
ii)		
165-260-ms pulse of stop polarity followed by		
teleprinter signals and start polarity for 1500 ms		
(tolerance ± 20%) (see Note)		
}		
{		
Out-of-order, number changed, number unobtainable, etc.		
(see § 10.1 of the text)		
}	{	
Clearing signal normally preceded by teleprinter		
signals		
}	{	
ii		
i)		
Permanent start polarity		
i		
ii)		
165-260-ms pulse of stop polarity followed by start polarity		
for 1500 ms (tolerance ± 30%) (see Note)		
iii)		
165-260-ms pulse of stop polarity followed by		

teleprinter signals and start polarity for 1500 ms (tolerance ± 20%) (see Note) }			

Note — This sequence of signals may be repeated until a clearing signal is sent over the forward signalling path. However, with transmission systems having significant propagation delay, e.g. satellite or multiplex systems, it may be preferable to prevent such repetitions.

Tableau 1a/U.1 [T1.1], p.

H.T. [T2.1]

TABLE 1b/U.1

International telex circuits terminated on distant automatic switching equipment with fully automatic working between subscribers

Signal	Type A	Type B
Call-confirmation (see §§ 4 and 5 of the text)	Permanent stop polarity	25-ms pulse of stop polarity (between 17.5 and 35 ms)
Proceed-to-select (see § 5.1 of the text)	40-ms (± 8 ms) pulse of start polarity	25-ms pulse of stop polarity (between 17.5 and 35 ms)
Selection (see § 6 of the text)	Teleprinter signals	Dial pulses, or teleprinter signals
Call-connected (see § 7 of the text)	150-ms (± 11 ms) pulse of start polarity followed by stop polarity for at least 2 seconds and possibly by teleprinter signals	Stop polarity for at least 2 seconds
Call redirection signal (see Rec. U.41, § 2)	Call connected signal as defined above, followed by the call redirection sequence defined in Rec. U.41, § 2	Call connected signal as defined above, followed by the call redirection sequence defined in Rec. U.41, § 2
Busy (see § 10.1 of the text)	Teleprinter signals followed by clearing signal	**ii** i) 165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance ± 30%) (see Note 1) **i** ii) 165-260-ms pulse of stop polarity followed by teleprinter signals and start polarity for 1500 ms (tolerance ± 20%) (see Note 1)
Out-of-order, number changed, number unobtainable, etc. (see § 10.1 of the text)	Clearing signal normally preceded by teleprinter signals	**ii** i) Permanent start polarity (see Note 2) **i**

ii) 165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance ± 30%) (see Note 1) iii) 165-260-ms pulse of stop polarity followed by teleprinter signals and start polarity for 1500 ms (tolerance ± 20%) (see Note 1) } { Changed address interception signal (see Rec. U.41, § 1) } Call connected signal as defined above, followed by the changed address interception sequence defined in Rec. U.41, § 1 } Call connected signal as defined above, followed by the changed address interception sequence defined in Rec. U.41, § 1 }	{ {	

Note 1 — This sequence of signals may be repeated until a clearing signal is sent over the forward signalling path. However, with transmission systems having significant propagation delay, e.g. satellite or multiplex systems, it may be preferable to prevent such repetitions.

Note 2 — The use of this signal should be avoided if possible.

Tableau 1b/U.1 [T2.1], p.

H.T. [T3.1]
TABLE 2/U.1
International telex circuits terminated on distant manual switching equipment

Signal	Type A	Type B
{ Call-confirmation (see § 4 of the text) } 25-ms pulse stop polarity (between 17.5 and 35 ms) }	Permanent stop polarity	{
{ Proceed-to-transmit (see § 5.2 of the text) } Stop polarity followed by teleprinter signals }	Teleprinter signals	{
{ Call-connected (see § 7 of the text) }	Teleprinter signals	Teleprinter signals
{ Busy, out-of-order, number changed and number unobtainable (see § 10.1 of the text) }	Teleprinter signals	Teleprinter signals

Tableau 2/U.1 [T3.1], p.

2 Free line condition

2.1 The *free line* | is characterized by a permanent signal corresponding to the start impulse in accordance with International Telegraph Alphabet No. 2 (ITA2) (see the Recommendation cited in [1]) on the forward and backward signalling paths.

3 Call

3.1 The *call* | is characterized by an inversion to STOP polarity, received on the forward signalling path. Future designs of equipment should not recognize such an inversion as a valid call signal, unless it has existed for a period of greater than 50 milliseconds.

4 Call-confirmation signal

4.1 A *call-confirmation* | signal shall be returned over the backward signalling path following the initiation of a call to prove the continuity of the line and the response of the distant terminal equipment.

4.2 The call-confirmation signal shall be returned by the receiving end as quickly as possible and in any event with a delay not exceeding 150 milliseconds after the arrival of the calling signal at the receiving end.

5 Signals preceding selection

5.1 *Proceed-to-select signal*

5.1.1 In the case of international telex circuits terminated on distant automatic switching equipment that cannot accept the selection information immediately (either after the reception of the calling signal or after the sending of the call-confirmation signal), a distinct *proceed-to-select* signal shall be returned over the backward signalling path after the call-confirmation signal, to indicate that the selection information may be transmitted.

