INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

RED BOOK

VOLUME VII – FASCICLE VII.2

TELEGRAPH SWITCHING

RECOMMENDATIONS OF THE U SERIES

VIIITH PLENARY ASSEMBLY
MALAGA-TORREMOLINOS, 8-19 OCTOBER 1984

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Part I – Series U Recommendations

Telegraph switching

PRELIMINARY NOTES

1 The Questions entrusted to each Study Group for the Study Period 1985-1988 can be found in Contribution No. 1 to that Study Group.

2 In this Fascicle, the expression "Administration" is used for shortness to indicate both a telecommunication Administration and a recognized private operating agency.

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 and Malaga-Torremolinos, 1984)

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.

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 signals	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	i) 165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance: ± 30%) (See Note) 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	i) Permanent start polarity 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.

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
Busy (see § 10.1 of the text)	Teleprinter signals followed by clearing signal	i) 165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance: ± 30%) (See Note 1) 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	i) Permanent start polarity (See Note 2) 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)

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.

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)	Permanent stop polarity	25-ms pulse stop polarity (between 17.5 and 35 ms)
Proceed-to-transmit (see § 5.2 of the text)	Teleprinter signals	Stop polarity followed by 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

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 the inversion of the condition specified in § 2.1 above on the forward signalling path.

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 a called subscriber. 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 date and time signals) 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 date, time or identity signals, this sequence should be limited to not more than 12 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.

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.

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 code expression should be preceded by the carriage-return, line-feed and letter-shift signals and followed by carriage-return and line-feed and then immediately by the clearing signal in all cases. Where additional information is transmitted, the long-term objective should be to standardize strictly the format of service signals. Such additional information should consist of four characters (α, β, γ, δ) and be sent before the service signal at maximum speed. The composition of the complete service signal train should then be:

$$\alpha\ \beta\ \gamma\ \delta \prec \equiv \downarrow \text{service code} \prec \equiv$$

where α may be a letter-shift ($\downarrow$) or figure-shift ($\uparrow$).

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; 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.

10.2 *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.

10.2.2 The *waiting signal sequence* should include the carriage-return, line-feed and letter-shift signals followed by the characters **MOM**. It may be useful in some instances to include characters to indicate 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.

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 pulse (± 8 ms) 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 pulse (± 11 ms) 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	i) 165-260-ms pulse of stop polarity followed by start polarity for 1500 ms (tolerance ± 30%) (See Note) 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.

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 is not returned over the backward signalling path within the delay indicated in § 4.2 above, 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 ± 10%. 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.

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service*, Rec. F.1, § C.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 milliseconds.

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 ± 10%, 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 ± 30%. 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,

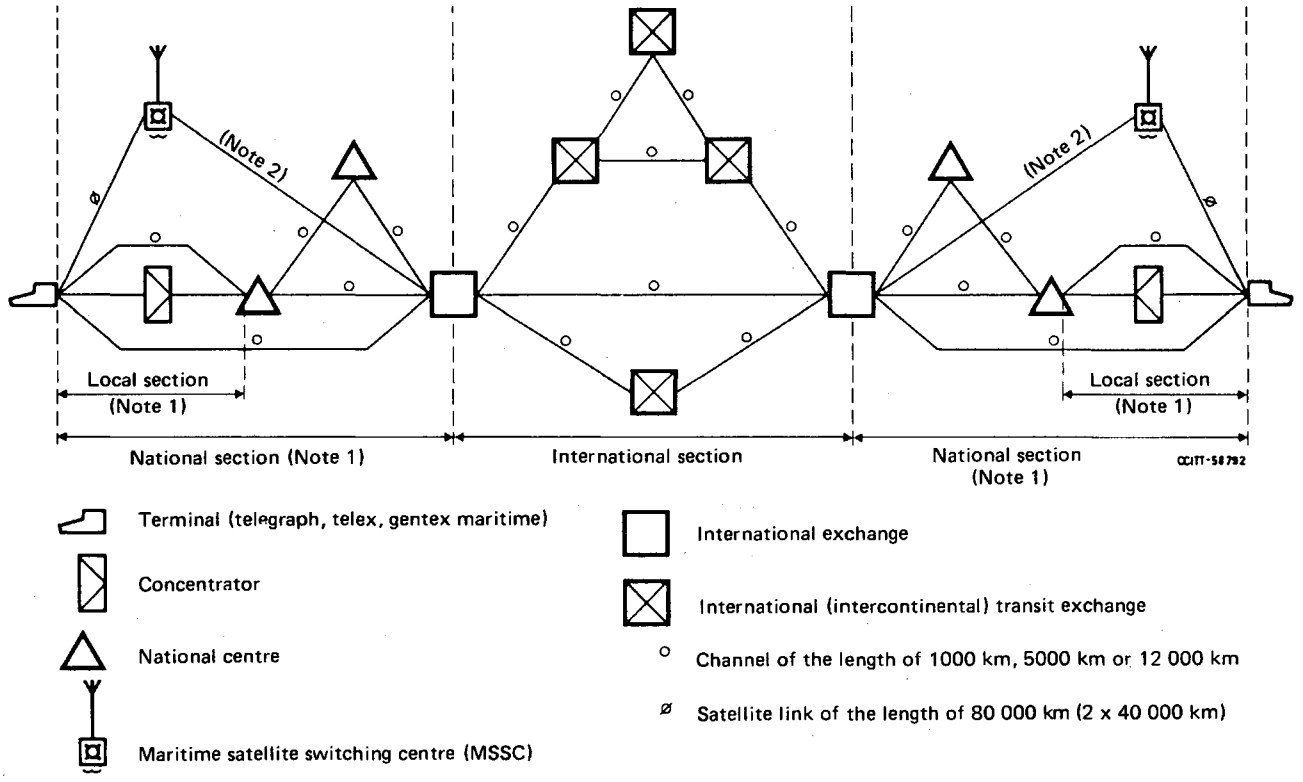
a) low level signalling types, because of their slower compelled nature, will not be used for transit switching on routes with long propagation delays, e.g., satellite links;

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.



Note 1 – The terms *local section* and *national section* do not apply in the Maritime Satellite Service.

Note 2 – The use of satellite links between the MSSC and the international exchange is not recommended.

FIGURE 1/U.8

Hypothetical reference connection for telegraph, telex and gentex networks

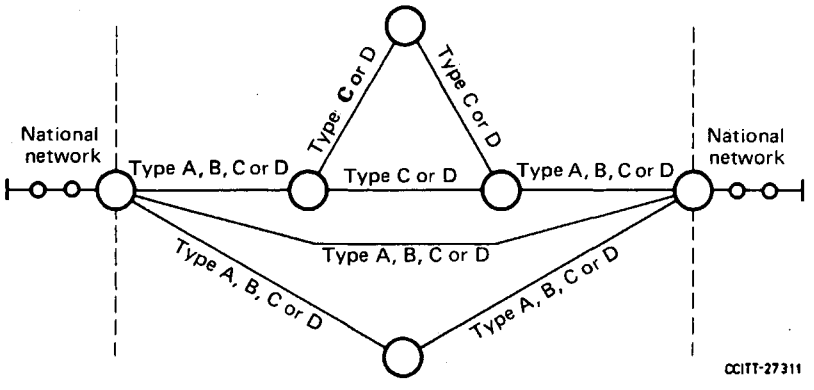


FIGURE 2/U.8

Hypothetical reference connections concerning signalling aspects

TABLE 1/U.8

Signalling combinations for two transit links

Combination No.	Link		Excluded
	1	2	
0	A	A	
1		B	
2		C	
3		D	
4	B	A	
5		B	
6		C	
7		D	
8	C	A	
9		B	
10		C	
11		D	
12	D	A	
13		B	
14		C	
15		D	

TABLE 2/U.8

Signalling combinations for three transit links

Combination No.	Link			Excluded	Combination No.	Link			Excluded
	1	2	3			1	2	3	
0	A	C	A		16	C	C	A	
1			B		17			B	
2			C		18			C	
3			D		19			D	
4		D	A		20		D	A	
5			B		21			B	
6			C		22			C	
7			D		23			D	
8	B	C	A		24	D	C	A	
9			B		25			B	
10			C		26			C	
11			D		27			D	X
12		D	A		28		D	A	
13			B		29			B	
14			C		30			C	
15			D		31			D	

TABLE 3/U.8

Signalling combinations for four transit links

Combination No.	Link 1	Link 2	Link 3	Link 4	Excluded	Combination No.	Link 1	Link 2	Link 3	Link 4	Excluded	Combination No.	Link 1	Link 2	Link 3	Link 4	Excluded	Combination No.	Link 1	Link 2	Link 3	Link 4	Excluded
0	A	C	C	A		16	B	C	C	A		32	C	C	C	A		48	D	C	C	A	
1				B		17				B		33				B		49				B	
2				C		18				C		34				C		50				C	
3				D		19				D		35				D		51				D	X
4			D	A		20			D	A		36			D	A		52			D	A	X
5				B		21				B		37				B		53				B	X
6				C		22				C		38				C		54				C	X
7				D		23				D		39				D		55				D	X
8		D	C	A		24		D	C	A		40		D	C	A		56		D	C	A	
9				B		25				B		41				B		57				B	
10				C		26				C		42				C		58				C	
11				D	X	27				D	X	43				D	X	59				D	X
12			D	A		28			D	A		44			D	A		60			D	A	
13				B		29				B		45				B		61				B	
14				C		30				C		46				C		62				C	
15				D		31				D		47				D		63				D	

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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SECTION 2

SPECIFIC SIGNALLING SCHEMES AND INTERWORKING BETWEEN SIGNALLING SYSTEMS

Recommendation U.11

TELEX AND GENTEX SIGNALLING ON INTERCONTINENTAL CIRCUITS USED FOR INTERCONTINENTAL AUTOMATIC TRANSIT TRAFFIC (TYPE C SIGNALLING)

(Geneva, 1964; amended at Mar del Plata, 1968, Geneva, 1972, 1976 and Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that it is necessary to standardize an intercontinental signalling system to be used between intercontinental transit centres, as the present standard systems A and B, in the limits of CCITT Recommendations, do not comply with all the requirements of an intercontinental signalling system;

(b) that the intercontinental links that are used and could be used in the future for telex and gentex operation use various transmission systems, including not only the standard voice-frequency telegraph channels – normally used in the continental field – but also 7-unit error-proof multiplex systems over radio circuits and 6-unit or 5-unit multiplex systems over VFT channels. Other transmission systems will perhaps be used in the future. Therefore, it seems necessary that the intercontinental signalling system should be suitable for as wide a variety of transmission systems as possible;

(c) that this signalling system must enable the channels to be operated on a both-way basis. This type of operation can produce collisions; therefore it was noted that the intercontinental signalling system must provide for limiting collisions, or at least for simple facilities to detect head-on collisions and for taking appropriate action after their detection;

(d) that another important feature of the intercontinental signalling system should concern the automatic testing of the ability of the multiplex equipment to transmit teleprinter characters, before establishing a call to the distant subscriber, through an intercontinental transit centre. The class-of-traffic signal, the class-of-traffic-check signal, and the transmission-confirmation signal in the form proposed, can provide an efficient and simple method of meeting this requirement. The signals provided also check the functioning of the FRXD when used. It is important that the correct class-of-traffic and class-of-traffic-check signals be transmitted for the required category;

(e) that the use of teleprinter characters, for selection information and other signalling functions, appears to be most advantageous, as they can be transmitted over the error-proof radio circuits, which undoubtedly will be part of the intercontinental transit network;

(f) that it is emphasized that the signals, in the form proposed, simplify interconnection of the intercontinental transit network to the terminal networks, in the outgoing and in the incoming countries;

(g) that as regards the method of transmission of selection information, it has been decided that the selection by complete block will be adopted on intercontinental routes. Under this arrangement, the telex destination code and the national number of the called subscriber will be signalled as a single group of characters without awaiting backward path signals. There may be some advantage with regard to reducing the occupancy of intercontinental trunks and equipment and in preventing the mutilation of signals if the complete group of selection signals is assembled, preferably by the originating country, before commencing to route the call. However, the retransmission of selection signals from one switching centre to the next may start even before the block has been completely received;

(h) that exemption from selection by complete block is permissible for manual testing of intercontinental links. The receiving centre should take account of this and also of the fact that calls via an error-proof multiplex radio channel may prevent selection signals' being received as a complete block;

(i) that interworking requirements between signalling standards according to U.1 (types A and B), U.11 (type C) and U.12 (type D) have been defined in Recommendation U.15 (interworking rules),

unanimously declares the view

1 The signalling system between two intercontinental transit centres will be as described in Table 1/U.11.

Note 1 – In this Recommendation:

X denotes the intercontinental transit centre that originates the call under consideration on the intercontinental circuit;

Y denotes the intercontinental transit centre that receives the call considered on the intercontinental circuit.

Both the forward and backward path signals are described at the moment of their emission on the intercontinental circuit. It should be noted that the signals in Tables 1/U.11, 2/U.11 and 3/U.11 are those transmitted by the switching equipment irrespective of the type of transmission used for the intercontinental trunk circuit. It is possible that the teleprinter signals, although transmitted at automatic speed, may be delayed or separated by periods of stop polarity after transmission via multiplex systems and that the original periods of start and stop polarity may be either lengthened or shortened by the incidence of error-correction on radio circuits.

The circuits between X and Y may transmit calls in both directions.

Note 2 – For the description of the combinations of International Telegraph Alphabet No. 2, see Table 1/S.13 [1] or the Recommendation cited in [2].

2 For new exchanges introduced into the intercontinental transit network, intercontinental circuits should be searched in a fixed order, always starting the search from the same initial position. The order of search should be inverse to the order used at the distant end.

A head-on collision is provisionally assumed if centre X receives combination No. 20 (100 ms pulse of polarity A) instead of combination No. 22 (40 ms pulse of polarity A). When this combination No. 20 has been detected, centre X checks receipt of the second combination No. 20 to establish whether a head-on collision or a signal mutilation due to faulty transmission has occurred. During this time, centre X continues signalling towards centre Y, until both combinations No. 20 of the calling signal have been transmitted. The clearing signal is then sent and the trunk is released.

When a head-on collision has been assumed upon receipt of a single combination No. 20, the switching equipment may make another attempt to select a free circuit either on the same group of circuits or on a group of overflow circuits, if they exist. In the event of a further head-on collision on the recall or on the call attempt via the overflow route, no further recall will be made and the call will be cleared down after returning the transit failure signal.

Should the second combination No. 20 not have arrived in the five seconds following the commencement of receipt of the first combination No. 20, centre X will put into operation the automatic retest procedure on the circuit concerned.

3 There is no need to distinguish on a circuit XY whether a call is to terminate in centre Y or if it is to pass in transit via Y to a country other than the country (or network) of Y. The advantage of not having to transmit on circuit XY the digits of the destination code in the case of a call termination in Y is offset by the complication of the registers and the necessity for an additional discrimination in the class-of-traffic signal.

4 The transit centre will be provided with an identification code consisting of seven characters, of which the uniform format is:

- combination No. 29;
- either one letter combination and combination No. 29 or two letter combinations designating the transit Administration;
- combination No. 30;
- a one-, two- or three-digit number identifying the centre and/or equipment in the transit Administration's network.

If the numerical portion of the transit centre identification code comprises one or two digits, two or one combinations No. 30 should be added to maintain the seven-character format. The letter (or two letters) designating the transit Administration shall be the letter (or two letters) of the telex network identification code as far as possible. In interworking cases the numeric portion may be replaced by combinations No. 30 to maintain the seven character format.

The transit centre identification code will be returned automatically in all cases and will continue as far as the calling country. If several transit centres are involved in setting up a call, the calling network will receive the codes of these transit centres one after the other. This information is useful for retracing the route followed by a call (for traffic statistics, international accounts and the clearing of faults).

5 To simplify the solution of problems raised by overflow (increased congestion of systems, risk that the call may return back to the original exchange) overflow for each call will be allowed at only one centre.

Note – The rigour of this rule could be eased by admitting alternative (2nd choice) routings in certain traffic relations. This question will be discussed when the routing plans are established.

6 A transit centre will have to be advised:

1) that an incoming call is:
   a) a telex call (between telex subscribers),
   b) a gentex call (between gentex stations),
   c) a call, generally originating from a switchboard operator or from maintenance staff, to a manual switchboard or service point. This class-of-traffic signal is to be used if signalling conditions for calls to manual switchboards or other service points in the destination network are different from those returned on calls to subscribers,
   d) a special category call (see §§ 7.1 and 7.2 below);
2) that the call concerned has already been subjected to overflow.

Other possibilities must be reserved, such as routing via telegraph circuits for 100 or 200 bauds, and a reserve supply of class-of-traffic signals has been envisaged to this end.

7 Class-of-traffic signal

7.1 The class-of-traffic signals are divided into two categories:

Category A: Signals for transmission at 50 bauds, the utilization of which is allocated as shown in Tables 4/U.11 and 5/U.11.

Category B: Signals reserved to meet future uses, not yet defined, such as use of circuits for more than 50 bauds.