5.1.2 For type A signalling, the sending duration of the stop polarity, from the beginning of the call confirmation signal until the moment when the proceed-to-select signal begins to be sent, should be at least 100 milliseconds.

5.1.3 For type B signalling, the time interval between the end of the call-confirmation signal pulse and the moment when the proceed-to-select signal begins to be sent, during which the start polarity is sent, should be at least 100 milliseconds.

5.1.4 During the busy hour, for 99 calls in 100, the delay in the return by the receiving system of the proceed-to-select signal must not exceed 3 seconds after the reception of the calling signal. (In certain existing networks, this time may be 4 seconds.)

5.1.5 If the automatic switching equipment at the receiving end can receive the selection information immediately after the sending of the call-confirmation signal, the call-confirmation signal shall constitute the proceed-to-select signal.

5.1.6 If the automatic switching equipment at the receiving end can receive the selection information at the time of receiving the call signal, there shall be no proceed-to-select signal.

5.2 *Proceed-to-transmit signal*

5.2.1 In the case of international telex circuits terminated on a distant manual switchboard, a *proceed-to-transmit* signal shall be returned over the backward signalling path following the initiation of a call, to indicate that the teleprinter of the distant operator has been connected to the international circuit.

6 Selection signals

6.1 The selection signals should be in conformity with International Telegraph Alphabet No. 2 or dial signals in conformity with Recommendation U.2.

6.2 In the case of dial selection into a system employing letters in the national numbering scheme, figures only will be used on international circuits, because of the difficulty in transmitting signals other than figures from dials.

6.3 In the case of selection into a keyboard selection system, the *prepare-for-digits* signal will be combination No. 30 (figure-shift).

6.4 In those cases where an *end-of-selection* signal is required, this signal shall be combination No. 26 (**+**), possibly followed by another combination characterizing the class of traffic in the incoming country.

6.5 In systems that use keyboard selection and that require an end-of-selection signal, it is preferable that the subscriber’s number consist of a uniform number of characters.

6.6 To avoid undue occupation of lines and equipment, Administrations should take all reasonable steps to ensure that the transmission of selection signals over international circuits is completed without undue delay. In particular, where excessive delays are encountered, the incoming country may cause the connection to be cleared. When selection signals are sent by a subscriber, or by an operator, from country A towards a register in country B, country B may disconnect itself from the call if the time interval between two successive selection signals (either pulse trains or teleprinter characters) exceeds 5 seconds.

7 Call-connected signal

7.1 A *call-connected* signal shall be returned over the backward signalling path to indicate that the call has been extended to the terminal of the called subscriber, which shall normally always be available to receive a call, as stated in Recommendation F.60 [4], §§ 3.1.2 and 3.4.2.1, except in the cases mentioned in § 10.1.1 below. In the case of fully automatic switching between subscribers, this signal will start the equipment for determining the charge for the call. For administrative purposes (accounting between Administrations), the conventional start of the chargeable duration is fixed at 6 ± 1 seconds after the start of the call-connected signal (see Recommendation F.61 [2]). For the same purposes, the end of the chargeable duration will be between 300 and 1000 milliseconds after the start of the clearing signal.

7.2 Switching systems not giving an automatic return of answer-back signals over the international telex circuits shall be arranged to be ready to respond to WRU signals (transmitted from the calling country) with a delay not exceeding two seconds from the beginning of the call-connected signal. To meet this requirement in the case of *in-local* working, the return of the call-connected signal has to be delayed until the moment when the teleprinter of the obtained subscriber has in effect been connected to line (see Recommendation S.9 [3]).

7.3 If the incoming country automatically returns the obtained subscriber's answerback, the interval between the start of the call-connected signal and the start of the answerback signals (or, if applicable, of other signal sequences, such as described in Recommendation U.41) should be at least two seconds to allow satisfactory reception of teleprinter signals by the calling subscriber. In order to restrict charging on unsatisfactory calls, the particular interval should be kept as short as possible and should not exceed 3 seconds for new networks or 6 seconds for existing networks.

7.4 If the call has been routed via a transit centre the two-second minimum period for the call-connected signal, which is transmitted by the destination network, may have been reduced on signalling conversion and the answerback signals may be received at the originating network after a minimum duration of 1050 milliseconds.

7.5 If the incoming country normally returns the obtained subscriber's answerback code automatically, and the answerback transmission fails to appear for some reason, the signal **DER** followed by the clearing signal should be transmitted to the country of origin within 6 seconds from the start of the call-connected signal.

7.6 In the case of a call to a switchboard or service point the call-connected signal shall be returned as soon as the call reaches the terminal equipment even though it may be required to wait before being switched to the service position.

7.7 If the answerback is preceded by a sequence of signals, such as the RDI sequence defined in Recommendation U.41, this sequence should be limited to not more than 20 characters and it should be followed within 1100 milliseconds by the answerback code.

7.8 If the answerback of the obtained subscriber is followed by a sequence or sequences of signals, the interval between the end of the answerback and the completion of the sequence (excluding the answerback of the calling subscriber if taken automatically) should be as short as possible and should not exceed 4 seconds.

7.9 For future networks the sending of date, time and other signals (excluding however WRU signals to the calling subscriber) that are additional to the obtained subscriber's answerback (either preceding or following it) should be avoided on international calls. In the case of call redirection, the service sequence RDI, as described in Recommendation U.41 shall precede the answerback of the connected subscriber.

8 Idle circuit condition

8.1 On an established connection, the *idle circuit* | is characterized by a permanent signal corresponding to the stop impulse, in accordance with International Telegraph Alphabet No. 2, on the forward and backward signalling paths.

9 Clearing

9.1 *Clearing signal*

9.1.1 The clearing signal is characterized by a reversion to the condition specified in § 2.1 above on either signalling path maintained until the complete release of the circuit.

9.1.2 The supervisory equipment of the international connection shall be arranged to interpret a signal of start polarity as a clearing signal within 300 to 1000 milliseconds.

9.2 *Clear-confirmation signal*

9.2.1 The clear-confirmation signal is a reversion to the condition specified in § 2.1 above on the other signalling path in response to the clearing signal. When a clearing signal transmitted on an international circuit has reached the receiving end of that circuit the clear-confirmation signal must be sent back in the other direction within 350 to 1500 milliseconds after the initial start polarity begins.

9.2.2 The minimum period will be increased to 400 milliseconds for future systems.

9.3 *Guard delay*

9.3.1 Guard arrangements at the ends of an international telex circuit should be such that the circuit cannot be used for a new call until the distant equipment is free to accept another call.

9.3.2 A guard delay of 1 second will be maintained during which incoming calls will not be accepted and a guard delay of 2 seconds will be maintained during which outgoing calls will not be offered, from the moment when start polarity appears on both signalling paths. This start polarity shall be maintained throughout the guard period on both signalling paths of the international circuit.

Whilst maintaining the requirements of § 9.3.1, guard delay periods should nevertheless be generally kept to a minimum in order to maximize the use of the circuit. Therefore, where modern electronic switching equipment is used at both ends of a circuit, the above figures for incoming and outgoing guard delay periods may be reduced to 0.5 and 1 second respectively.

10 Service signals

10.1 *Signals for ineffective calls*

10.1.1 If a *busy* , *out of order* , *absent subscriber/office closed* , *number changed* , or *number unobtainable* (i.e. not connected, service ceased or barred access) condition is encountered in the distant network, this shall be indicated by the return of a signal to the calling end. This signal shall cause the connection to be cleared.

10.1.2 In printed service signal sequences the code expressions mentioned in the Recommendation cited in [4] should be used. In this case, the signal should commence with the carriage-return, line feed and letter-shift signals, then the text of the code expression and ending with the carriage return and line-feed signals and immediately followed by the clearing signal in all cases. Where additional information is transmitted, this should consist of four characters (α, β, γ, δ) and sent before the standard service signal at automatic speed. Such additional information shall be used to either

a) indicate the TNIC of the network which has generated the service signal, or

b) indicate the reasons of the not-ready condition of the called terminal, as shown in Table 4/U.1. The composition of the complete service signal train should then be

$$\alpha\ \beta\ \gamma\ \delta \leftarrow \equiv \downarrow \text{code expression} \leftarrow \equiv$$

where α is always letter-shift (↓). The ability to indicate the international gateway exchange which has generated the service signal is left for further study.

It should be noted that some Administrations currently use their own interpretation of these additional information characters, for transmission over international circuits. The objective, however, should be always to ensure that the standard service signal is clearly presented to the calling subscriber or TAED with no reasonable possibility of confusion by the use of these characters and that, consequentially, the provisions of Recommendation U.40 can be unambiguously applied.

10.1.3 Ineffective telex calls should not be charged for. With this in view printed service signal sequences returned on ineffective calls should never be preceded by the call-connected signal except in the case described in Recommendation U.41, § 1.2. However, under faulty conditions that can be detected only after the call has been put through, it may be impossible to prevent the return of the call-connected signal and subsequent charging of the call.

10.1.4 In new networks, ineffective telex calls to a subscriber whose number has been changed will be signalled by the return of the call connected signal followed, after 2 seconds, by the NCH service sequence described in Recommendation U.41 and the clearing signal.

10.2 *Waiting signals*

10.2.1 Should a call be routed to a point in the system where it is required to wait before connection can be made to the requested service, a *waiting signal* (**MOM**) should be sent back automatically in accordance with Table 3/U.1.

H.T. [T4.1]