7.1.1 The signals of category A are characterized by Z polarity of the first element; the signals under category B are characterized by A polarity of the first element.

7.1.2 For category A signals the second and third elements are associated to discriminate the four following categories: telex, gentex, service traffic and a special category (see Note under § 7.2).

7.1.3 For the signals of category A as well as for those of category B, the polarity of the fourth element indicates whether or not the call has already been overflowed.

7.1.4 For the signals of category A as well as for those of category B, the fifth element must always have an A polarity in order to avoid the use as a class-of-traffic (COT) signal of the special signals, combination No. 20 (calling signal) and combination No. 30 (special pre-signal).

7.2 Table 5/U.11 indicates the combinations used for class-of-traffic and class-of-traffic-check signals.

Note – For 50-baud transmissions during which an alphabet with a non-5-unit code could be used, to avoid routing through time-division multiplex channels see the Recommendation cited S.15 [3].

7.3 The class-of-traffic combination for a previously alternatively routed call shall be inserted by the switching equipment in the centre at which overflow occurs.

8 The ability of the forward signalling path of the trunk to transmit 5-unit signals is checked by using complementary class-of-traffic and class-of-traffic-check (COTC) signals. The two combinations of the transmission-confirmation signal are also complementary and provide a similar check of the backward signalling path. Failure to receive the reception-confirmation and transmission-confirmation signals correctly within 5 seconds from the start of the calling signal, or receipt of the transmission-failure signal, should initiate the automatic retest signal on the circuit concerned.

9 The equipment of centre Y should preferably begin the forward selection as soon as the first digit of the called number has been registered, but in the case of 2-digit destination codes forward selection may be postponed until the second digit of the called number has been registered. In the case of interworking to signalling according to Recommendation U.12 (type D) standard, additional rules for timing of outgoing seizure and forwarding selection are given in Recommendation U.15.

If D1, D2 and D3 are the destination code digits of the called country (or network), and if N1, N2, N3, etc., are the digits of the called number, on any intercontinental circuit XY the sequence of selection signals, including those for calls terminating in the country Y, will be as follows:

Case of a called country having a 2-digit destination code

Class-of-traffic

Class-of-traffic check

D1
D2
N1
→ N2 → } start of forward selection
N3
.
.
N*n*

Combination No. 26

Case of a called country having a 3-digit destination code

Class-of-traffic

Class-of-traffic check

D1
D2
D3
N1
→ } start of forward selection
N2
.
.
N*n*

Combination No. 26

The maximum number of digits to be expected in the sum of the destination code and national number is 12.

10 Retest signal

10.1 The automatic retest signal should be initiated on the circuit concerned as indicated in §§ 2 and 8 above, another attempt to select a circuit should be made (once only) and, if unsuccessful, the transit failure signal should be returned to the preceding exchange. The circuit should be marked *unavailable* for outgoing traffic and the retest signal should be transmitted over the forward signalling path as shown in Table 1/U.11.

10.2 The circuit should be tested up to five times at nominal intervals of 1.0 or 1.2 minutes and a check should be made to confirm the receipt of backward path signals up to and including the transmission-confirmation signal in response to each test. If a valid transmission-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- or 30/36-minute intervals. If 5.0- or 6.0-minute intervals are used and a valid transmission-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.

10.3 If, however, during the above sequence of retests a valid transmission-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.

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

10.6 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 intercontinental transit centre having the higher F.69 [4] telex destination code should take the longer interval (i.e. 1.2, 6 and 36 minutes). Nevertheless, when this requirement would entail considerable difficulty, alternative arrangements may be adopted by agreement between the two Administrations concerned.

11 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 should be maintained throughout the guard period, on both signalling paths of the international circuit.

Note – In the case of error-corrected radiotelegraph systems the guard period should be measured from the moment that the appropriate number of α signals has been transmitted and received in accordance with Recommendation U.20, § 8.3.

12 The receiving equipment congestion signal should be returned on not more than 0.4% of calls in the busy hour and the equipment should ensure that this signal is returned only when receiving equipment congestion is positively identified, and not in the case of a fault in the register access equipment.

Receipt of a receiving equipment congestion signal by a transit centre either on the first attempt or after a single recall (either on the same route or on an alternative route) should cause the transit failure signal to be returned to the calling network.

13 The incoming equipment should be arranged to maintain start polarity on the backward path if the first character of the selection signal is spurious as indicated either by a character other than a class-of-traffic signal or the pre-signal combination No. 30 (see Note to Table 2/U.11).

The incoming equipment may release the connection if any of the consecutive combinations of the calling and selection signals is delayed for five or more seconds. In this case the transit failure signal should be returned after the reception confirmation, the transmission confirmation and transit centre identification code signals; and be followed by the clearing signal.

An Administration may release the connection or recall if the transit centre identification code from the next transit centre has not been returned within three seconds after the receipt of the transmission confirmation signal.

14 The normal time (i.e. without taking account of the supplementary delay which could be introduced by operation of ARQ equipment) required to switch through a transit centre measured from the beginning of the receipt of the calling signal to the offering of the calling signal on the outgoing route varies from 1200 to 1500 milliseconds (according to the number of digits to be examined), plus the time required to position the selectors. (This time is independent of the transmission delay of the transmission system.) The time required to position the selectors should not exceed 800 milliseconds.

15 For signalling purposes on international circuits that will be used between the international exchange of the terminal country and an intercontinental transit centre, several solutions are available to the Administrations concerned. The choice between the solutions must be the subject of agreement between the terminal country and the country handling the intercontinental transit. These solutions will result from the following considerations:

a) Whether the routing towards the intercontinental transit centre (or from the intercontinental transit centre) would be made through the continental centre adjacent to the intercontinental transit centre in the transit country (in this case the access prefix 00 should be used).

b) Alternatively, whether the routing would be made directly from the international terminal centre towards the intercontinental centre and vice versa.

c) Whether the international circuits between the terminal country and the transit country would be operated only as outgoing or incoming circuits or whether it would be possible to operate them in both directions for setting up calls.

d) Whether the signalling system on these circuits would be the one that is used for automatic traffic between the terminal country and the transit country, the transit country being responsible for making the conversion of this signalling system according to type C, Table 1/U.11 signals on the intercontinental circuits and vice versa.

e) Alternatively, whether this signalling would be established according to type C signalling.

f) It is permitted to transmit over the intercontinental transit network the digits of the called station number (except the first one or two digits) as and when received from the calling subscriber. It is to be noted, however, that in that case backward path signals may be received by the calling subscriber or operator during his selection. This may prevent correct printing of the forward and backward path signals and even lead to mutilation of the forward selection signals. This difficulty, as well as unnecessary loading of the intercontinental transit network by selection faults and slow selection can be avoided by assembling the subscriber's selection information, preferably in the originating network.

To give some guidance to Administrations Tables 2/U.11 and 3/U.11 below have been set up. Table 2/U.11 corresponds to the case of access to the intercontinental transit centre through the adjacent continental centre. Table 3/U.11 corresponds to the case of direct access to the intercontinental transit centre with unidirectional circuits. In the case of direct access to the intercontinental transit centre using both-way circuits, type C signalling indicated in Table 1/U.11 could be applied.

TABLE 1/U.11

Signalling between the two intercontinental transit centres

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Free line	Start polarity (polarity A)	Start polarity (polarity A)	
Call	Stop polarity (polarity Z) for 150-300 ms followed by 2 combinations No. 20 (2 polarity A pulses of 100 ms duration) and then followed immediately by the selection signals		The Y incoming register must be connected and ready to receive selection signals within 425 ms of the commencement of the inversion to stop polarity; the combinations No. 20 do not need to be detected as part of the signal for calling purposes. The Y register must be able to absorb any combination No. 20 or portion of a combination No. 20 that may precede the selection signals. *Note* – It is necessary for the transmission system to be capable of transmitting the combinations No. 20 of the calling signal before reception of the reception-confirmation signal. In the case of error-corrected radio circuits the radio equipment must ensure that the period of stop polarity preceding the first combination No. 20 is transmitted as four consecutive β signals, and that at the Y end the inversion to stop polarity is transmitted when two consecutive β signals have been received. The radio equipment at the Y end must also ensure that the first combination No. 20 is preceded by at least 140 ms of stop polarity.
Reception confirmation		Stop polarity followed by combination No. 22 (40-ms pulse of A polarity)	Stop polarity is returned 450 ms (± 10%) after the end of receipt of the class-of-traffic signal. Combination No. 22 is returned 450 ms (± 10%) after the inversion to stop polarity on the backward path.
Selection signals	Class-of-traffic signal Class-of-traffic-check signal The 2 or 3 digits of the destination code of the called country The digits of the called station number Combination No. 26		These signals are transmitted immediately after the calling signal, without awaiting the reception at X of the reception confirmation signal. These signals are transmitted according to the code of International Telegraph Alphabet No. 2 at the normal modulation rate of 50 bauds; the digits of the destination code and the first two digits of the called station are transmitted at automatic speed [see § 15*f*).]
Transmission confirmation		Combination No. 29 (20-ms pulse of A polarity) Combination No. 32 (120-ms pulse of A polarity)	Transmitted after the reception-confirmation signal on condition that the class-of-traffic check signal has been correctly received. This signal and the reception-confirmation signal will have to be absorbed by the switching equipment of X and should not be able to go through that equipment to arrive at the preceding centre.
Transit centre identification		Combination No. 29 Either 1 letter and Combination No. 29 or 2 letters to identify transit centre Y Combination No. 30 1, 2 or 3 digits followed by 2, 1 or 0 combinations No. 30 respectively (See § 4)	Teleprinter signals immediately following the transmission-confirmation signal at automatic speed. These signals must go through centre X and arrive at the originating country.

TABLE 1/U.11 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Call connected		Combination No. 32 (120-ms pulse of A polarity) followed by 8 combinations No. 29 (20-ms pulses of A polarity) transmitted at automatic speed	As soon as it is possible, at the last transit centre, to discriminate that the signal received is the call-connected signal from the destination network, it should be returned immediately to the calling network, in type C format, by the last transit centre. In the case of type A signalling in the destination network the format of the type C call-connected signal is either *a)* combination No. 32 and 8 combinations No. 29 transmitted at automatic speed but then preceded by the type A call-connected signal (150 ms ± 11 ms) followed by 150-300 ms stop polarity, or *b)* combination No. 32 followed by 0-300 ms stop polarity and 8 combinations No. 29 transmitted at automatic speed. In the case of type B signalling in the destination network the format of the type C call-connected signal will always be combination No. 32 and 8 combinations No. 29 transmitted at automatic speed. In the event of non-receipt of a call-connected or service signal from the destination network within 60 seconds of the transmission of the end-of-selection signal, the last transit centre will return an appropriate service signal and release the connection. Non-receipt of the call-connected or service signal at the first transit centre within approximately 60 seconds of transmission of the end-of-selection signal will cause this transit centre to return the **NC** service signal and release the connection.
Answer-back signals			Where the destination system returns the answer-back automatically, the answer-back and any associated signals (e.g. date and time) should be extended to the calling network as and when received. Where the destination system does not return the answer-back automatically, the last transit centre in the connection will make a request for the return of the answer-back code of the obtained teleprinter.
Teleprinter service signals from type A or B systems		Teleprinter signals as returned from the called system, followed by the clearing signal	
Service signals from type D systems in CSC		Convert to service signals in Rec. U.1 format, coded as in Table 7b/U.12	
Non-printing service signals from type B systems *a)* Spare line of permanent start polarity		Combination No. 27 Combination No. 28 Combination No. 31 Combination No. 29 Combination No. 4 **(D)** Combination No. 5 **(E)** Combination No. 18 **(R)** Combination No. 27 Combination No. 28 followed by the clearing signal	These signals *a)*, *b)* or *c)* should be transmitted by the last transit centre in the connection. In order to reduce the ineffective time of trunk circuits to a minimum the service signal in *a)* should be returned not later than 15 sec. from the end of the last selection signal transmitted to the terminal system and in *c)* should be returned within 6 sec. from the inversion to stop polarity from the terminal system.

TABLE 1/U.11 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
b) Busy or similar signals		Combination No. 27 Combination No. 28 Combination No. 31 Combination No. 29 Combination No. 15 **(O)** Combination No. 3 **(C)** Combination No. 3 **(C)** Combination No. 27 Combination No. 28 followed by the clearing signal	
c) Station faulty permanent stop polarity		Combination No. 27 Combination No. 28 Combination No. 31 Combination No. 29 Combination No. 4 **(D)** Combination No. 5 **(E)** Combination No. 18 **(R)** Combination No. 27 Combination No. 28 followed by the clearing signal	
Idle circuit	Stop polarity	Stop polarity	
Clearing	Inversion to continuous start polarity in the direction of clearing		The recognition time for this signal is 450 ± 150 ms.
Clear confirmation	Inversion to continuous start polarity in the opposite direction within 500 ± 100 ms of the commencement of the clearing signal		
Automatic re-test	Stop polarity for 300 ms Combination No. 20 Combination No. 20 Combination No. 21 Combination No. 15 Combination No. 16 Combination No. 16 Combination No. 16 Stop polarity for 2 seconds Start polarity for 1.0 or 1.2 minutes, 5 or 6 minutes, 30 or 36 minutes (repeated; see § 10 of the text)		3 combinations No. 16 correspond to a spare destination code 000, allocated for re-test purposes. 1.0, 5 and 30 minute periods of start polarity for one centre. 1.2, 6 and 36 minute periods of start polarity for the other centre. The automatic re-test signal is initiated: – in the case of a head-on collision, on failure to receive the second combination No. 20, – or on failure to receive the reception-confirmation and transmission-confirmation signals correctly, – or on receipt of the transmission failure signal. *Note* – Tolerance on all timings is ± 10%.
Backward busy	Continuous stop polarity for a maximum of 5 minutes		
Receiving equipment congestion		Stop polarity for 450 ms followed by clearing signal	This signal is returned not more than 500 ms after the start of the calling signal when there is no receiving equipment free to be connected to receive the selection signals within 425 ms of the start of the calling signal. This signal will have to be absorbed by the switching equipment at X and should not be able to go through that equipment to arrive at the preceding centre.

TABLE 1/U.11 *(concluded)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Transit failure		Combination No. 27 Combination No. 28 Combination No. 31 Combination No. 29 Combination No. 14 (N) Combination No. 3 (C) Combination No. 27 Combination No. 28 followed by clearing signal	This signal is returned as soon as possible following the transit centre identification code signal: *a)* when there is no free trunk outgoing from transit centre, *b)* when the three digits following the class-of-traffic check signal do not correspond to an allocated code, *c)* any of the consecutive incoming Y selection signals is delayed for 5 seconds or more, *d)* when a call fails owing to a head-on collision, *e)* when the class-of-traffic signal received does not correspond to an authorized type of call, or *f)* when the receiving equipment congestion signal is received from another transit centre.
Transmission failure		Combination No. 15 Combination No. 15 (two 80-ms pulses of A polarity) followed by clearing signal	Returned after the reception-confirmation signal as soon as the class-of-traffic check signal has been found to be incorrect. This signal and the reception-confirmation signal will have to be absorbed by the switching equipment of X and should not be able to go through that equipment to arrive at the preceding centre.

TABLE 2/U.11

Signalling between the calling international system and the intercontinental transit system (using code 00 for access via the international exchange of the transit Administration)

Function	Forward path	Backward path	Remarks
Call			These are signalled in accordance with the type of signalling used on terminal calls into the national system of the transit Administration.
Call confirmation			
Proceed-to-select			
Selection	Digits 00		
Transit proceed-to-select		Stop polarity for at least 450 ms followed by combination No. 22 (40-ms pulse of A polarity)	In the case where the transit Administration uses type A signalling for terminal calls to its national network, the inversion to stop polarity on the backward signalling path takes place when the incoming trunk circuit is seized. Where the transit system uses type B signalling for this traffic the inversion to stop polarity on the backward signalling path occurs after the transit access code digits 00 have been selected. The transit access code is selected in accordance with the same signalling arrangements as those used for the terminal traffic into the national network.
Selection signals [a]	Combination No. 30 Class-of-traffic 2 or 3 digit destination code Digits of called number Combination No. 26		
Transit centre identification code signals		As in Table 1/U.11. Returned within 150 ms of recognition of the class-of-traffic signal (or the end-of-selection signal if the method using assembling of selection signals [see § 15*f*) of the text] is adopted)	
Call connected		As in Table 1/U.11	
Service signals		As in Table 1/U.11	
Clear			These are signalled in accordance with the type of signalling used on terminal calls into the national system of the transit Administration.
Clear confirmation			

[a] The pre-signal combination No. 30 indicates a call without class-of-traffic check facilities, which are considered unnecessary for circuits of this type.