TABLE 3/U.1

Access to switchboards and service points

Signal	Type A	Type B
{		
Call-confirmation (see §§ 4 and 5.1 of the text)		
}	**Permanent stop polarity**	**{**
25-ms pulse of stop polarity (between 17.5 and 35 ms)		
}		
{		
Proceed-to-select (see § 5.1 of the text)		
}	**{**	
40-ms (± 8 ms) pulse of start polarity		
}	**{**	
25-ms pulse of stop polarity (between 17.5 and 35 ms)		
}		
{		
Selection (see § 6 of the text)		
}	**Teleprinter signals**	**{**
Dial pulses or teleprinter signals		
}		
{		
Call-connected (see § 7 of the text)		
}	**{**	
150-ms (± 11 ms) pulse start polarity followed by stop polarity for a period between 2 and 8 seconds		
}	**{**	
Stop polarity for a period between 2 and 8 seconds		
}		
{		
Waiting signals (see § 10.2 of the text)		
}	**{**	
Teleprinter signals which may interrupt the stop polarity period of the call-connected signal, in which case the initial period of stop polarity should not be less than 2 seconds		
}	**{**	
Teleprinter signals which may interrupt the call-connected signal, in which case the initial period of stop polarity should not be less than 2 seconds		
}		
{		
Service-connected (see § 10.3 of the text)		
}	**{**	
Teleprinter signals indicating the identification of the switchboard or service point		
}	**{**	
Teleprinter signals indicating the identification of the switchboard or service point		
}		
{		
Busy		
(see § 10.1 of the text)		
}	{	
Teleprinter signals followed by clearing signal		
}	{	
ii		
i)		
165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance ± 30%) (see Note)		
i		
ii)		
165-260-ms pulse of stop polarity followed by teleprinter signals and then by start polarity for 1500 ms (tolerance ± 20%) (see Note)		
}		

Note — This sequence of signals may be repeated until a clearing signal is sent over the forward signalling path.

Tableau 3/U.1 [T4.1], p.

10.2.2 The *waiting signal sequence* | should include the carriage-return, line-feed and letter-shift signals followed by the characters **MOM** the date and/or time and also characters indicating the identity of the switchboard or service point returning the signals. In some existing systems, however, the waiting signal sequence consists only of a group of characters indicating the date and/or time.

10.2.3 The first character of the waiting signal sequence shall be transmitted within 8 seconds of the commencement of the call-connected signal.

10.2.4 The **MOM** signal sequence shall be followed by stop polarity until the service-connected signal is returned.

10.2.5 In some systems, however, arrangements are provided so that the transmission by the caller of suitable teleprinter characters causes the return of a further sequence of the **MOM** signal. Where such a facility is provided attention is drawn to the need for the Administrations returning the signal to make arrangements to ensure that the signal sequence can be correctly received without mutilation in the calling system. For this purpose it is acceptable to include one or two letter-shift signals at the beginning of the **MOM** signal sequence.

10.2.6 It is desirable that when connection is established to the requested service the service-connected signal should be returned as quickly as possible.

10.2.7 The equipment must be arranged so that a caller in the waiting condition can be released.

10.3 *Service-connected signal*

10.3.1 A *service-connected* signal shall be returned over the backward signalling path to indicate that the call has been extended to the teleprinter, or equivalent, of the requested service point. This signal may comprise the answerback code of the teleprinter or a group of teleprinter characters identifying the service point or switchboard position. The service-connected signal may also include characters indicating date and/or time.

10.3.2 Where waiting signals are not provided the first character of the service-connected signal shall be returned within 8 seconds of the commencement of the call-connected signal.

10.4 *Backward busying signal*

10.4.1 To facilitate routine tests of the switching equipment connected at the incoming end of an international telex circuit, a backward busying signal might be sent on the return signalling channel to show, at the other end, that the circuit is occupied.

10.4.2 With fully-automatic operation, on one-way circuits as well as on both-way circuits, the signal would take the form of permanent stop polarity for not more than 5 minutes.

10.4.3 In semi-automatic working, the signal would be either permanent start polarity, or permanent stop polarity, lasting not more than 5 minutes; the particular polarity chosen would be that requested by the outgoing country.

10.4.4 If the outgoing equipment is designed to block the outgoing end of the circuit in the busy position after receipt of the permanent stop polarity, stop polarity would be used for preference. In some instances, use of stop polarity could give rise to difficulties. It might, for example, cause a call signal to appear in the outgoing manual switching equipment. In such circumstances, recourse will have to be had to permanent start polarity.

10.4.5 As to tests made at the outgoing end of one-way circuits, there will be no call for a forward busying signal. The blocking of these circuits is locally done, on the outgoing side.

10.5 *Retest signal*

10.5.1 When the call-confirmation signal is not received over the backward signalling path within 5 to 10 seconds from the start of the calling signal, Administrations may apply a *retest signal* , which automatically provides for the test of the circuit in such a way that the international circuit is marked *unavailable* for outgoing traffic and may be restored to service if the fault disappears in the course of this test.

10.5.2 This signal transmitted over the forward signalling path should be composed of:

— a stop polarity period of 2 seconds duration;

— a start polarity period of 58 (or 70) seconds, 4 minutes 58 seconds (or 5 minutes 58 seconds) or 29 minutes 58 seconds (or 35 minutes 58 seconds) duration.

10.5.3 For the fault to be regarded as cleared, the return of stop polarity should occur during the stop period of a retest.

10.5.4 The circuit should be tested up to five times at nominal intervals of 1.0 minute or 1.2 minutes and a check should be made to confirm the receipt of a call-confirmation signal in response to each test. If a valid call-confirmation signal has not been received at the end of this first group of tests, the retest will continue with a further group of up to five tests at either 5.0/6.0-minute or 30/36-minute intervals. If 5.0- or 6.0-minute intervals are used and a valid call-confirmation signal has not been received at the end of this second group of tests, a further group of up to nominally five retests will be made at 30- or 36-minute intervals. An alarm will be given at an appropriate time. However, this retest procedure may be discontinued at any stage at the discretion of the outgoing Administration.