TABLE 3/U.11

Signalling between the calling international system and the first transit exchange (when access to this is by direct connection to the transit switching equipment)

Function	Forward path	Backward path	Remarks
Free line	As in Table 1/U.11		
Call	Inversion to stop polarity for 450 ms		The incoming register must be connected and ready to receive selection signals within 425 ms of the commencement of the inversion to stop polarity.
Reception confirmation		As in Table 1/U.11	
Selection signals	As in Tables 1/U.11 and 2/U.11		As in Table 1/U.11
Transmission confirmation		Combination No. 29 (20-ms pulse of A polarity) Combination No. 32 (120-ms pulse of A polarity)	Transmitted only on receipt of selection signals in accordance with Table 1/U.11 and then as soon as the class-of-traffic check combination has been correctly received.
Transit centre identification code signals		As in Table 1/U.11	
Call connected		As in Table 1/U.11	
Service signals		As in Table 1/U.11	
Idle circuit	As in Table 1/U.11		
Clearing	As in Table 1/U.11		
Clear confirmation	As in Table 1/U.11		
Automatic re-test	As in Table 1/U.11		As in Table 1/U.11
Backward busy	As in Table 1/U.11		
Receiving equipment congestion		As in Table 1/U.11	
Transit failure		As in Table 1/U.11	
Transmission Failure		As in Table 1/U.11	

Note 1 – Working over these circuits is on a unidirectional basis and there is therefore no requirement for the inclusion of combinations No. 20 in the calling signal.

Note 2 – In the case of both-way working the use of the signalling system of Table 1/U.11 is recommended.

TABLE 4/U.11

Class-of-traffic signals

Category	Element number					Condition signalled
	1	2	3	4	5	
A	Z					Category A (50 bauds)
B	A					Category B (reserved)
A		A	A			Special category (see Note under § 7.2)
A		A	Z			Gentex
A		Z	A			Service traffic
A		Z	Z			Telex
A and B				A		Not previously overflowed
A and B				Z		Previously overflowed
A and B					A	Permanent polarity

TABLE 5/U.11

Combinations used for class-of-traffic and class-of-traffic check signals

Category	Class-of-traffic						Class-of-traffic check						Function	
	Combination number	Element number 1	2	3	4	5	Combination number	Element number 1	2	3	4	5	Gentex, telex, telex and gentex combined, or special category	Previously alternatively routed (overflowed)
A	11	Z	Z	Z	Z	A	20	A	A	A	A	Z	Telex	yes
	21	Z	Z	Z	A	A	15	A	A	A	Z	Z		no
	10	Z	Z	A	Z	A	8	A	A	Z	A	Z	Service traffic	yes
	1	Z	Z	A	A	A	13	A	A	Z	Z	Z		no
	6	Z	A	Z	Z	A	12	A	Z	A	A	Z	Gentex	yes
	19	Z	A	Z	A	A	7	A	Z	A	Z	Z		no
	4	Z	A	A	Z	A	16	A	Z	Z	A	Z	Special category (see Note under § 7.2)	yes
	5	Z	A	A	A	A	22	A	Z	Z	Z	Z		no
B	3	A	Z	Z	Z	A	26	Z	A	A	A	Z		yes
	9	A	Z	Z	A	A	2	Z	A	A	Z	Z		no
	18	A	Z	A	Z	A	25	Z	A	Z	A	Z		yes
	28	A	Z	A	A	A	24	Z	A	Z	Z	Z		no
	14	A	A	Z	Z	A	23	Z	Z	A	A	Z		yes
	31	A	A	Z	A	A	30	Z	Z	A	Z	Z		no
	27	A	A	A	Z	A	17	Z	Z	Z	A	Z		yes
	32	A	A	A	A	A	29	Z	Z	Z	Z	Z		no

References

[1] CCITT Recommendation *Use on radio circuis of 7-unit synchronous systems giving error correction by automatic repetition*, Rec. S.13, Table 1/S.13.

[2] CCITT Recommendation *Operational provisions for the international public telegram service*, Rec. F.1, § C8.

[3] CCITT Recommendation *Use of the telex network for data transmission at 50 bauds*, Rec. S.15, § 2.

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

Recommendation U.12

TERMINAL AND TRANSIT CONTROL SIGNALLING SYSTEM FOR TELEX AND SIMILAR SERVICES ON INTERNATIONAL CIRCUITS (TYPE D SIGNALLING)

(Geneva, 1972; amended at Geneva, 1976, 1980 and Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that new networks are being introduced based upon stored programme control techniques;

(b) that these networks, which may be synchronous or anisochronous, are being provided to carry either telex and similar services or these services in combination with data traffic;

(c) that the equipment provided for these networks facilitates an enhanced range of facilities compared with those available on existing types of telex network;

(d) that these factors justify the establishment of a new type of signalling, enabling both telex and other traffic to be handled, as far as practicable, by common processes;

(e) that, for interworking between these anisochronous networks for telex and similar switched telegraph services, a signalling standard (designated type D) has been adopted, based upon that described in Recommendation X.70 [1] for start-stop data services on anisochronous networks;

(f) that the decentralized signalling to apply on connections between synchronous public data networks is described in Recommendation X.71 [2],

unanimously declares the view

1 Signal conversion

1.1 Recommendation U.1, § 1.1 concerning the responsibility for signal conversion, should be the ultimate aim for interworking between networks using type D signalling on the one hand and type A, B or C signalling on the other hand.

1.2 However, in order to avoid unnecessary inconvenience during the introductory stages of the new signalling system, it is recommended that countries employing type D signalling systems should provide for incoming international traffic type A or B signalling and possibly for transit working type C signalling. The question as to when Recommendation U.1, § 1.1 will become fully effective is yet to be resolved.

1.3 Rules for interworking Recommendation U.12 signalling with signalling standards defined in Recommendations U.1 and U.11 are given in Recommendation U.15.

2 General switching and signalling principles

2.1 Decentralized signalling will apply, the same channel being used for control signalling and information transfer.

2.2 Both terminal and transit operation will be required. Due to the inclusion of transit operation, link-by-link signalling control of calls will be adopted.

2.3 Onward selection from transit and incoming terminal centres should be arranged to overlap the receipt of selection signals, this in order to minimize call set-up times. Selection signals will be transmitted by the originating country at automatic speed in a single block that includes an end-of-selection signal. It is nevertheless necessary to coordinate the transmission of signals on the forward path to allow sufficient time for retransmission or conversion of backward path signals.

2.4 The schedule of telex destination codes laid down in Recommendation F.69 [3] will apply. The same numerical codes will be used for network identification purposes.

2.5 Alternative routing will be permitted. The principle of a few high usage circuits will be adopted, with overflow on to adequately provided routes between centres. In order to prevent repeated alternative routing causing traffic to circulate back to the originating point, alternative routing will be restricted to once per call.

2.6 Both-way operation will be assumed and inverse order testing of circuits on both-way routes, or a close approximation to it by testing the route in small groups in fixed order always starting the search from the same position, will be specified in order to minimize head-on collisions.

2.7 In all cases (including transit switching) the originating network will be responsible for recording accounting information.

2.8 The grade of service for the provision of circuits should not be worse than one lost call in 50 for routes carrying overflow traffic or from which overflow is not permitted. For high-usage direct links, circuits would be provided at a grade of service to be agreed bilaterally, but should not be worse than one lost call in ten.

2.9 Sufficient switching equipment will be provided to ensure that congestion will not be signalled on more than 0.4% of calls in the busy hour, and only then when congestion has been positively identified.

3 Specific signalling characteristics

Notes applicable to § 3

Note 1 – X denotes the international centre that originates the call under consideration on the international link concerned. Y denotes the international centre that receives the call under consideration on the international link.

Centre X and centre Y will provide any necessary signalling conversion to the type of signalling employed on the preceding and succeeding links if these do not use type D signalling.

Note 2 – Timings shown are within the centre concerned with no allowance being made for propagation and other delays, such as slow sending of selection signals by the originating subscriber.

Note 3 – The times for permanent start polarity (A) and stop polarity (Z) are generally indicated in the following signal descriptions as integral multiples of a character (see Note 4). Compared with Recommendation X.70 [1], some other multiples are selected in order to enable simpler interworking with systems operating in accordance with Recommendations U.1 and U.11.

Note 4 – The control signalling code (CSC) used in this signalling system is described in Table 8/U.12.

3.1 The signalling system for telex and similar services between two anisochronous networks using type D signalling is described in Table 1/U.12.

3.2 The incoming equipment may release the connection if the calling signal exceeds the maximum period of two characters, or of four characters in exceptional cases where extension of call signals has been requested by centre Y. Start polarity will be maintained on the backward signalling path from centre Y to centre X.

3.3 The first forward path signal following the calling signal (class-of-traffic signal) is distinctive from the first backward path signal to provide a guard against head-on collisions in the case of bothway operation. A head-on collision is detected by the fact that centre X receives a first class-of-traffic character instead of the reception-confirmation or reception-congestion signal.

When a head-on collision is detected, the switching equipment at each end of the circuit should make another attempt to select a free circuit, either on the same group of circuits or on a group of overflow circuits, if they exist and there are no free circuits on the primary route. In the event of a further head-on collision on the recall, or on the call attempt via the overflow route, no further recall will be made and the call will be cleared down. In the case of a transit centre, the service signal No. 20 (**NC**) followed immediately by the clearing signal will be returned to the preceding centre after the reception-confirmation signal and the network identification signal (Recommendation F.69 [3]).

3.4 If there is failure to receive the reception-confirmation or reception-congestion signal within 4 seconds from the start of the calling signal or receipt of a spurious signal, as indicated by a character other than a first class-of-traffic character, the reception-confirmation signal or reception-congestion signal should then initiate the automatic retest signal on the circuit concerned.

In the case of failure to receive the correct reception-confirmation or reception-congestion signal, another attempt to select a circuit should be made (once only). If the second attempt is unsuccessful, the service signal No. 20 (**NC**) followed by the clearing signal will be returned to the preceding centre after the reception-confirmation signal and the network identification signal (Recommendation F.69 [3]).

3.5 Selection signals can be divided into two parts. The first part, designated as the network selection signals, contains information regarding network and subscriber requirements and may be composed of one or more characters (see Tables 2/U.12, 3/U.12, 4/U.12, 4a/U.12, 5/U.12 and 5a/U.12). The second part comprises the address signals (the called subscriber number, which is preceded by the destination code in the case of a transit call). The network selection signals used in the forward direction (see also Appendix II) are further subdivided and assembled as follows (§§ 3.5.1 to 3.5.4 below) for signalling purposes:

3.5.1 *First class-of-traffic character* (see Table 2/U.12)

The calling signal is always followed by at least one class-of-traffic character. The bit functions of this character were so chosen that no further characters are needed for most connections. If there is a need for indication of further requirements, a second class-of-traffic character may be used. Whether the second class-of-traffic and user-class characters follow or not will be indicated by the bits b_3 and b_4 of the first class-of-traffic character.

3.5.2 *User-class character* (see Table 3/U.12)

This character, if used, will follow the first class-of-traffic character and will be required when, for example, this information cannot be derived from the incoming line. Whether a second user-class character follows or not will be indicated by the bits b_1, b_2 and b_3 of the first user-class character. When seven user classes in Table 3/U.12 are not sufficient, a second user-class character may be added by means of an escape character. Whether a second class-of-traffic character follows or not will be indicated by bit b_4 of the first user-class character.

3.5.3 *Second and subsequent class-of-traffic characters* (see Tables 4/U.12 and 4a/U.12)

These characters follow any user-class characters required. The number of these class-of-traffic characters depends on the number of user facilities available. The bit b_4 of the second or subsequent class-of-traffic characters will indicate whether another class-of-traffic character follows or not.

3.5.4 *Closed user group character* (see Tables 5/U.12 and 5a/U.12)

closed user group is defined as follows: A number of users of a public switched communication service who have the facility that they can communicate with each other but access is barred to and from all other users of the service.

Note 1 – A special facility, permitting a user in a closed group to call any other user connected to a public switched communication service or to any other network with which interworking is permitted, may be offered. This is termed *Closed user group with outgoing access.* Access to users of this facility is restricted to other members of the closed user group.

The start of closed user group character would precede the closed user group number which would be coded into a number of hexadecimal characters up to a maximum of four (see Table 5/U.12).

Note 2 – Further study is required concerning administrative aspects of the method to provide the closed user group facility.

3.5.5 The numerical characters used for the second part of the selection signals are shown in Table 6/U.12. When the first class-of-traffic character indicates a terminal call, the Recommendation F.69 [3] telex destination code will be omitted.

3.6 The incoming equipment should maintain start polarity on the backward signalling path by releasing the connection if the first received character is spurious, as indicated by a character other than a valid first class-of-traffic signal. This procedure prevents the possibility of regarding a second selection signal as a first class-of-traffic character and provides a further safeguard against false calls.

In the case of receipt of a spurious signal as indicated by a parity error or by a character other than a valid selection signal (with the exception of the first class-of-traffic signal), the incoming equipment should return the service signal No. 20 (**NC**) to the preceding centre – after the reception-confirmation and the network identification signal (Recommendation F.69 [3]) – followed by the clearing signal.

The incoming equipment may release the connection if all of the selection signals are not correctly received within a period of 15 seconds from the reception of the first class-of-traffic signal. In this event, the service signal No. 20 (**NC**) is returned to the preceding centre, followed by the clearing signal.

3.7 For the address signals, i.e. the destination code and the national number, the maximum number of digits to be expected is 12.

3.8 In the case of receipt of the reception-congestion signal at a transit centre, the service signal No. 61 (**NC**) should be returned to the preceding centre (after the reception-confirmation and the network identification signal) and followed by the clearing signal.

3.9 The network identification signal shall be sent following the reception-confirmation signal.

If several networks are involved in setting up a call, the calling network will receive the network identification signals one after the other. If a transit centre fails to receive the first character of a network identification signal within two seconds of the reception-confirmation signal, it will return the service signal No. 20 (**NC**) to the preceding centre, followed by the clearing signal. The network identification signals could be useful for retracing the route followed by a call (for traffic statistics, international accounts, analyses of unsuccessful calls and the clearing of faults).

It is possible for a transit centre to receive backward path signals, such as network identification signals, a call-connected signal or service signals, from subsequent centres whilst the backward path signals originated locally are still being sent. It is necessary for the transit centre to ensure that the received signals are retransmitted to the preceding centre without mutilation or loss. This can be ensured if the forward seizure does not occur before complete transmission of the reception confirmation signal.

3.10 The backward path signals indicating effective and ineffective call conditions are scheduled in Tables 7/U.12, 7a/U.12 and 7b/U.12.

3.11 If the last backward path signalling character, call-connected, or service signal is not received within 90 seconds from the end of selection, then the service signal No. 20 (**NC**) will be returned to the preceding centre and followed by the clearing signal.

3.12 If the called station is not able to receive information immediately, the return of the start-of-transit-through-connect or call-connected signals to the calling station should be delayed accordingly (up to a maximum of 3 seconds for telex in accordance with Recommendation S.9 [4]).

3.13 In this type of signalling, originating and terminating national centres contain the identification of the calling or called subscribers respectively. These identifications may be exchanged within the network as an optional subscriber's feature.

In the case of a call terminating in a network with a signalling standard other than type D, and hence called line identification is not available, the last type D centre in the connection should send only the call-connected signal in response to a request for the called line identification. The last type D centre may be either an international transit centre, the last international gateway or a national type D centre.

In the case of a call originating in a network with a signalling standard other than type D, and hence the calling line identification is not available, the first type D centre in the connection should send only the end-of-line-identification signal (CSC character No. 12) in response to a request for the line identification. The corresponding printed service signal to indicate the absence of the line identification to the calling or called subscriber as appropriate is **NI**.

3.14 The call connected signal confirms that the call is extended to the called subscriber and, if applicable, that the calling line identification has been completely received by the terminating centre and passed to the called suscriber and, when applicable, that the called line identification has been completely transmitted to the originating centre (see Appendix III).

Regardless of the action taken on calling and/or called line identifications, tripping of the called subscribers answerback is required. Normally this is initiated by the originating type D centre. The rules for taking the called subscribers answerback in interworking cases are given in Recommendation U.15.

Return of the answerback is supervised by the originating centre. If it does not arrive within 6 seconds of the commencement of the WRU sequence, the originating centre returns the **DER** signal in International Telegraph Alphabet No. 2 (ITA2) to the calling subscriber and clears the connection.

The WRU signal confirms that the call-connected signal has been received by the originating centre and, when applicable, that the called line identification has been completely received by the originating centre and passed to the calling subscriber (see Appendix III).

The call-connected signal is sent on the backward path by the terminating centre, the WRU signal is sent by the originating centre to the called subscriber, but not before the calling subscriber is ready to receive the answerback signal.

The connection must be switched through in the originating centre and in the terminating centre within the timings shown in Appendix III.

In transit centres the connection can be switched through earlier provided that losses and mutilations of characters are avoided.

Connect-through procedures at centres where interworking between type D and other standards takes place are described in Recommendation U.15.

Complete network through-connection is assured when the called subscriber's answerback is received by the calling terminal.

3.15 The guard delays on clearing are measured from the moment when start polarity has been established on both signalling paths by:

- either recognizing or transmitting the clearing signal on one signalling path, and
- either transmitting or recognizing the clear-confirmation signal on the other signalling path.