10.5.5 If, however, during the above sequence of retests, a valid call-confirmation signal is received, a clearing signal shall be transmitted in the place of the retest signal. Following a valid clear-confirmation signal, the incoming and the outgoing sides of the trunk circuit should not be returned to service until after expiry of the appropriate guard delay time.

10.5.6 In order to cater for the possibility that a faulty circuit may be seized at both ends, the automatic retest equipment should be arranged to allow an incoming call to be received during the start polarity period of the automatic retest signals. Administrations may, however, ignore such calls which occur during the incoming guard delay period.

10.5.7 Where an exchange has knowledge of a transmission system failure, it is desirable that retest signals shall not be applied to the circuits affected.

10.5.8 In order to avoid simultaneous seizure of too many registers at the distant centre, it is advisable that the retest signals, which might be sent simultaneously on various circuits subjected to this test, should be out of phase with one another.

10.5.9 The intervals between the tests at the two ends of the trunk route should be made different to be sure that successive retests do not overlap at both ends. In general, the international/intercontinental transit centre having the higher F.69 [5] telex destination code should take the longer interval (i.e. 1.2, 6 and 36 minutes). The tolerance on all above time intervals is ± | 0%. Nevertheless, when this requirement would entail considerable difficulty, alternative arrangements may be adopted by agreement between the two Administrations concerned.

11 Setting-up time

11.1 The setting-up time is defined as the period of time from the initiation of the call on the international circuit until the initiation of the return of either the call-connected signal or a service signal indicating that the call has been unsuccessful, provided the selection signals have been transmitted at the maximum speed.

11.2 For new networks, the objectives are as follows:

— an average of 8 seconds;

— a maximum of 15 seconds with a probability of 1% exceeding this value.

12 Both-way working

12.1 For both-way cable circuits used in the fully automatic telex service, the following action to minimize the incidence of head-on collision is recommended:

a) that inverse order testing, or a close approximation to it by testing the route in small groups of circuits in fixed order, always starting the search from the same initial positions, should be adopted at opposite ends of a group of both-way trunk circuits;

b) that calls should be offered in such a way that each circuit is treated once only for the minimum period of time necessary to ascertain whether it is free or busy, and the outgoing selectors should not have facilities for delayed hunting.

12.2 The absence of the proceed-to-select signal in type A signalling or the substitution of call signal for the call-confirmation signal in type B signalling will serve respectively to detect a head-on collision when the group of circuits is totally occupied or very nearly totally occupied. The two calls will then be cleared down unless there are still free circuits in the route.

13 Transit working

13.1 It is noted that a number of Administrations use signalling systems in accordance with Recommendation U.1 to provide international transit facilities. Whilst Recommendations U.11 and U.12 (types C and D) are intended for signalling between telex transit centres, nevertheless transit operation using type A or B signalling is feasible. To provide guidance for this specific application, the following general rules should apply.

13.2 Circuits provided for terminal calls will normally also be used to carry transit calls.

13.3 The signalling conditions for transit calls between the originating centre and the transit centre should, as far as possible, be the same as those used for terminal calls to subscribers in the transit network.

13.4 The signalling conditions for transit calls between the transit centre and the terminating centre should, as far as possible, be the same as those used for terminal calls to subscribers in the terminating network.

13.5 Any signal conversion to meet the requirements of the distant terminal network is the responsibility of the transit centre.

13.6 An appropriate numbering scheme should either:

a) include F.69 [5] destination codes on both terminal and transit calls; or

b) use 0 as a standard transit prefix. Should 0 be precluded by the national numbering plan in the transit network, another digit might be agreed with the transit Administration.

Either way the originating centre should bar irregular routing, by discriminating the digits transmitted by calling subscribers.

13.7 A single stage of selection in which all the selection digits are transmitted as a single block should be employed over the circuit from the outgoing centre to the transit centre.

H.T. [T5.1]

TABLE 4/U.1

Standardization of additional information characters in printed service signals

Character Indication of not-ready condition }	Indication of TNIC (Note)	{
α	LS	LS
β See Recommendation U.45 }	Z	{

Note — TNICs are listed in Annex A to Recommendation F.69. γ First letter of TNIC δ { Second letter of TNIC (or L/S)

Tableau 4/U.1 [T5.1], p.

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service* , Rec. F.1, Division C, No. 8.

[2] CCITT Recommendation *The chargeable duration of a telex call* , Rec. F.61.

[3] CCITT Recommendation *Switching equipment of start-stop apparatus* , Rec. S.9.

[4] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60, § 4.1.

[5] CCITT Recommendation *Plan for telex destination codes* , Rec. F.69.

Recommendation U.2

STANDARDIZATION OF DIALS AND DIAL PULSE GENERATORS

FOR THE INTERNATIONAL TELEX SERVICE

(former CCIT Recommendation E.2, 1951;

amended at Arnhem, 1953 and Geneva, 1956)

The CCITT,

considering

(a) that, when dials and dial pulse generators are used for the process of automatic selection by subscribers to the international telex network, it is advantageous to standardize as far as possible the characteristics of such dials and dial pulse generators;

(b) that the standardization of the dialling speed and lost motion periods of dials presents no technical difficulty;

(c) that, for the satisfactory working of certain automatic systems, the time between successive pulse trains should not be less than 500 milliseconds, but that experience has shown that the minimum time taken by an experienced operator to rotate the dial is of the order of 300 milliseconds;

(d) that pulse ratios from 1.2:1 to 1.9:1 will ensure the satisfactory working of existing automatic switching systems;

(e) that these pulse ratios can be usefully adopted with a view to simplifying direct calling between subscribers,

unanimously declares the view

(1) that in the international telex service, when dials or dial pulse generators are used for the automatic selection of subscribers:

a) the dialling speed shall be standardized at 10 pulses per second with a tolerance of ± 10%;

b) the lost motion period of dials shall be not less than 200 milliseconds nominal value;

c) the inter-digit pause of dial pulse trains generated by dial pulse generators shall not be less than 600 milliseconds;

(2) a) that the pulse ratio must be between 1.2:1 and 1.9:1, the nominal ratio may be chosen as lying between 1.5:1 or 1.6:1;

b) that when the selection signals pass through a regenerative repeater it may be advantageous to use a nominal ratio of 1.5:1.

Recommendation U.3

ARRANGEMENTS IN SWITCHING EQUIPMENT

TO MINIMIZE THE EFFECTS OF FALSE CALLING SIGNALS

(former CCIT Recommendation E.3, Geneva, 1956)

The CCITT,

considering

(a) that transmission systems at present in use for international telex trunks are liable to generate false calling signals;

(b) that such false calling signals can seize and engage switching equipment, thereby reducing the grade of service. This is of particular importance with systems in which common equipment normally used only to set up calls is seized by false calling signals;

(c) that the ill effects of false calling signals can be minimized by delaying the operation of the calling relay at the termination of the international telex trunk circuit;

(d) that, however, when direct dial selection is employed over an international trunk line, unless it is a manually selected circuit not preceded by a stage of automatic selection, there is normally insufficient time available between successive digits to permit the use of slow operating relays;

(e) that, nevertheless, Administrations may agree among one another to use digit storage at the outgoing end of the circuit so that the inter-train pause can be increased to permit the calling relays to be made slow to operate,

unanimously declares the view

(1) that the design and maintenance of transmission systems should be such as to reduce to a minimum the number and duration of false calling signals. In this connection attention is drawn to the merits of frequency-modulated voice-frequency telegraph systems, particularly with long overhead lines;

(2) that, wherever possible, calling relays on international telex trunk circuits should have an operation lag of at least 100 milliseconds. Administrations using circuits on lines prone to long-duration false calling signals may agree to use calling relays with longer operation lags.

Recommendation U.4

EXCHANGE OF INFORMATION REGARDING SIGNALS DESTINED TO BE USED OVER INTERNATIONAL CIRCUITS

CONCERNED WITH SWITCHED TELEPRINTER NETWORKS

(former CCIT Recommendation E.4, Geneva, 1956;

modified at New Delhi, 1960 and Geneva, 1972)

The CCITT,

considering

(a) that certain signals and certain characteristics of signals used in the international telex service have been standardized in Recommendation U.1;

(b) that certain Administrations have introduced automatic telex transit switching facilities based upon the signalling standards shown in Recommendation U.1;

(c) that standardized signals for the European switched network for the public telegram service (gentex network) are advocated in Recommendation U.30;

(d) that in view of the foregoing an exchange of information regarding the precise nature of the signals proposed to be used in the above-mentioned services by interested Administrations would be very useful;

(e) that certain Administrations have already supplied such details regarding their telex services in a useful form (see supplements to the documents of the VIIIth Plenary Assembly of the CCIT, and subsequent Plenary Assemblies of the CCITT),

unanimously recommends

that Administrations concerned in the international telex service and gentex network be invited to supply to the CCITT time-sequence diagrams showing in each case the signals at present transmitted or proposed to be transmitted over the international circuit for incoming calls. The diagrams should show not only the sequence and characteristics of the signals, but also the timing tolerances to be expected. The diagrams should show the signalling conditions applicable to transit as well as to terminal calls, including any conversion of the signals that are received from the destination network.

Recommendation U.5

REQUIREMENTS TO BE MET BY REGENERATIVE REPEATERS

IN INTERNATIONAL CONNECTIONS

(former CCIT Recommendation E.5, Geneva, 1956;

amended at Geneva, 1964, Mar del Plata, 1968 and Geneva, 1976)

The CCITT,

considering

(a) that it may be desirable to include regenerative repeaters in teleprinter switching networks;

(b) that the only signals other than teleprinter signals that must be transmitted by a regenerative repeater are the clearing signal and the call-connected signal (see § 3.1.3 below), since all other signals can be bypassed;

(c) that other signals may be transmitted by regenerative repeaters,

unanimously declares the view

1 that, when regenerative repeaters are used in switching systems, the clearing signal should be retransmitted with a minimum of delay. This delay is of course the same as for the transmission of teleprinter signals;

2 that to ensure the correct retransmission of the call-connected signal (see § 3.1.3 below) and the clearing signal, the regenerative repeater must not automatically insert the stop element in either of these signals;

3 that for other signals that may pass through regenerative repeaters, the tolerances at the origin and after retransmission through the regenerative repeaters are as stated below.