On all type D signalling paths the guard period for incoming calls should be a period of 3-4 characters. A new call shall not be accepted until this guard period has elapsed. This is on the assumption that the terminating centre will be able to accept the first selection signal after a negligible period of stop polarity and will also be able to return the reception-confirmation signal within a negligible delay after the receipt of the first class-of-traffic character.

On all type D signalling paths the guard period for outgoing calls should be a period of at least eight characters. If centres are able to distinguish between the different clearing conditions, shorter periods may be introduced accordingly.

3.16 The automatic retest signal will be initiated as indicated in § 3.4 above.

The circuit should be marked *unavailable* for outgoing traffic and should be tested up to five times at nominal intervals of 1.0 minute or 1.2 minutes and a check made to confirm the receipt of a reception-confirmation signal in response to each test. If a valid reception-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- or 30/36-minute intervals. If 5.0- or 6.0-minute intervals are used and a valid reception-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.

If, however, during the above sequence of retests, a valid reception-confirmation signal is received, a clearing signal will 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. 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 that occur during the incoming guard delay period. Where an exchange has knowledge of a transmission system failure, it is desirable that retest signals shall not be applied to the affected circuits.

The intervals between the tests at the two ends of the trunk circuit 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 Recommendation F.69 [3] telex destination code should take the longer interval (i.e. 1.2, 6 and 36 minutes). The tolerance on all above time intervals is ± 10%. Nevertheless, when this requirement would entail considerable difficulty, alternative arrangements may be adopted by agreement between the two Administrations concerned.

The use of a special first class-of-traffic character for retest permits the incoming centre to be informed about retests on its incoming circuits.

3.17 If at the receiving end parity does not check, provisionally the connection should be cleared down unless otherwise specified. However, the possibility of different actions remains open for further study.

TABLE 1/U.12

Signalling for telex and similar services between anisochronous networks

Note – For the Control Signalling Code (CSC) numbers mentioned refer to Table 8/U.12.

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Free line	Start polarity (polarity A)	Start polarity (polarity A)	
Call	Stop polarity (polarity Z) for a minimum period of one character and a maximum period of two characters followed immediately by selection signals		The equipment at centre Y must be connected and ready to receive selection signals within one character period. Exceptionally the minimum and consequently the maximum period may be lengthened to no more than four characters at the request of the incoming country (Y).
Reception-confirmation		Stop polarity followed by CSC No. 14	Stop polarity returned within three character periods after the end of receipt of the first class-of-traffic signals. The return of CSC No. 14 shall commence within one to two character periods after the inversion to stop polarity. The reception-confirmation signal will have to be absorbed by the switching equipment of X and should not be able to go through that equipment to arrive at the preceding centre.
Selection	At least one (first class-of-traffic signal only) or possibly several network selection signals depending on the network requirement (see Appendix I), the two or three digits of the F.69 [3] telex destination code of the called country, the digits of the called station number and an end-of-selection signal (CSC No. 11)		These signals are transmitted immediately after the calling signal without awaiting the reception at X of the reception-confirmation signal. The destination code will be omitted for terminal calls. The selection signals will be transmitted in a single group at automatic speed.
Network identification		CSC No. 12 followed by the F.69 [3] code for the network concerned	The CSC No. 12 follows the reception confirmation signal at automatic speed after one to two character periods. These signals must go through centre X and arrive at the originating country.
Reception-congestion		Stop polarity for a period of one or two characters followed by the clearing signal	When selection signals cannot be accepted (refer to § 2.9 of the text) this signal should be returned as soon as possible and in any event within three character periods (exceptionally five character periods where centre X sends prolonged call signals) after the start of receipt of the call signal. The reception-congestion signal should be absorbed by centre X and not allowed to be received by a preceding country.
Service signal without clearing		CSC characters (see Table 7b/U.12) followed by the idle circuit condition	Service signals consist of CSC No. 11 followed by two characters from Table 7b/U.12.

TABLE 1/U.12 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Call connected		One CSC character (see Table 7/U.12)	See Appendix III.
Start of transit through-connect signal (STTC)		CSC No. 15 (see Table 7/U.12)	This signal always precedes the transit through-connect signal.
Transit through-connect signal (TTC)		One CSC character (see Table 7a/U.12)	This signal will always be prefaced by the start of transit through-connect signal and will be returned preceding a service signal without clearing when this has to be sent. It will also be transmitted when the calling and/or called line identification is required (for further details see Appendix III).
Transit centres through-connected signal (TTD)	CSC No. 11 (see Table 6/U.12)		This signal will be transmitted within one to two character periods after the receipt of the transit through-connect signal (TTC) when no calling line identification is required (for further details see Appendix III).
Called line identification (if required)		The called line identification signal transmitted at automatic speed commencing within one character period of the receipt of the TTD signal or the first character of the calling line identification signals.	The called or calling line identification signal consists of the F.69 [3] code followed by the digits of the subscriber's number and then the end-of-identification character (CSC No. 12). The receipt of only the CSC No. 12 indicates that the line identification is not available. Where the called line identification has been requested, the reception of the call-connected signal, not preceded by the STTC and TTC, will also indicate that the called line identification is not available. For further details see Appendix III.
Calling line identification (if required)	The calling line identification transmitted at automatic speed commencing within one to two character periods of receipt of the transit through-connect signal (TTC)		
WRU *(Who are you?)*	WRU characters (combinations Nos. 30 and 4) of ITA2		For definition see § 3.14 of the text and for further details see Appendix III.
Service signal with clearing		CSC characters (see Table 7b/U.12), followed by clearing signal	The service signal consists of CSC No. 11 followed by two characters of Table 7b/U.12.
Idle circuit	Stop polarity	Stop polarity	

TABLE 1/U.12 *(concluded)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remarks
Clearing	Inversion to start polarity in the direction of clearing. The minimum recognition time is 2 characters and the maximum time is 4 characters		The minimum period of start polarity on one signalling path that in itself ensures the complete release of the connection is 4 characters.
Clear confirmation	Inversion to continuous start polarity in the opposite direction after a minimum duration of 2 characters of clearing signal and a maximum duration of 7 characters		The minimum and maximum periods for the release of the international circuit by a centre are 2 and 7 characters respectively.
Incoming guard delay	Period of 3-4 characters measured from the appearance of start polarity on both signalling paths		A new incoming call shall not be accepted until this guard period is elapsed. For further details see § 3.15 of the text.
Outgoing guard delay	Period of 8 characters measured from the appearance of start polarity on both signalling paths		The outgoing equipment should not open the trunk circuit for service until this guard period has elapsed. For further details see § 3.15 of the text.
Automatic retest	Stop polarity for 1-2 (exceptionally 4) character periods followed by CSC No. 13, stop polarity for 4 seconds and then start polarity, repeated		For further details on the repetition periods see § 3.16 of the text.
Backward busy		Continuous stop polarity for a maximum of 5 minutes	

TABLE 2/U.12

First CSC [a] character on the forward and backward paths

Combination				Condition signalled
b_4	b_3	b_2	b_1	
A	A			No further network selection signal follows [b]
A	Z			Second class-of-traffic character follows [b] (see Table 4/U.12)
Z	A			User-class character follows [b] (see Table 3/U.12)
		A		Alternative routing not allowed [b]
		Z		Alternative routing allowed [b]
			A	Transit traffic [b]
			Z	Terminal traffic [b]
Z	Z	A	A	Retest signal [b]
Z	Z	A	Z	Reception-confirmation
Z	Z	Z	A	} Not allocated
Z	Z	Z	Z	

[a] CSC = control signalling code.
[b] First class-of-traffic character.

TABLE 3/U.12

First user-class character

Combination				Condition signalled from X to Y [a]
b_4	b_3	b_2	b_1	
A				No second class-of-traffic character follows
Z				A second class-of-traffic character follows (see Table 4/U.12)
	A	A	A	} Reserve
	A	A	Z	
	A	Z	A	Service
	A	Z	Z	Telex
	Z	A	A	Gentex
	Z	A	Z	} Reserve
	Z	Z	A	
	Z	Z	Z	A second user-class character follows [b]

[a] The user-class character may be omitted, if, for example, the information can be derived from the incoming line.
[b] Reserve for future needs.

TABLE 4/U.12

Second class-of-traffic character

Combination				Condition signalled from X to Y
b_4	b_3	b_2	b_1	
A				No third class-of-traffic character follows
Z				Third class-of-traffic character follows [a]
	A			No closed user group sequence follows
	Z			Closed user group sequence follows (see Table 5/U.12)
		A		Called line identification not required
		Z		Called line identification required
			A Z	} Reserved for national use [b]

[a] Reserve for future needs. If implemented, the allocations should be the same as in Table 4a/X.70 [5].

[b] On international circuits b_1 should be set to A-polarity.

TABLE 4a/U.12

Third class-of-traffic character

Combination				Condition signalled from X to Y
b_4	b_3	b_2	b_1	
A				No fourth class-of-traffic character follows
Z				Fourth class-of-traffic character follows [a]
	A Z			Reserved [b]
		A Z		Reserved [b]
			A	no delay of forward selection is required [c]
			Z	delay of forward selection is required [c]

[a] Reserved for future needs.

[b] See Table 4a/X.70.

[c] See Recommendation U.15.

TABLE 5/U.12

Start of closed user group character [a) b)]

Combination				Condition signalled from X to Y	
b_4	b_3	b_2	b_1		
A				Without outgoing access	
Z				With outgoing access	
	A			No DNIC follows [c)]	
	Z			DNIC follows [c) d)]	
		A	A	1	Number of hexadecimal closed user group characters that follow
		A	Z	2	
		Z	A	3	
		Z	Z	4	

a) The application of closed user groups is provisional and for further study in the telex service.

b) The start of closed user group character shall precede the data network identification code (DNIC – Recommendation X.121 [6]) of the representative user (see Recommendation X.87 [7]) followed by the closed user group number, which would be coded into a number of hexadecimal characters up to a maximum of four, as indicated. The closed user group number would be transmitted with the least significant bit of the least significant character first.

c) For further information, see Recommendation X.121 [6].

d) On international circuits b_3 should be set to Z-polarity.

TABLE 5a/U.12

Closed user group characters

Combination				Condition signalled from X to Y	
b_4	b_3	b_2	b_1		
A	A	A	A	0	Hexadecimal closed user group character
A	A	A	Z	1	
A	A	Z	A	2	
A	A	Z	Z	3	
A	Z	A	A	4	
A	Z	A	Z	5	
A	Z	Z	A	6	
A	Z	Z	Z	7	
Z	A	A	A	8	
Z	A	A	Z	9	
Z	A	Z	A	A	
Z	A	Z	Z	B	
Z	Z	A	A	C	
Z	Z	A	Z	D	
Z	Z	Z	A	E	
Z	Z	Z	Z	F	

TABLE 6/U.12

Miscellaneous forward path signals

Combination				Condition signalled from X to Y	
b_4	b_3	b_2	b_1		
A	A	A	A	0	Digits for: – telex destination code; – called subscriber's number; – calling line identification; – DNIC.
A	A	A	Z	1	
A	A	Z	A	2	
A	A	Z	Z	3	
A	Z	A	A	4	
A	Z	A	Z	5	
A	Z	Z	A	6	
A	Z	Z	Z	7	
Z	A	A	A	8	
Z	A	A	Z	9	
Z	A	Z	A	End-of-selection signal and transit centres through-connected signal (TTD)	
Z	A	Z	Z	End-of-calling-line-identification signal[a]	
Z	Z	A	A		Not allocated
Z	Z	A	Z		
Z	Z	Z	A		
Z	Z	Z	Z		

[a] This signal is also used without any pre-service signal when the calling line identification is not available.

TABLE 7/U.12

Miscellaneous backward path signals

Combination				Condition signalled from Y to X
b_4	b_3	b_2	b_1	
A	A	A	A	0
A	A	A	Z	1
A	A	Z	A	2
A	A	Z	Z	3
A	Z	A	A	4
A	Z	A	Z	5
A	Z	Z	A	6
A	Z	Z	Z	7
Z	A	A	A	8
Z	A	A	Z	9
				Digits for: – network identification signal (Recommendation F.69[3]), – called line identification, – service signals.
Z	A	Z	A	Start-of-service signal (see Table 7a/U.12)
Z	A	Z	Z	End-of-called-line identification [a] Start-of-network identification signal
Z	Z	A		Call connected signal
			A	Call metering
			Z	No call metering
Z	Z	Z	A	Start of transit through-connect signal (STTC)
Z	Z	Z	Z	Further backward path signal follows [b]

a) This signal is also used without any pre-service signal when the called line identification is not available.

b) Use of this combination is for future need.

TABLE 7a/U.12

Transit through-connect signals [a]

Combination				Condition signalled from Y to X
b_4	b_3	b_2	b_1	
A	A	A	A	Not allocated
A	A	A	Z	
A	A	Z	A	
A	A	Z	Z	
A	Z	A	A	
A	Z	A	Z	
A	Z	Z	A	
A	Z	Z	Z	
Z	A	A	A	
Z	A	A	Z	
Z	A	Z	A	
Z	A	Z	Z	
Z	Z			Transit through-connect signal (TTC)
		A		Calling line identification not required
		Z		Calling line identification required
			A	Call metering
			Z	No call metering

[a] These signals follow the start of transit through-connect signal (STTC) in Table 7/U.12.

TABLE 7b/U.12

Service signals on the backward path

Numerical code, first/second digit	Category	Significance	Equivalent alphabetical code
01	Without clearing	a)	–
02		Redirected call b)	**RDI**
03		Connect when free c)	**MOM**
20	With clearing, due to subscriber – short term d)	Network failure	**NC**
21		Number busy	**OCC**
22		a)	–
23		a)	–
41	With clearing, due to subscriber – long term d)	Access barred	**NA**
42		Changed number	**NCH**
43		Not obtainable	**NP**
44		Out of order (general)	**DER**
45		Controlled not ready	**ABS**
46		Uncontrolled not ready	**DER**
47		(Answerback failure)	–
48		a)	–
49		Network fault in local loop	**DER**
51		Call information service	**INF**
52		a)	–
61	With clearing, due to network – short term d)	Network congestion	**NC**
71	With clearing, due to network – long term d)	a)	–
72		a)	–
81	With clearing, due to subscriber – network procedure	a)	–
82		a)	–
83		a)	–

a) Used in data networks. Not applicable to telex.

b) Procedures concerning the use of this signal are left for further study (see Recommendation U.41).

c) Only utilized within national networks.

d) "Short-term" in this context approximates to the holding time of a call, whilst "long-term" implies a condition that can persist for some hours or even days.

TABLE 8/U.12

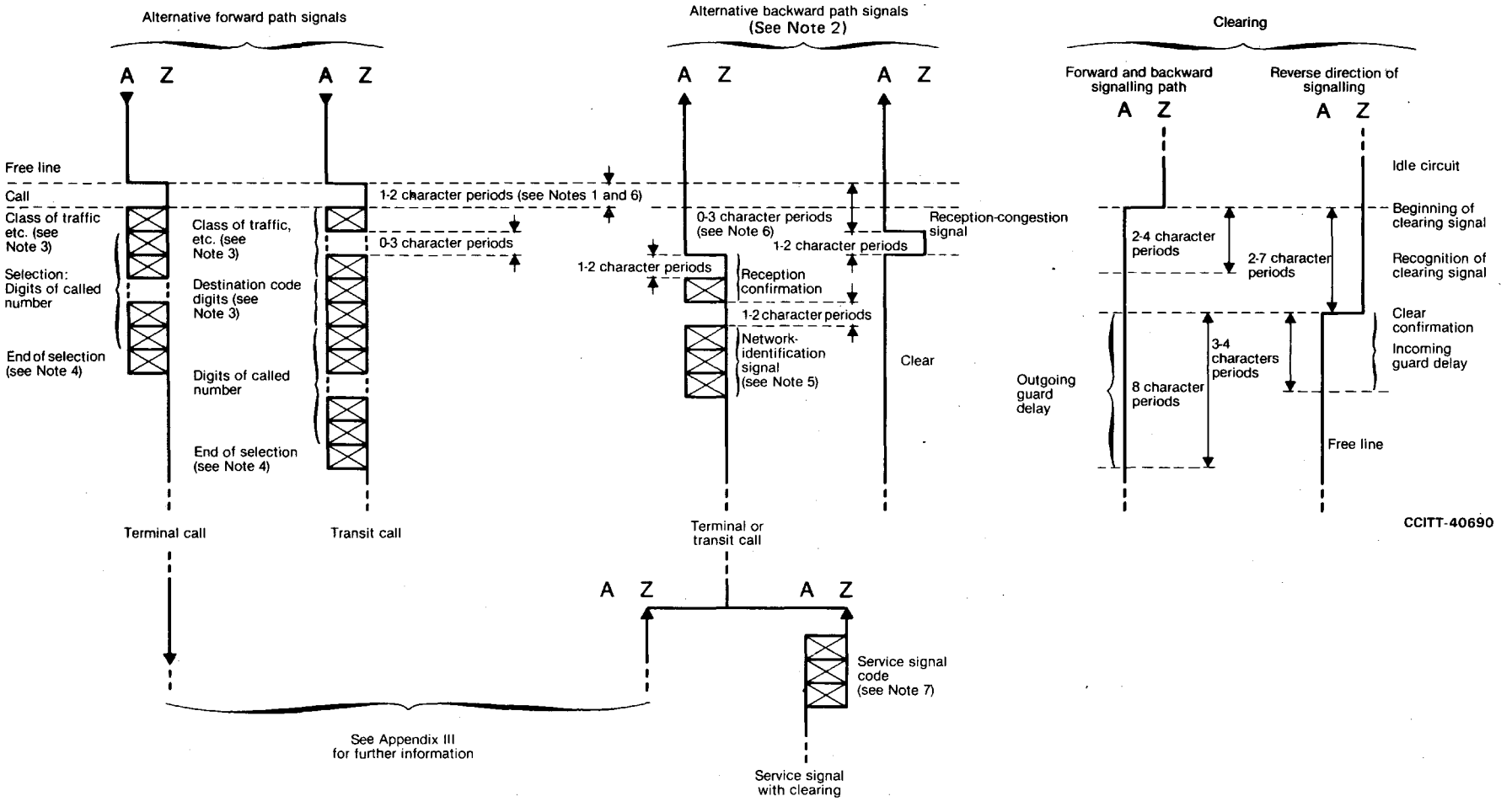
Control signalling code (CSC)

CSC character number	CSC character structure				
	b_5	b_4	b_3	b_2	b_1
1	A	A	A	A	A
2	Z	A	A	A	Z
3	Z	A	A	Z	A
4	A	A	A	Z	Z
5	Z	A	Z	A	A
6	A	A	Z	A	Z
7	A	A	Z	Z	A
8	Z	A	Z	Z	Z
9	Z	Z	A	A	A
10	A	Z	A	A	Z
11	A	Z	A	Z	A
12	Z	Z	A	Z	Z
13	A	Z	Z	A	A
14	Z	Z	Z	A	Z
15	Z	Z	Z	Z	A
16	A	Z	Z	Z	Z

Note 1 – The 4-unit code with one parity check bit used in this control signalling system is listed in the table. A complete control signalling code (CSC) character consists of a one-unit start element, four information bits (b_1, b_2, b_3 and b_4), a parity check bit (b_5) and a stop element of nominally one and a half units.

Note 2 – The parity bit of the signal should correspond to even parity with regard to unit elements of Z polarity. The individual bits should be transmitted at the nominal modulation rate of 50 bauds with the low order bit (b_1) first and completed by the parity check bit (b_5).

Note 3 – The transmitting part of the signalling device shall send the control characters at the nominal modulation of 50 bauds ± 0.5% with a maximum degree of gross start-stop distortion of 5%. The receiving part of the signalling device shall have an effective margin of not less than 40%.



Note 1 – Timings are shown as character periods of the 4 (+ 1 parity) bit code. Switching and propagation delays are not included.

Note 2 – Forward path signals may also appear on the backward path, indicating a head-on collision on both-way circuits.

Note 3 – Network selection signals (class-of-traffic), user-class signals, etc.: see Tables 2-5/U.12. Destination codes may comprise two or three digits.

Note 4 – Selection signals will always be sent as a single block by the originating country. An end-of-selection signal must be included.

Note 5 – The network identification signal comprises a distinctive character followed by the destination code of the network concerned.

Note 6 – The minimum and consequently the maximum periods will be lengthened at the request of the incoming country.

Note 7 – Service signals comprise a distinctive character followed by a 2-digit number.

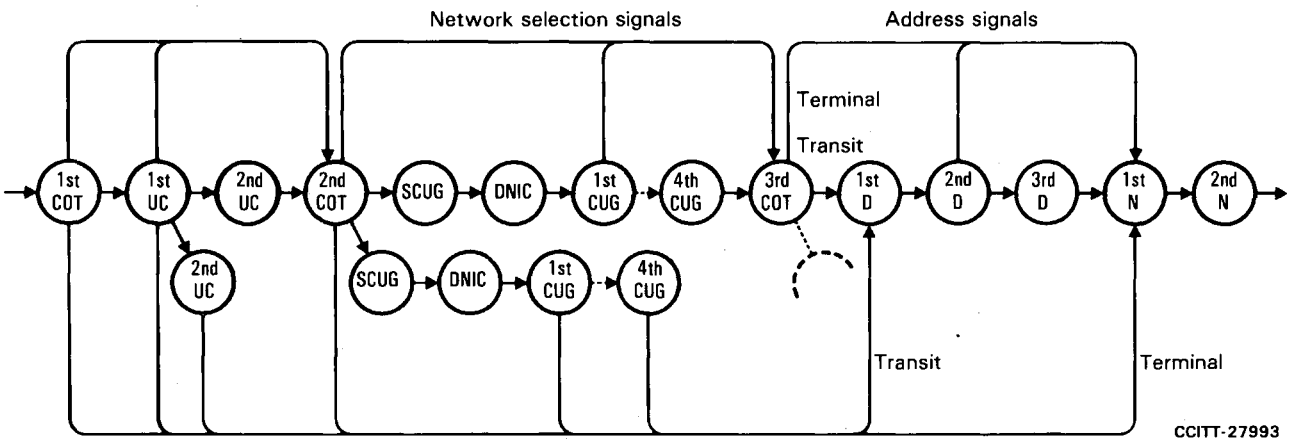
FIGURE 1/U.12

Signalling system type D

APPENDIX I

(to Recommendation U.12)

Possible sequences of network selection signals



COT Class-of-traffic character
UC User-class character
SCUG Start of closed user group sequence
DNIC Data network identification code (see Recommendation X.121 [6])
CUG Closed user group character
D Destination code digit
N Called number digit

Dotted lines reserved for further extension

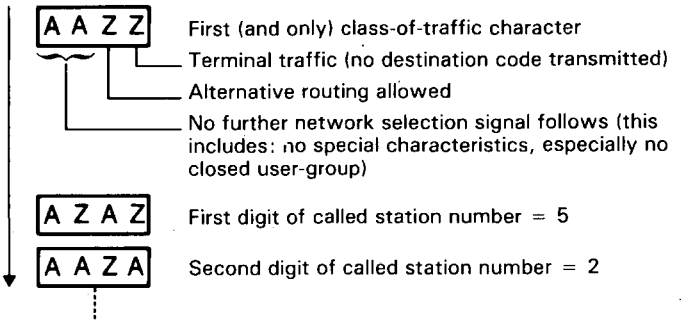
APPENDIX II

(to Recommendation U.12)

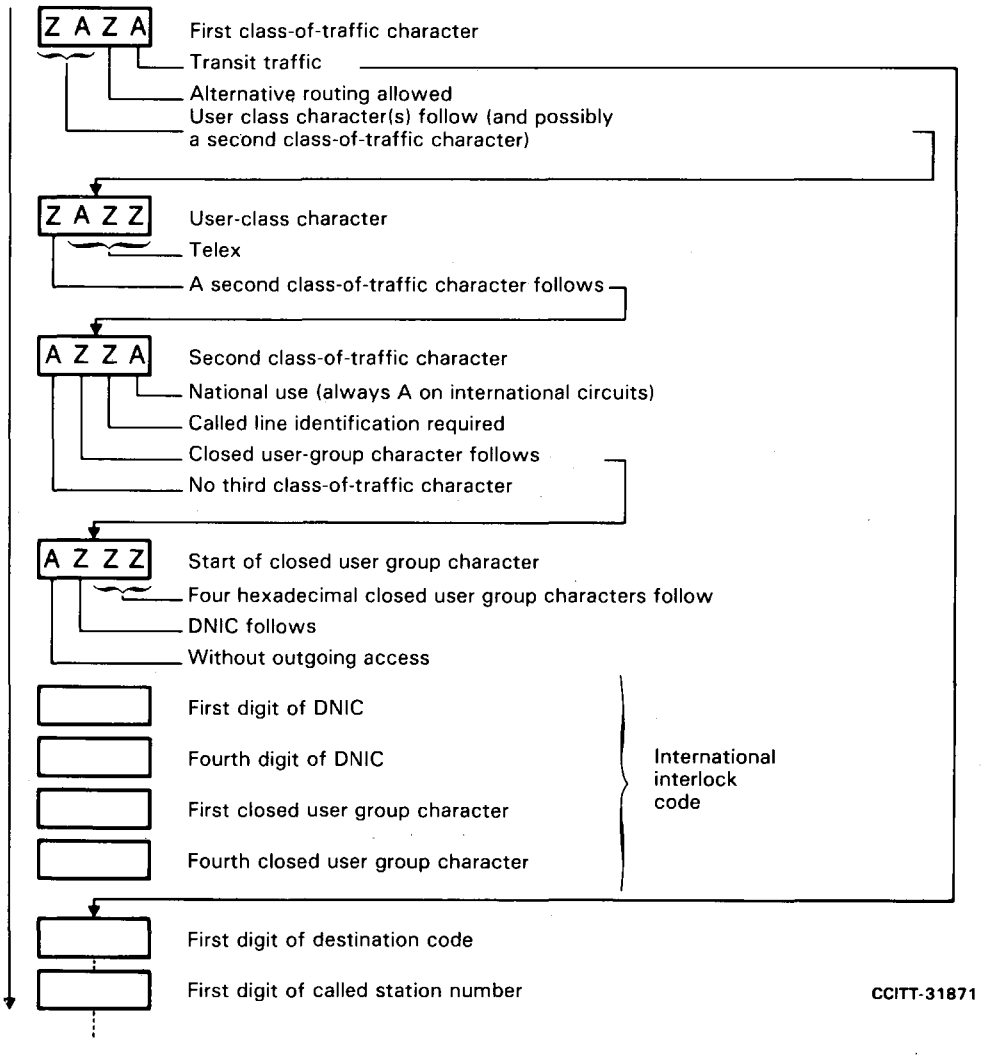
Examples of network selection signals

II.1 *First example* (minimum sequence of network selection signals)

This example shows a sequence of minimal length. (The preceding calling signal, the start and stop elements and the parity bit are not shown. The bits are shown in the order b_4, b_3, b_2 and b_1.)



II.2 *Second example* (a sequence of network selection signals including closed user-group characters)

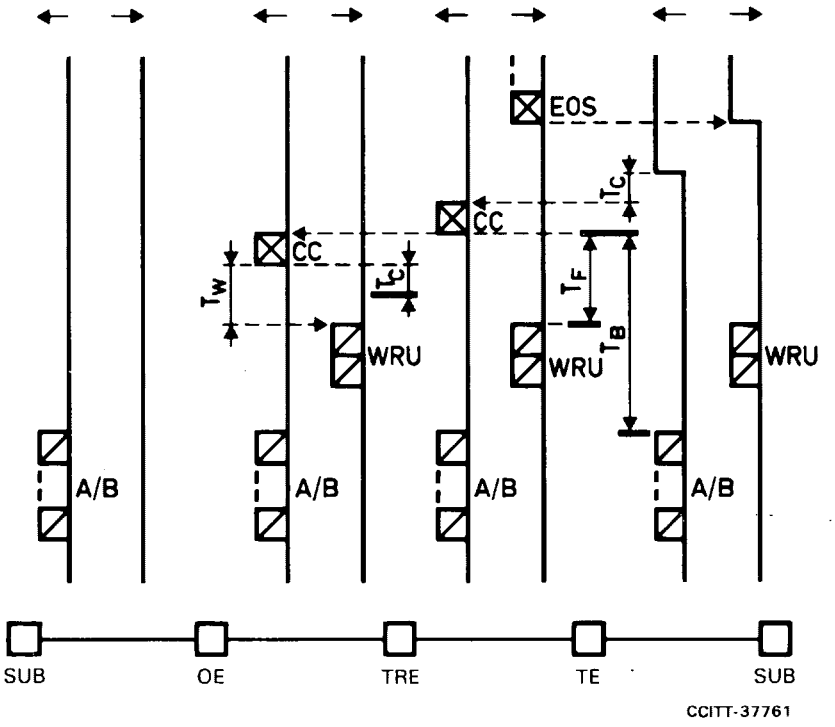


APPENDIX IIIa

(to Recommendation U.12)

Through-connection procedure

Called and calling line identification not required



Legends to Appendices IIIa to IIId

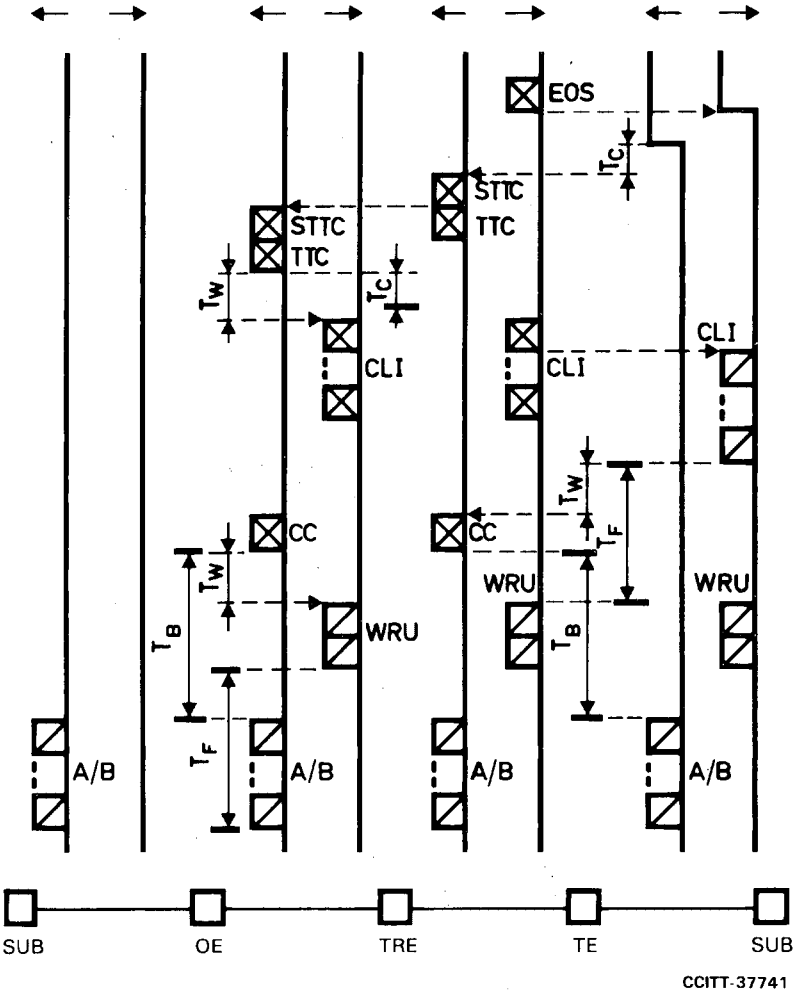
----▶	Correlation line	CDI	Called line identification signals
▬▬	Through-connection	CC	Call connected signal
T_B	Upper and lower limits for through-connection of backward path	WRU	Who are you?
T_F	Upper and lower limits for through-connection of forward path	A/B	Answerback
⊠	ITA2 character	SUB	Subscribers
⊠	CSC character	OE	Originating exchange
EOS	End of selection signal	TRE	Transit exchange
STTC	Start of transit through-connect signal	TE	Terminating exchange
TTC	Transit through-connect signal	C	Character period
TTD	Transit centres through-connected signal	T_C	0 to 1 C, see also § 3.12
CLI	Calling line identification signals	T_W	1 to 2 C, see also § 3.14

APPENDIX IIIb

(to Recommendation U.12)