Note — The characteristics and tolerances quoted are for the signals at the origin. The tolerances at the input to the regenerative repeater will depend on the degree of distortion in the transmission path from the origin to the input of the regenerative repeater. The tolerances at the output will depend on the normal tolerances for the regenerative repeater.

3.1 *Pulse signals*

3.1.1 *Call-confirmation (proceed-to-select) signal* . Type B signalling

A pulse of stop polarity of duration from 17.5 to 35 milliseconds. The nominal duration of the pulse after retransmission through the regenerative repeater should not be less than 20 milliseconds or more than 40 milli seconds.

Note — This signal will be transmitted over only one international trunk circuit and should thus normally pass through not more than one regenerative repeater.

3.1.2 *Dial selection signals* . Type B signalling

These signals have been standardized (Recommendation U.2) at a dial speed of 10 pulses per second ± | 0%, and a pulse ratio (start/stop) between the tolerance of 1.2:1 and 1.9:1 with a nominal ratio lying between 1.5:1 and 1.6:1. Such signals after retransmission through several regenerative repeaters should not fall outside the tolerances stated above.

3.1.3 *Call-connected signal* . Type A signalling

A pulse of start polarity lasting 150 ± 11 milliseconds. The nominal duration of the pulse after retransmission through several regenerative repeaters should be within the limits of 140 to 160 milliseconds.

3.1.4 *Busy signal* . Type B signalling

Pulses of stop polarity lasting 165-260 milliseconds, separated by intervals of start polarity lasting 1.5 seconds ± | 0%. After retransmission through several regenerative repeaters neither the pulses nor the intervals should be shortened by more than 10%.

3.2 *Sequence signals (involving a single change of polarity)*

3.2.1 *Calling signal* . Types A and B signalling

3.2.2 *Call-connected signal.* Type B signalling

These signals (inversion from start to stop polarity) have no timing tolerances as such. It is, however, essential that they should be retransmitted by a regenerative repeater with a minimum of delay which in no case should exceed 20 milliseconds.

Recommendation U.6

PREVENTION OF FRAUDULENT TRANSIT TRAFFIC
IN THE FULLY AUTOMATIC INTERNATIONAL TELEX SERVICE

(New Delhi, 1960; amended at Geneva, 1964)

The CCITT,

considering

(a) that, with fully automatic working in the international telex service, the possibility of fraudulent routing by subscribers of international calls involving tandem connection of international telex trunks might arise whenever subscribers are given automatic access to international telex trunk circuits that have, at their incoming ends, automatically switched access to other international telex trunk circuits;

(b) that, by the adoption of a systematic plan, such traffic can be barred without involving either expensive or elaborate equipment arrangements;

(c) that, to be effective, such a plan would need to be adopted by all Administrations and recognized private operating agencies since failure to provide barring facilities on the traffic between two countries could open the way for irregular routings at the expense of a third country,

unanimously declares the view

(1) that national telex systems shall be so arranged that the first digit of the selection signals transmitted over incoming international telex trunks will indicate whether an automatic transit call is concerned;

Note — The use of a common first digit to indicate access to both international telex trunk circuits and manual switchboards leads to complication in the barring arrangements and should therefore be avoided as far as possible.

(2) that where an international telex trunk carrying fully automatic traffic also carries traffic requiring access at the incoming end to outlets selected by means of the digit characterizing an automatic transit call, the country of origin will bar irregular routings by discriminating on the digits transmitted by calling subscribers;

(3) that where an international telex trunk carrying fully automatic traffic does not carry traffic requiring access at the incoming end by means of the digit characterizing an automatic transit call, the incoming equipment shall be so arranged that the corresponding outlets are not accessible and that when access is attempted the *number unobtainable* signal is returned;

(4) that it is not admitted that two Administrations can agree to omit the provision of barring facilities on traffic between their respective countries. However, where the incoming country has an existing network in which considerable difficulty would be experienced in barring in accordance with § 3 above, the responsibility for barring may, by agreement, be assumed by the country of origin in the manner specified in § 2.

Recommendation U.7

NUMBERING SCHEMES FOR AUTOMATIC SWITCHING NETWORKS

(former CCIT Recommendation E.7, Geneva, 1956)

The CCITT,

considering

that with fully automatic working between subscribers in the international telex service it is desirable to envisage the possibility:

a) of routing traffic over the appropriate international trunk route where more than one such route exists between two countries;

b) of enabling the appropriate tariff to be determined automatically (in the originating country), even if the destination country is divided into several tariff zones,

unanimously declares the view

(1) that subscribers' national numbering plans should be systematically arranged;

(2) that, where more than one international trunk route exist between two countries, the corresponding geographical division and hence the appropriate point of entry should be identifiable by examination of the initial digits of the called subscriber's national number;

(3) that, where a multiple tariff scale exists, the different tariff zones should be identifiable in the originating country by the initial digits of the called subscriber's national number;

(4) that the number of initial digits to be examined should be limited, preferably to one, but in any case should not exceed two. When a single digit provides the discrimination it will usually be the first digit, but, where the subscribers' national numbers have a uniform initial digit (usually 0) to permit discrimination on internal calls, the following (second) digit should be used.