Through-connection procedure

Called line identification not required,
calling line identification required

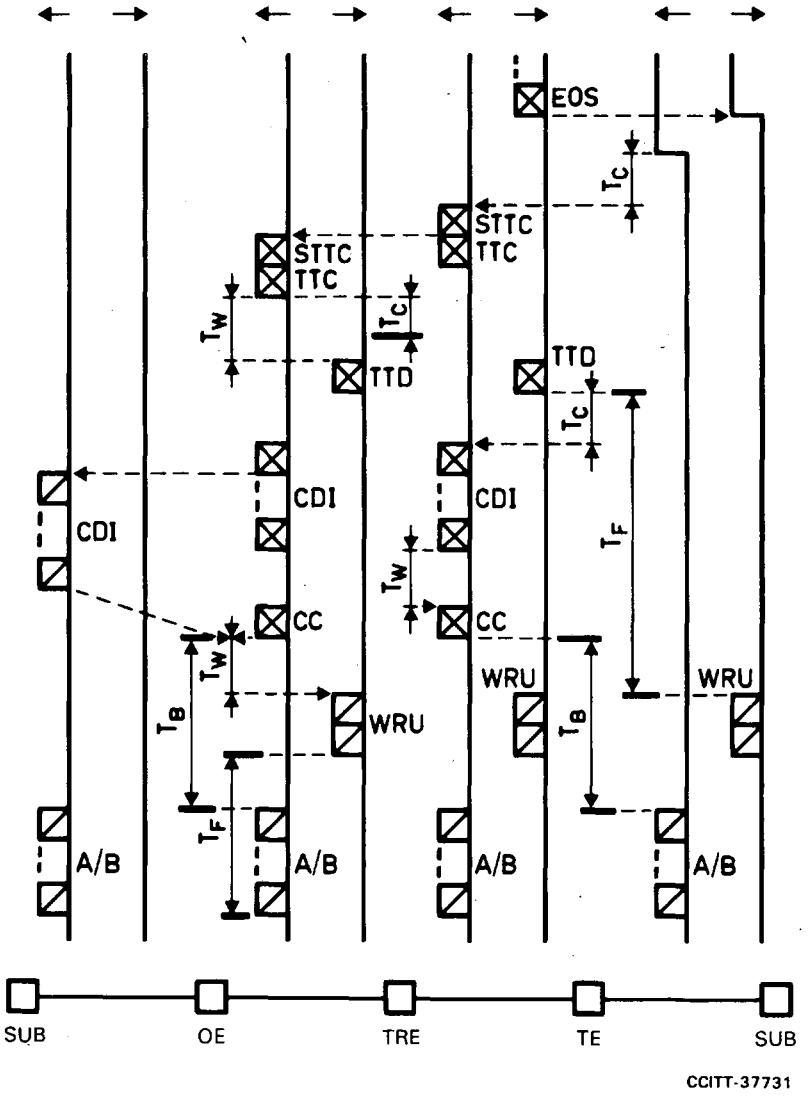


APPENDIX IIIc

(to Recommendation U.12)

Through-connection procedure

Called line identification required,
calling line identification not required

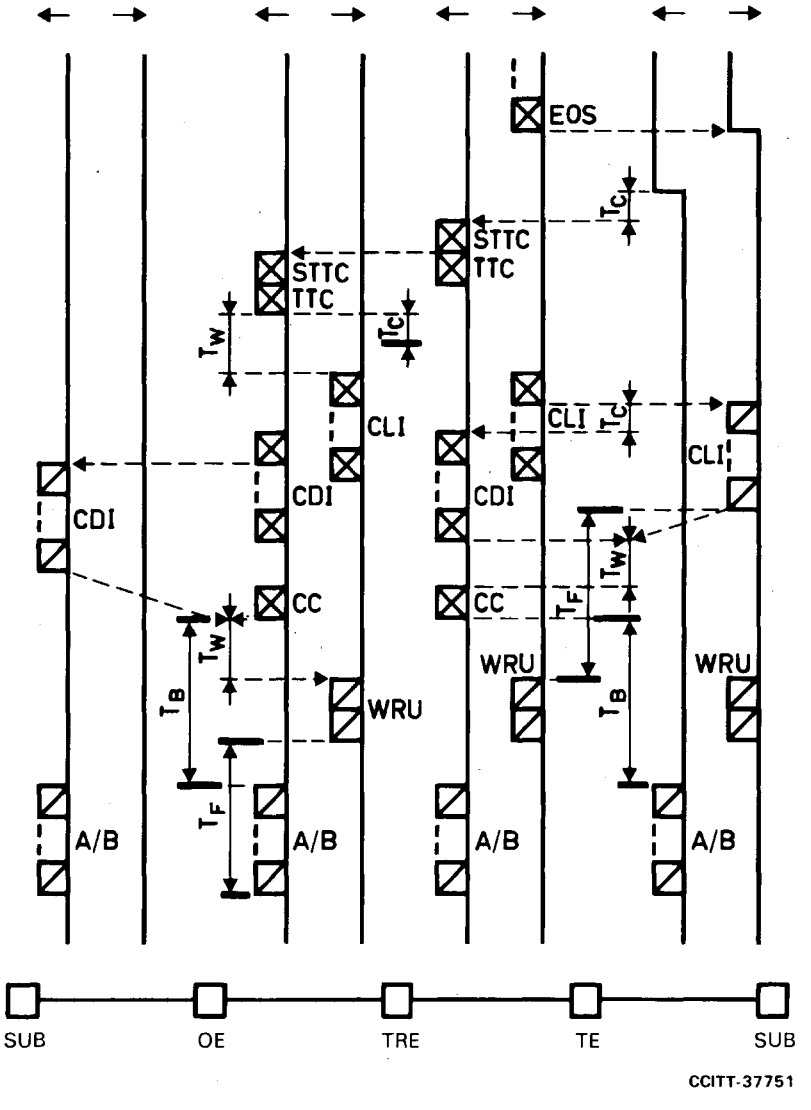


APPENDIX IIId

(to Recommendation U.12)

Through-connection procedure

Called and calling line identification required



References

[1] CCITT Recommendation *Terminal and transit control signalling system for start-stop services on international circuits between anisochronous data networks*, Rec. X.70.

[2] CCITT Recommendation *Decentralized terminal and transit control signalling system on international circuits between synchronous data networks*, Rec. X.71.

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

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

[5] CCITT Recommendation *Terminal and transit control signalling system for start-stop services on international circuits between anisochronous data networks*, Rec. X.70, Table 4a/X.70.

[6] CCITT Recommendation *International numbering plan for public data networks*, Rec. X.121.

[7] CCITT Recommendation *Principles and procedures for realization of international user facilities and network utilities in public data networks*, Rec. X.87.

INTERWORKING RULES FOR INTERNATIONAL SIGNALLING SYSTEMS ACCORDING TO RECOMMENDATIONS U.1, U.11 AND U.12

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that in international transit calls, a number of different signalling standards may be involved;

(b) that interworking between signalling systems according to Recommendations U.1 and U.11 is already mostly covered by those Recommendations;

(c) that it is necessary to define specifically the interworking rules between Recommendations U.1 or U.11 signalling and Recommendation U.12 signalling;

(d) that it is also useful to cover in the same Recommendation any interworking problems between Recommendations U.1 and U.11 signalling standards;

(e) that the originating Administration is responsible for international telex accounting;

(f) that it is desirable for standard arrangements to apply for obtaining the called customer's answerback;

(g) that it is essential to prevent alternative routing in transit centres if network identities cannot be conveyed to the originating centre;

(h) that the use of type D signalling according to Recommendation U.12 should be considered in preference to type C (Recommendation U.11) signalling for transit working;

(i) that types A and B (Recommendation U.1) signalling may only be used for transit working where no alternative routings are allowed;

(j) that there may be cases where conversion of Network Identification Code (NIC) to a Transit Centre Identification Code (TCIC) or vice versa cannot be implemented. In such cases the TCICs and NICs shall be absorbed and alternative routing shall not be allowed within that transit centre. Onward selection shall indicate this condition by using the appropriate COT,

unanimously declares the view that

1 General

The rules for interworking should cover the following areas:

- alternative routing,
- conversion of TCIC (Recommendation U.11) and NIC (Recommendation U.12) signals,
- service signal conversion,
- exchange of line identifications,
- call-connected signal conversion,
- methods for obtaining the called subscriber's answerback.

For the purposes of this Recommendation it shall be assumed that a typical type D interworking connection comprises a first and a last type D exchange and intermediate type D exchanges if any. These are defined below:

A first type D exchange uses type D signalling on the outgoing side and any other trunk signalling standard or directly connected subscriber line standard on the incoming side.

An intermediate type D exchange uses type D signalling on both the incoming and outgoing sides.

A last type D exchange uses type D signalling on the incoming side and any other trunk signalling standard or directly connected subscriber line standard on the outgoing side.

2 Rules for alternative routing

In general, alternative routing should not be allowed when the incoming circuit uses an A or B signalling standard. Table 1/U.15 gives details of each case.

3 Rules for conversion of TCICs and NICs (see Table 1/U.15 for details)

Rule 1 – The last type D exchange should convert any TCIC received from outgoing type C circuits to the type D NIC format. Where a bilateral agreement exists between Administrations to use TCICs on a type A signalling route, then these may be converted by the last type D exchange to the NIC format at the discretion of the Administration of that exchange. This requires that the TCIC must always use the standard Administration's identification letter(s) as recommended in Recommendation U.11, § 4 and defined in the ITU publication List of Indicators for the Telegraph Retransmission System and Telex Network Identification Codes, Part A (Recommendation F.60, § 3.4.2.4 refers).

Rule 2 – Non-standard information, e.g. type A register codes will be absorbed by the last type D exchange. Such codes may also be received on type C circuits. It is therefore recommended that Administrations should, in no circumstances, return from terminating or transit centres any International Telegraph Alphabet No. 2 (ITA2) sequences which could be incorrectly interpreted as TCICs.

Rule 3 – In the case of calls from type A or C circuits routed to type D circuits, the network identification codes (NICs) received from the type D network may be converted into the type C transit centre identification code (TCIC format) by the first type D exchange, see Table 1/U.15.

The NICs received from the type D network will be translated into the TCIC format of ITA2 Combination No. 29, followed by the TNIC code (as recommended in Recommendation F.60) followed by number of Combinations No. 30 to complete a sequence of seven combinations.

Rule 4 – In the case of calls from type B circuit routing to a type D circuit, the first type D exchange shall absorb any NICs.

4 A third COT on type D to allow conversion of NIC to TCIC, and overcome possible call connected signal and answerback timing problems

The conversion from 3 or 4 character NICs to 7 character TCICs can result firstly in the call-connected signal arriving at the first type D centre before complete transmission of the last TCIC, and secondly, in some cases, the answerback arriving before complete transmission of the call-connected signal to the incoming circuit. It is necessary to overcome this difficulty by delaying the forwarding of selection in relation to the activities on the backward path.

The third COT character should be sent by the first type D exchange to indicate (by bit b_1) to the following type D exchanges that a delay of forward selection is necessary, since the call has been received from a non-type D signalling standard for which conversion of NICs to TCICs is required.

Figure 1/U.15 shows the timing diagram of this protocol.

Note 1 – TCICs received from distant type C links would pass through the type D links with the appropriate conversion. Where the third COT indicates that conversion of NIC to TCIC is necessary, onward seizure should not occur before the complete transmission of CSC No. 12 of the locally generated NIC.

Where the conversion of NIC to TCIC is not necessary, onward seizure of the outgoing circuit should not occur before the complete transmission of the reception-confirmation signal.

Note 2 – A problem may exist where the same Recommendation F.69 code is allocated to more than one RPOA.

5 Rules for service signal conversion

Rule 1 – The last type D exchange will convert all returned standard service signals into the appropriate type D numeric service codes. In the case of additional information included in the service text (i.e. α, δ, γ, δ preceding a Recommendation U.1 type A or B service code (see Recommendation U.1, § 10.1.2)), only the standard Recommendation U.1/U.11 service text will be translated by the type D transit centre.

Table 7b/U.12 gives details of service signal conversion.

6 Rules for exchange of line identifications

Rule 1 – If the incoming circuit is not a subscriber line then the first type D exchange shall not request a called line identification.

Rule 2 – When the incoming circuit is not a subscriber line and a request for calling line identification is received, the first type D exchange shall send CSC No. 12 only, to indicate that no identification is available as per Table 1/U.12.

Rule 3 – If the incoming circuit is a subscriber line and the called line identification is required, then the first type D exchange shall recognize receipt of the call-connected signal not preceded by a STTC and a TTC signal as an indication that a called line identification is not available.

Rule 4 – If the outgoing circuit is not a subscriber line, then the last type D exchange shall not request a calling line identification.

Rule 5 – When the outgoing circuit is not a subscriber line and a request for called line identification is received, the last type D exchange shall indicate that the identification is not available, as described in Recommendation U.12, § 3.13.

7 Rules for call connected signal conversion

Rule 1 – The last type D exchange shall convert all variations of received call connected signals as defined in Recommendations U.1 and U.11 to the type D call connected signal, indicating that call metering is required (CSC No. 13).

Rule 2 – The first type D exchange shall convert CSC No. 13 to the call connected signal according to Recommendations U.1 or U.11.

Rule 3 – CSC No. 14 (call connected without metering) received at the first type D exchange may or may not be converted to a call connected on type A, B or C circuits. The use of CSC No. 14 is left for further study.

8 Rules for obtaining the called subscriber's answerback when interworking type D with other signalling systems

Rules 2 to 4 apply to the first type D exchange and Rules 5 to 7 to the last type D exchange.

A compilation of the rules is shown in Tables 2/U.15 and 3/U.15.

Rule 1 – As a general rule, the first and the last type D exchanges should behave independently of each other's interworking requirements with regard to controlling the answerback tripping, and intermediate exchanges will be transparent to this control.

Rule 2 – For locally connected subscribers the first type D exchange will generate the WRU on receipt of the call connected signal as per Recommendation U.12, Appendix III.

Rule 3 – If the incoming circuit uses an automatic return of answerback trunk signalling standard, then the first type D exchange will generate a WRU two seconds after receipt of the call connected signal.

Rule 4 – If the incoming circuit uses a nonautomatic return of answerback trunk signalling standard, then the first type D exchange will through-connect on receipt of the call connected signal without generating a WRU.

Rule 5 – For locally connected subscribers, the last type D exchange will through-connect after the call connected signal has been transmitted on the incoming type D trunk.

Rule 6 – If the outgoing circuit uses an automatic return of answerback trunk signalling standard, then the last type D exchange will absorb any incoming characters on the forward path until two seconds from the commencement of the first backward path character. If no characters have been received on the backward path within 8-9 seconds following the start of the received call connected signal, then through-connection shall occur. The alternative of clearing the call is for further study.

Rule 7 – If the outgoing circuit uses a nonautomatic return of answerback trunk signalling standard, then the last type D exchange shall delay any received WRU until two seconds from the start of the received call connected signal. Through-connection shall occur following the retransmission of the WRU or after two seconds from the start of the received call connected signal if no WRU has been received.

TABLE 1/U.15

Rules for conversion of network identification codes (NICs) and transit centre identification codes (TCICs) and alternative routing

Incoming signalling	Outgoing signalling	Action to be taken by the transit exchange
Type D	Type D	The NIC shall be retransmitted as received. Alternative routing is allowed.
	Type C	TCICs shall be converted into NICs. Any type A register codes shall be absorbed. Alternative routing is allowed.
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type A with register codes	Absorb register codes. Alternative routing is not allowed (see Note).
	Type A with TCICs	TCICs may be absorbed or converted to NICs at the discretion of individual Administrations. Alternative routing is not allowed (see Note).
Type C	Type D	NICs shall be converted into TCICs. Alternative routing is allowed.
	Type C with register codes or TCICs	TCICs shall be retransmitted as received. The type A register codes may be retransmitted as received at the discretion of individual Administrations. Alternative routing is allowed.
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type A with register codes	The register codes may be absorbed or retransmitted as received at the discretion of individual Administrations. Alternative routing is not allowed (see Note).
	Type A with TCICs	The TCICs may be absorbed or retransmitted as received at the discretion of the individual Administration. Alternative routing is not allowed (see Note).
Type B	Type D	Any received NICs shall be absorbed. Alternative routing is not allowed (see Note).
	Type C with register codes or TCICs	Any received register codes or TCICs shall be absorbed. Alternative routing is not allowed (see Note).
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type A with register codes or TCICs	Any received register codes or TCICs shall be absorbed. Alternative routing is not allowed (see Note).

TABLE 1/U.15 *(cont.)*

Incoming signalling	Outgoing signalling	Action to be taken by the transit exchange
Type A using a TCIC (trunk route dedicated to originating traffic only).	Type D	Conversion of NICs to TCICs is at the discretion of individual Administrations. Alternative routing can be allowed only if conversion of NICs to TCICs occurs.
	Type C with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted at the discretion of individual Administrations. Alternative routing is allowed only if retransmission of TCICs occurs.
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type A with register codes or TCICs	Any received register codes or TCICs may be absorbed or retransmitted as received at the discretion of individual Administrations. Alternative routing is not allowed (see Note).
Type A using register codes (trunk route dedicated to originating traffic only)	Type D	NICs will be absorbed. Alternative routing is not allowed (see Note).
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type C with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted, at the discretion of the individual Administrations. Alternative routing is not allowed (see Note).
	Type A with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted as received, at the discretion of individual Administrations. Alternative routing is not allowed (see Note).
Type A with register codes or TCICs	Type D	NICs may be absorbed or converted to TCICs, at the discretion of individual Administrations. Alternative routing is not allowed (see Note).
	Type C with register codes or TCICs	Register codes or TCICs may be absorbed or retransmitted as received, at the discretion of individual administrations. Alternative routing is not allowed (see Note).
	Type B	No register codes will be received. Alternative routing is not allowed (see Note).
	Type A with register codes or TCICs	Register codes or TCICs may be absorbed or retransmitted as received at the discretion of individual Administrations. Alternative routing is not allowed (see Note).

Note – Where alternative routing is stated as "not allowed" it applies in this transit exchange and shall also be indicated in the COT signals on outgoing type C and D signalling to prevent alternative routing in distant centres. Alternative routing is not allowed when the outgoing or incoming trunks use type A or B signalling, with the one exception of the case where a type A incoming route accepts TCICs and is dedicated to originating traffic only and where the outgoing signalling is type C or D standard.

TABLE 2/U.15

Rules for obtaining the called subscriber's answer-back (first type D exchange)

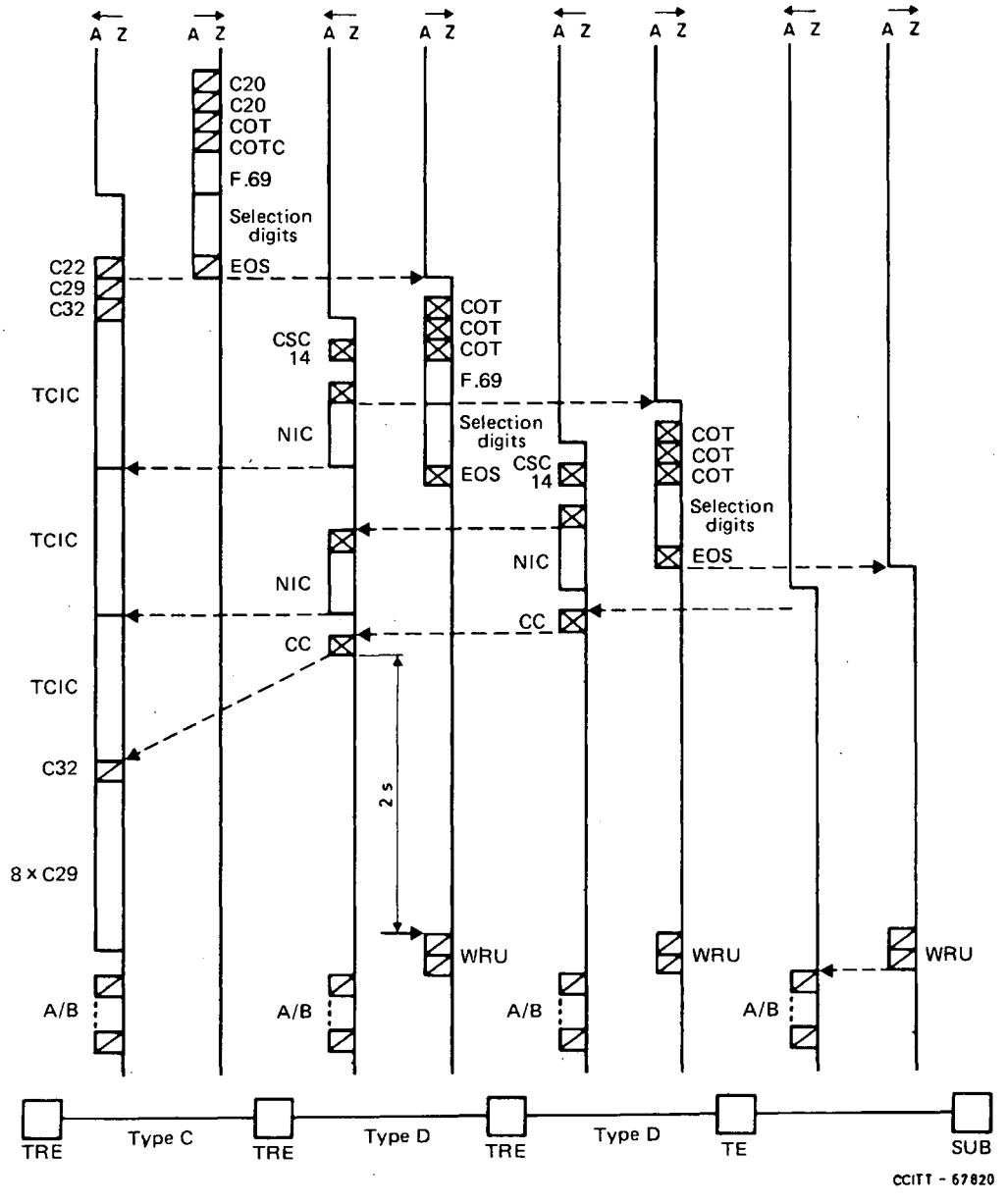
Incoming signalling type	Action to be taken by the first type D exchange	Outgoing signalling type
Type A, Type B (automatic return of answer-back), Type C	1. Send WRU two seconds after receiving call connected signal. 2. Connect-through backward path after sending the call connected signal. 3. Connect-through forward path after sending WRU. (See § 8, Rule 3 and Note below)	Type D
Type B (non-automatic return of answer-back	1. No action on WRU. 2. Connect-through backward path after sending call connected signal. 3. Connect-through forward path after receiving call connected signal. (See § 8, Rule 4)	Type D
Subscriber	1. Send WRU 1-2 character periods after receiving call connected signal. 2. Connect-through backward path after receiving call connected signal. 3. Connect-through forward path after sending WRU. (See § 8, Rule 2 and Note below).	Type D

Note – Where a call is recognised as originating from a service position (either as indicated by the COT received or derived from the use of dedicated service trunks or lines), then individual Administrations may at their discretion inhibit the generation of the WRU at the first type D exchange.

TABLE 3/U.15

Rules for obtaining the called subscriber's answer-back (last type D exchange)

Incoming signalling type	Action to be taken by the last type D exchange	Outgoing signalling type
Type D	1. Absorb WRU and any other characters on the forward path until through-connection of the forward path. 2. Connect through the backward path after sending the call connected signal and in the case of type C on completion of the received call connected signal. 3. Connect-through the forward path two seconds after reception of the first backward path characters following the received call connected signal or in the absence of any characters, 8-9 seconds after the start of the received call connected signal. (See § 8, Rule 6)	Type A, Type B (automatic return of answer-back), Type C
Type D	1. Delay any received WRU until two seconds after the start of the received call connected signal. 2. Connect-though the backward path after sending the call connected signal. 3. Connect-through the forward path after retransmitting any received WRU, or in the absence of a received WRU, two seconds after the start of the received call connected signal. (See § 8, Rule 7)	Type B (non-automatic return of answer-back)
Type D	1. No Action on WRU. 2. Connect-through backward path after sending call connected signal. 3. Connect-through forward path after sending call connected signal. (See § 8, Rule 5)	Subscriber



TCIC	Transit centre identification code	C20	ITA2 combination No. 20
NIC	Network identification code	CSC	Control signalling code
EOS	End of selection signal	A/B	Answerback
COT	Class of traffic	TRE	Transit exchange
COTC	Class of traffic check	SUB	Subscriber
CC	Call connected signal	TE	Terminating exchange
		WRU	Who are you ?

FIGURE 1/U.15

Procedure for delaying the forwarding of selection in relation to the transmission of backward path signals

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SECTION 3

SIGNALLING OVER RADIO AND MULTIPLEXED CHANNELS

Recommendation U.20

TELEX AND GENTEX SIGNALLING ON RADIO CHANNELS (SYNCHRONOUS 7-UNIT SYSTEMS AFFORDING ERROR CORRECTION BY AUTOMATIC REPETITION)

(Geneva, 1956; amended at New Delhi, 1960, Geneva, 1964, Mar del Plata, 1968, and Geneva, 1972)

The CCITT,

considering

(a) that numerous radiotelegraph circuits working in association with 5-unit start-stop apparatus make use of error-correcting synchronous systems having a special error-detecting 7-unit code enabling errors to be corrected by a request for a repetition (ARQ system);

(b) that when they are usable for switched communications, on the radio section these synchronous systems use two combinations α and β, which characterize the permanent conditions of start polarity and stop polarity respectively in the start-stop part of the connection (see Recommendation S.13 [1]);

(c) that the special make-up of these systems is such that a change in the significant condition at the input to the system is not reproduced at the output with a constant delay;

(d) that the experience acquired with telex and gentex switching through these radiotelegraph systems seems sufficient to justify the laying down of general rules specifying signalling arrangements for manual, semi-automatic and automatic working in such international radio channels,

unanimously declares the view

that the signals, enumerated in Recommendation U.1, to be used in setting up international telex and gentex calls over radio channels comprising synchronous systems with error correction by automatic repetition should be characterized as follows:

1 Free line condition

1.1 Successive α combinations on the forward and backward paths.

2 Call

2.1 Transition from combination α to combination β on the forward signalling path. Reception of two consecutive β signals over the forward signalling path shall be interpreted as a calling signal.

2.2 On circuits automatically operated in both directions, reception of a single β signal at the end of the circuit remote from the calling subscriber must cause the outgoing equipment on this circuit at that end to be marked busy immediately. This busy condition must be applied until two α signals are received.

2.3 If the motor of the FRXD (fully automatic reperforator transmitter distributor) or equivalent motor-driven storage device is not already running, it must be started without delay, in order to accept the subsequent selection signals. Furthermore, if the motor of the storage device at the called end is not already working, it must be started.

2.4 It is desirable that, in the busy hour at least, the starting of the motor of the storage device should not be dependent on the calling signal for each call. One simple method of meeting this requirement is to provide a device that delays the switching off of the motor until about 5 minutes after the call has been cleared.

3 Call-confirmation signal

3.1 Transition from combination α to combination β on the backward signalling path. The reception of two consecutive β signals over the backward signalling path shall be interpreted as a call-confirmation signal.

3.2 The return of this signal can be initiated either by the switching equipment or by the radio equipment. Not more than one second shall elapse at the incoming end between the moment when two β signals have been received and the return of the first β signal of the call-confirmation signal.

3.3 With manual switching the call-confirmation signal shall be returned independently of the operator's answer.

3.4 For retest purposes radio circuits may be considered faulty when the call-confirmation signal is not received within three seconds.

4 Signals preceding selection

4.1 *Proceed-to-select signal*

4.1.1 *Semi-automatic working*

4.1.1.1 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.

4.1.1.2 If the automatic switching equipment at the receiving end cannot receive the selection information immediately after the sending of the call-confirmation signal, a distinct *proceed-to-select* signal, combination No. 22, shall be returned over the backward signalling path after the call-confirmation signal. For 99% of calls in the busy hour, this signal must be returned not more than 3 seconds after the transmission of the call-confirmation signal begins. (For some existing systems this delay will be 4 seconds.)

4.1.2 *Fully-automatic working*

4.1.2.1 The proceed-to-select signal, combination No. 22, returned over the backward signalling path shall always be distinct from the call-confirmation signal and should be returned within the limits specified under semi-automatic working.

4.2 *Proceed-to-transmit signal*

4.2.1 On the backward signalling path teleprinter signals indicating the called operator's position.

4.2.2 The sending of the proceed-to-select or the proceed-to-transmit signal should be delayed until two consecutive β signals have been correctly received over the backward signalling path. Two consecutive β signals can be presumed to have been or to be received when four β signals have been accepted by the storage of the error-correcting equipment at the sending end. (This allows for the loss of one β signal as an undetected error.)

4.2.3 The receiving equipment shall be arranged so that when two β signals are received and followed immediately by teleprinter signals [representing the call-confirmation and proceed-to-select (or proceed-to-transmit) signals in rapid succession] the recognition of the two β signals as the call-confirmation signal will allow the teleprinter signals to be preceded by 140 ms (minimum) of stop polarity.

4.2.4 Measures should be taken so that, if proceed-to-select or proceed-to-transmit signals are relayed by the FRXD (or equivalent storage device), the switching equipment does not return these signals until the motor has reached its full speed.

5 Selection signals

5.1 For manual working, teleprinter signals over the forward signalling path.

5.2 For semi-automatic working, teleprinter signals over the forward signalling path, as follows:

- the prepare-for-digits signal shall be combination No. 30 (figure-shift);
- digits of the called subscriber's number (preceded by transit access codes, if required) in International Telegraph Alphabet No. 2;
- end-of-selection signal, combination No. 26. This may be followed by another combination characterizing the class of traffic in the incoming country.

5.3 For fully-automatic working: teleprinter signals over the forward signalling path, as follows:

- the prepare-for-digits signal shall be combination No. 30 (figure-shift);
- digits of the called subscriber's number (preceded by transit access codes, if required) in International Telegraph Alphabet No. 2;
- if an end-of-selection signal is required, this should be combination No. 26. This may be followed by another combination characterizing the class of traffic in the incoming country.

5.4 The transmission of the selection signals should be delayed if the motor of the FRXD has not yet gained speed.

5.5 Where the incoming system uses a uniform numbering plan so that the number of digits in the number can be determined from the initial digit, the outgoing Administration must transmit an end-of-selection signal if this is required by the incoming country. Where the incoming system has a non-uniform numbering scheme the end-of-selection signal cannot be made obligatory. However, for such a system it may be advantageous to use this signal subject to the agreement of the outgoing Administration, in those cases where the outgoing system can readily insert the signal. To avoid undue occupation of trunks and equipment, Administrations should take all reasonable steps to ensure that selection signals are transmitted over radio circuits without undue delay.

6 Call-connected signal

6.1 Manual working: the code **DF** over the backward signalling path.

6.2 Semi-automatic working: either answerback signals or the signals defined for fully-automatic working below.

6.3 Fully-automatic working: combination No. 32, followed by 11 to 13 combinations No. 29 (letter-shift) followed by the obtained subscriber's answerback code. The insertion of the combinations No. 29 must not cause mutilation of the subsequent signals in the sequence.

6.4 In the case of transit operation where the first circuit in the connection is an ARQ radio circuit and the second circuit in the connection uses Type A or B signalling to a country that returns the answerback automatically, the number of combinations No. 29 of the radio call-connected signal may be reduced to eight to avoid mutilating the answerback.

7 Idle circuit condition

7.1 Combinations β on the forward and backward signalling paths.

8 Clearing

8.1 *Clearing signal*

8.1.1 The appearance of α combinations in the direction in which the clearing signal is sent. Reception of two consecutive α signals will have to be interpreted as a clearing signal.

8.1.2 On recognition of the clearing signal received over the radio circuit any text remaining in the store, at the point where the clearing signal is recognized, must be destroyed.

8.1.3 On recognition of the clearing signal received over the land line, any text remaining in store, at the point where the clearing signal is recognized, must be transmitted before the α signals are sent over the radio path.

8.2 *Clear-confirmation signal*

8.2.1 The appearance of α combinations in the direction opposite to that from which the clearing signal was sent. Reception of two consecutive α signals will be interpreted as a clear-confirmation signal when a clearing signal of 7 α signals has been accepted by the storage of the radio equipment without a request for repetition. The transmission of 7 α signals in this way ensures that, allowing for the loss of one α signal as an undetected error, the clearing signal can be presumed to have been received and recognized at the distant end.

8.2.2 For radio circuits using an eight-character cycle with four characters stored, a sequence of 8 α signals shall be used in place of the above sequence of 7 α signals. For radio circuits using an eight-character cycle with seven characters stored, a sequence of 11 α signals shall be used in place of the above sequence of 7 α signals.

8.2.3 It is desirable that the equipment shall be arranged so that the clearing and clear-confirmation signals do not cause spurious characters (including combinations No. 32) to be transmitted over the radio path. Where electronic storage devices are used it is possible to arrange for these spurious characters to be suppressed in the storage device. Where electro-mechanical storage devices are used, the generation of spurious characters by the clear-confirmation signal can be minimized by arranging that when the clearing signal is received over the radio circuit, the input to the storage device is blocked.

8.2.4 In order to ensure that, on transit calls, switching equipment and possibly the subscriber's teleprinter set are not unnecessarily held because of delay in transmitting the clearing and clear-confirmation signals over the radio path, the radiotelegraph equipment should return the clear-confirmation signal to the switching equipment without waiting for the exchange of clearing and clear confirmation signals over the radio path.

8.3 *Guard delay*

8.3.1 The circuit shall be guarded on release as specified in Recommendation U.1 except that the delay shall be measured from the moment when the equipment has both:

a) transmitted 7 α signals over the radio path without request for repetition;

b) has received two consecutive α signals over the other signalling path.

8.3.2 During the guard period the free line condition shall be maintained on both signalling paths of the international circuit.

8.3.3 Because it is possible for the circuit to be opened for traffic at one end before the equipment at the other end has completed the transmission of the 7 α signals, it is possible that an incoming call may be received before the 7 α signals have been transmitted. Where this occurs, the call should be accepted but the call-confirmation signal should not be returned until the transmission of the 7 α signals has been completed. (See § 8.2.2 above.)

9 Register congestion

9.1 Semi-automatic working: the return of a signal indicating congestion may be allowed; the **NC** sequence with the standard form of service signal should be used to indicate the situation.

9.2 Fully-automatic working: the return of a signal indicating congestion is prohibited.

10 Service signals

10.1 Teleprinter signals (**OCC, NC, NCH, NA, NP, DER, ABS**) preceded by the carriage-return, line-feed and letter-shift signals and followed by line-feed (preferably together with carriage-return) and then immediately by the clearing signal in all cases.