Note — The attention of Administrations (and recognized private operating agencies) is drawn to the considerable technical advantage that would result from the adoption of a single tariff between two countries.

Recommendation U.8

HYPOTHETICAL REFERENCE CONNECTIONS FOR TELEX AND GENTEX NETWORKS

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) the operational provisions for the telex service and the gentex network indicated in Recommendations F.60 and F.20;

(b) the overall subscriber-to-subscriber performance objectives;

(c) the technical provisions in Recommendations R.57 and R.58 concerning standard limits of transmission quality;

(d) the need to standardize the signalling functions in international/intercontinental transit exchanges;

(e) the telex signalling specified in Recommendations U.1 (types A and B), U.11 (type C) and U.12 (type D);

(f) the level differences existing among the type A, B, C and D signalling functions, *unanimously recommends*

the use of the hypothetical reference connections contained in this Recommendation.

1 General

1.1 The hypothetical reference connections set down in the present Recommendation (see Figure 1/U.8) are intended for assessing the overall subscriber-to-subscriber performance, for determining answerback return delay, signal transfer delay and other characteristics and setting-up delays related to the hypothetical reference circuit.

1.2 The hypothetical reference connections concerning signalling aspects set down in the present Recommendation (see Figure 2/U.8 and Tables 1/U.8 to 3/U.8) are intended for specifying the transit environment where the signalling functions should be considered.

2 Signalling levels

2.1 There will be two levels of signalling:

a) low level (type A or B);

b) high level (type C or D). High level in this case indicates the ability of the signalling system to signal additional customer facilities and/or additional network facilities, such as alternative routing.

2.2 Only high level signalling will be used in a transit connection where alternative routing is possible because of the need to indicate changes of routing for accounting purposes.

2.3 Routing may be on the basis of all high level, all low level or one transition from low to high and then back from high to low if required.

2.4 To restrict the call set-up delay to a reasonable period,

a) low level signalling types, because of their slower compelled nature, will not be used for transit switching on routes with long propagation delays, e.g., satellite links;

b) dial selection will not be used for transit switching.

2.5 Only Recommendation F.69 codes will be used for routing purposes in transit switching.

2.6 It is noted that as an interim solution, transit traffic is at present being switched on a fixed routing basis using only low level signalling.

2.7 Connections using ARQ radio circuits and signalling according to Recommendation U.20 have been excluded.

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Figure 1/U.8, (M), p. 6

Figure 2/U.8, (M), p. 7

H.T. [T1.8]

lw(48p) | lw(24p) | lw(24p) | lw(48p) . lw(48p) | lw(24p) | lw(24p) | lw(48p) .
{

C 3

D 4

A 5 B B 6
} lw(48p) | lw(24p) | lw(24p) | lw(48p) .
{

C 7

D 8

A 9 C B 10
} lw(48p) | lw(24p) | lw(24p) | lw(48p) . C 11 . D 12 . A 13 lw(48p) | lw(24p) | lw(24p) | lw(48p) .
B 14 D C 15 . D

Tableau 1/U.8 [T1.8], p. 8

H.T. [T2.8]

lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . C B 17 C B 2 lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . C 18 { C 3 A D

19 C D 4 A 20 A 5
} lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . D B 21 D B 6 lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . C 22 { C 7 D 23 D 8 A 24 A 9
} lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . C B 25 C B 10 lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . C 26 { C 11 B D

27 D D X 12 A 28 A 13
} lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . B 29 B 14 lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) | lw(36p) | lw(12p) | lw(12p) | lw(12p) | lw(30p) . D C 30 D C 15 . . D . 31 . . D

Tableau 2/U.8 [T2.8], p. 9

H.T. [T3.8]

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Tableau 3/U.8 [T3.8], p. 10   A L'ITALIENNE

Recommendation U.10

EQUIPMENT OF AN INTERNATIONAL TELEX POSITION

(former CCIT Recommendation F.60; modified at New Delhi, 1960)

The CCITT,

considering

that an international telex position that is a manual position in an international telex exchange and is used to set up international telex calls should be so equipped as to permit satisfactory operation in conformity with Recommendation F.60 [1],

unanimously declares the following view

(1) An international telex position must be equipped in such a way as to receive the clearing signal from both sides.

(2) It should not be possible to recall the operator of that position by a signal to an established connection, except if Recommendation U.21 is applied.

(3) Precaution must be taken that, in the event of the operator of the international telex position's delaying to remove the plug on reception of the clearing signals, a new call from a subscriber on one network cannot pass to the other network.

(4) When the call has been established, the answer-back signals of equipment used at the intermediate telex positions must not be sent to line when figure-shift D is received.

(5) The international telex position must be provided with equipment to determine the chargeable time of calls controlled by these positions, this timing equipment to be brought into operation in accordance with the Recommendation cited in [2] but to be stopped on receipt of the first clearing signal.

References

[1] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60.

[2] *Ibid.* , § 3.3.

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