11 Both-way working

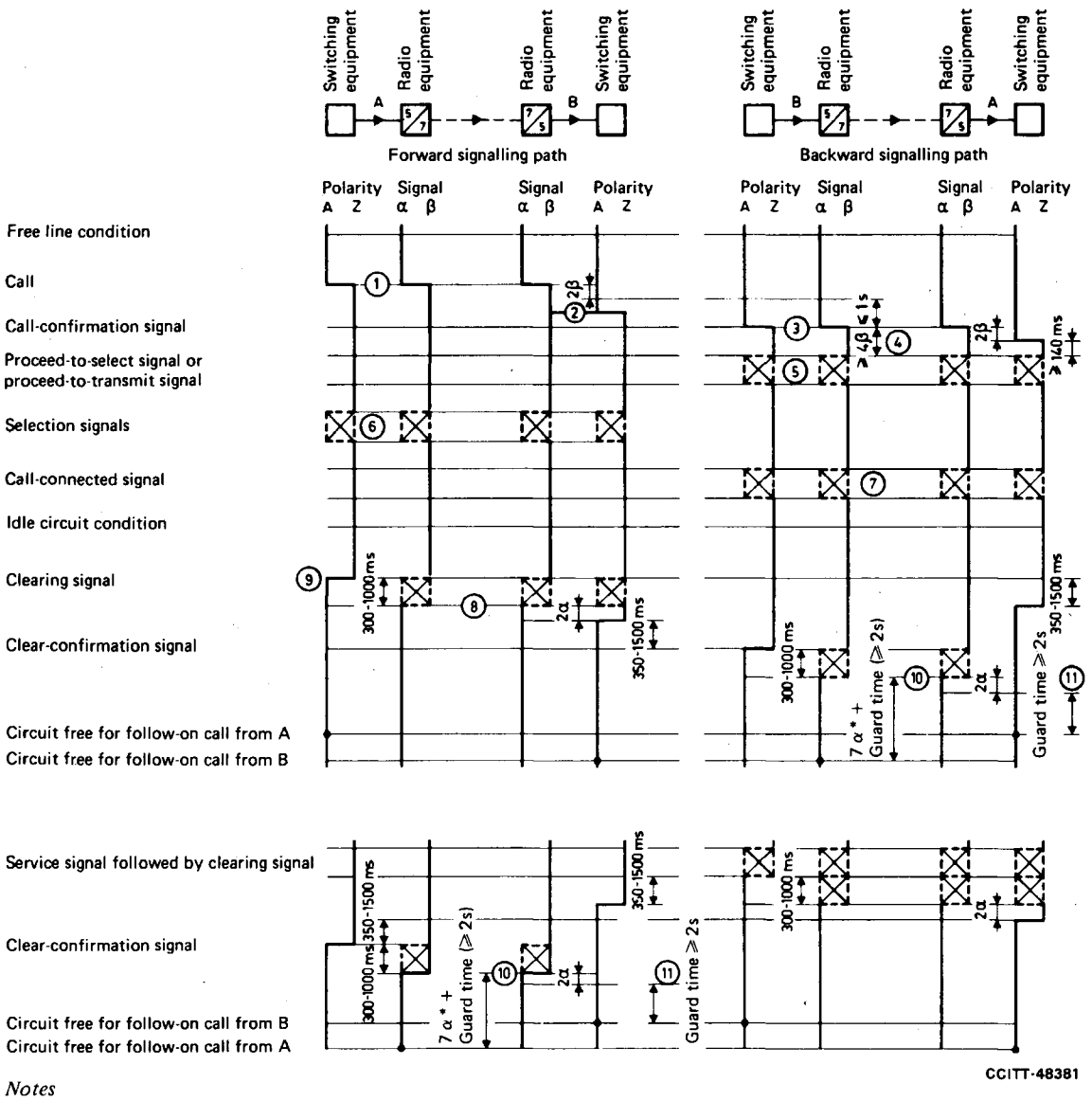
11.1 For both-way ARQ radio circuits used in the fully-automatic telex and gentex services, the following action to minimize the incidence of head-on collision is recommended:

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 position, should be adopted at opposite ends of a both-way group of trunk circuits.

b) that calls should be offered in such a way that each circuit is tested 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.

11.2 The absence of the proceed-to-select signal will serve 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.

Note – The recognition of the calling, call-confirmation, clearing and clear-confirmation signals requires the detection of two consecutive signals β or α as specified. The detection device should, in new equipment, be arranged to recognize two consecutive signals even though these may be separated by a period of automatic correction, i.e. the discrimination involves counting. In some existing equipments the detection device requires that the two signals to be recognized shall occur in consecutive character periods, i.e. the discrimination involves timing. The transmission of the call-confirmation, clearing and clear-confirmation signals requires that the appropriate number of β or α signals shall be offered to the storage of the radio equipment without a request for repetition, i.e. the control should be by a timing device that is reset when automatic correction occurs.



Notes

1. See § 2.3.
2. See §§ 2.2 to 2.4.
3. See § 3.3.
4. See § 4.1 and 4.2.4.
5. The letter V (combination No. 22 in ITA 2) shall be used for the proceed-to-select signal.
6. See §§ 5.1 to 5.5.
7. See §§ 6.1 to 6.4.
8. See § 8.1.3.
9. See §§ 8.2.3 and 8.2.4.
10. Should there still be text stored, this text must be destroyed. If an FRXD contains perforated tape that has not yet been transmitted, this tape should be fed out independently of possible requests for repetition. During the feeding out of the tape there shall be blocking with β-signals. The transmission of α-signals should be delayed until the perforated tape has been completely fed out.
11. See §§ 8.3.1 and 8.3.3.

* See § 8.2.2.

A = start polarity
Z = stop polarity
α = equivalent of permanent start polarity
β = equivalent of permanent stop polarity
⊠ = teleprinter signals
FRXD = fully-automatic reperforator transmitter distributor

This diagram does not show delays caused by propagation time, cooperation between start-stop and synchronous systems and possible repetitions.

FIGURE 1/U.20

Telex signalling on radio channels

Reference

[1] CCITT Recommendation *Use on radio circuits of 7-unit synchronous systems giving error correction by automatic repetition*, Rec. S.13.

OPERATOR RECALL ON A TELEX CALL SET UP ON A RADIOTELEGRAPH CIRCUIT

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

The CCITT,

considering

(a) that experience has shown that, for telex calls set up over a radiotelegraph circuit, it was useful to enable the telex subscriber to cause an operator to re-enter on a call in progress without interrupting it;

(b) that such re-entry may be of interest in the following cases as well as in the case of a defective connection:

i) When a subscriber decides, in the course of a call, to change from a plain text to a cypher he can call the operators in the terminal radio exchanges and ask them to interrupt the delay signal, which might otherwise disturb the synchronism between the cyphering apparatus used at the two ends.

ii) When a subscriber has sent a message but waits a very long time for a reply from his correspondent, he can ask the operator whether his message is still being stored or whether it is expected that any interruption to the radio circuit will continue. If need be, he can then choose another means of communication (telegram or telephone call) to send an urgent message to its destination;

(c) that although it seems that re-entry by an operator will be limited mainly to national networks (for example by a subscriber calling the controlling telex operator on the radiotelegraph circuit), international standardization of an *operator recall* signal would be useful if the controlling telex operator on the radiotelegraph circuit is located in a transit country, and also for intermediate manual switches; this would no doubt prove to be a great advantage when this possibility is generally utilized,

unanimously declares the following view

(1) If the Administrations concerned agree on the use of a special signal enabling a subscriber to recall an international telex operator's position making use of radiotelegraph circuits, such a recall must not cause release of a call in progress.

(2) This *operator recall* signal will consist of the following sequence: combinations No. 28 (line-feed) followed by four combinations No. 27 (carriage-return).

(3) The detection device causing re-entry by the operator will be controlled by the receipt of four consecutive combinations No. 27; combinations No. 28 will only be used to avoid superposition of the text on the receiving teleprinter and will not have to be recognized by the detection device.

(4) The equipment for discriminating the operator recall signal will be switched off by a sequence of four consecutive combinations No. 19 (signal for transfer to data).

SIGNALS INDICATING DELAY IN TRANSMISSION ON CALLS SET UP BY MEANS OF SYNCHRONOUS SYSTEMS WITH AUTOMATIC ERROR CORRECTION BY REPETITION

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

The CCITT,

considering

(a) that traffic observations on radio telex channels have shown that the possible delay in the reception of text transmitted by one subscriber to another is a drawback from the operating point of view. The delay may be caused by repetitions and/or difference in the modulation rate of the teleprinters (traffic from Europe to the USA). In case of such delays a subscriber is left in doubt whether he simply has to await transmission of his message over the radio path or whether the delay is due to the tardy answering of his correspondent, for which he will have to pay. Furthermore, in the case of delays due to long repetition periods a receiving subscriber may be tempted to answer prematurely, which causes garbling of the text;

(b) that to a certain extent this drawback can be offset by the application of a strict operating procedure (+? signal to invite the correspondent to transmit). However, supplementary technical measures have proved to be desirable;

(c) that a good technical solution of this problem is to use combinations No. 32 as a delay signal in the following manner:

i) combinations No. 32 are returned to the transmitting subscriber at the rate of one every 5 seconds if he stops transmission during an interval of 10 seconds and the local storage device still contains untransmitted tape;

ii) combinations No. 32 are sent to a subscriber at the rate of one every 1.2 seconds if transmission is delayed by repetitions whenever condition i) does not apply;

(d) that the slow delay signals inform a sending subscriber that his message has not yet been received by his correspondent. The rapid delay signals inform a receiving subscriber that the received message is not yet complete and that he should not cut in;

(e) that in the case of cypher messages where combinations No. 32 may result from the coding procedure, delay signals should not be used. Also in the case of full duplex working, waiting signals cannot be used. Furthermore, it is desirable not to transmit waiting signals during the setting-up of semi- or fully-automatic calls, since interpolated waiting signals would complicate the discrimination of the selection signals and the call-connected signals. Therefore, the best solution seems to be to put the switching on and off of the delay signal facility under the control of the subscribers: four consecutive combinations No. 8 or No. 14 could be used for this purpose;

(f) that the transmission of these delay signals can obviously not be imposed on an Administration that makes an international connection by a landline and radio channel,

unanimously declares the view

(1) That, when the Administrations concerned agree that it is necessary to signal to telex subscribers about a delay in transmission over the radio telex channel, delay signals shall be used having the following characteristics:

i) combinations No. 32 at the rate of one every 5 seconds, returned to a sending subscriber when he has stopped transmission for a period of 10 seconds and if there is still text stored;

ii) combinations No. 32 at the rate of one every 1.2 seconds sent to a subscriber whenever transmission over the radio channel is delayed by repetitions and condition i) above does not apply.

(2) Sending of combinations No. 32 is cut off as soon as the subscriber starts to transmit again.

(3) No delay signal will be transmitted while the call is being put through.

(4) The calling and also the called subscribers can suppress sending of the waiting signal at the two ends of the radio circuit by transmitting four successive combinations No. 8. The waiting signal can also be started off again by transmitting four successive combinations No. 14.

(5) The delay signal should be switched off upon reception of four consecutive combinations No. 19 (signal for transfer to data) for the duration of the call.

Note – Administrations must take precautions to ensure that the reception of combinations No. 32 should not cause spacing of the paper on page-printing or tape-printing apparatus.

Recommendation U.23

USE OF RADIOTELEGRAPH CIRCUITS WITH ARQ EQUIPMENT FOR FULLY AUTOMATIC TELEX CALLS CHARGED ON THE BASIS OF ELAPSED TIME

(Mar del Plata, 1968; amended at Geneva, 1972)

1 Charging on the basis of elapsed time

Where a radiotelegraph circuit equipped with ARQ equipment forms part of an international telex network and can be engaged in a telex connection established by fully automatic switching, the Administrations are faced with a difficult problem regarding automatic charging of the calls. The difficulty arises from the fact that in case of bad transmission conditions on the radiotelegraph circuit, signals recognized as erroneous are repeated. These repetitions can be numerous at certain times. For manual or semi-automatic operation, in order to establish the basis for charging, the Administrations or recognized private operating agencies (RPOA) deduct the time during which the circuit has been transmitting repetitions from the elapsed duration of the connection.

The application of this method to fully automatic calls – although desirable – is made difficult by the fact that the charge for these calls is made in the originating country and by automatic methods. When the call is not established through the intermediary of radiotelegraph circuits incorporating ARQ equipment, the charge is made according to the elapsed time of the communication. It would then be necessary to advise the originating country that the call has involved a radiotelegraph circuit that incorporates ARQ equipment, and to advise what correction should be applied to the elapsed time of the communication in order to account for the periods of inefficiency of the radiotelegraph circuit.

Some study has been made for finding a solution that is both technically and economically acceptable for the transmission and use of information necessary for corrected charging as a function of the inefficiency of the radiotelegraph circuit. However, due to the declining importance of radio circuits incorporating ARQ equipment for fully automatic traffic in the telex network and the tendency for them to be relegated to the role of standby circuits, further study of the method of charging based upon efficient time has been abandoned.

The alternative solution of charges based upon elapsed time has now been adopted as the standard to be applied. It will then be necessary before incorporating a circuit with ARQ equipment in the fully automatic telex service to ensure that it meets with certain stability requirements. Safeguard measures designed to avoid, in certain cases, an excessive overcharge of the calling subscriber, as indicated in the present Recommendation, will be necessary.

2 Safeguard measures

When charges are to be based on elapsed time, the methods of safeguard are:

i) busying of an unoccupied radiotelegraph channel whenever transmission conditions on this channel are inadequate;

ii) forced release of an established connection on such a channel whenever transmission conditions are bad.

In the application of the latter type of safeguard (forced release of an established connection), there are two conflicting requirements:

i) the need to avoid substantial differences between the charged time and the time during which the connection was efficient;

ii) the need to avoid, as much as possible, forced release of established connections.

A reasonable compromise solution should achieve the following main objectives:

i) the percentage of forced releases must not exceed three;

ii) the average overcharge for a call must not exceed five per cent;

iii) the maximum overcharge for a call must not exceed twenty-five per cent.

3 Control of forced release

Administrations employing radiotelegraph circuits incorporating ARQ equipment should use the efficiency factor for controlling the forced release of an established connection. With this arrangement, an established connection will be cut whenever the efficiency factor, averaged over 60 consecutive seconds, falls below 80%. This form of control, especially if it is applied to circuits that conform to the stability requirements specified in § 9 below, ought not to result in more than two or three per cent of connections being interrupted; this figure is quite comparable with the number of fortuitous releases recorded in the use of cable circuits.

4 Control of busying

At those times when its efficiency factor is too low, a circuit that is not carrying traffic should be busied at both ends so that it cannot be seized by a call until such time as the efficiency factor reverts to an acceptable value. The circuit will be busied if the mean value of the efficiency factor, measured over an interval of 20 consecutive seconds, is less than 80%.

5 Practical application of busying

For a radiotelegraph system corresponding to 50 bauds (see Recommendation S.13 [1]), the maximum number of transmissible elements in a 20-second period is 20×48 and the corresponding number of characters is $(20 \times 48)/7$ i.e. 137. If r is the number of repetition cycles during 20 seconds, the efficiency factor is $(137 - 4^{1)}\, r)/137$. Hence, it is sufficient to count the number of repetition cycles because if, in a period of 20 consecutive seconds, there are $7^{2)}$ repetition cycles or more, then the mean efficiency factor is below 80% during that period.

The two most practical methods of dividing the time up into intervals of 20 seconds are the procedure of splitting the time into 20-second blocks and the method of using sliding periods of 20 seconds.

In the procedure of splitting the time into blocks, the time is divided into fixed intervals of 20 seconds. The repetition cycles are counted during each of these intervals and the count is recommenced for each interval, no account being taken of the result of the count for the preceding interval. In the sliding period method, the earliest count is eliminated and a new count added.

The block method uses simpler equipment than the sliding period method; it is a little less exact because of the fact that the influence of a bundle of repetitions arriving at about the same time as the division between successive blocks is spread over two successive and independent blocks.

After very close consideration of the discrepancies between the results given by the two methods, it was concluded that the effect of these discrepancies is small and of no practical importance as far as subscribers are concerned. Administrations may therefore select either method.

If, during a counting period, the number of repetition cycles has already reached a figure corresponding to a mean efficiency factor of lower than 80% over the 20-second period, the decision to order busying of the circuit will be made immediately, without waiting for the end of the current 20-second period.

The manner in which the order to busy the circuit is sent from the ARQ equipment to the switching centre is a matter that interests only the Administration that operates the centre and the ARQ equipment to issue an international recommendation on this matter.

The timing of intervals at the two ends of the same circuit is not synchronized, so that instants of busying or debusying a circuit at one end may differ from the corresponding instants at the other end by several seconds. As a result, while one end of the circuit is marked busy, a call can seize the circuit at the other end. This situation is considered as admissible, and the incoming call is accepted.

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1) This figure is 8 in the case of an 8-character-repetition cycle.

2) 3.5 with an 8-character-repetition cycle.

After a circuit is marked busy, the measurement of the efficiency factor proceeds in accordance with the same time-division process. If, during a 20-second period, the mean efficiency factor reaches or exceeds 80%, the busy marking is removed. It follows that, whenever the efficiency factor is varying at about 80%, periods of busying and of return to service can succeed one another at intervals of about 20 seconds. This effect was considered to be permissible.

6 Application of forced release

A call can seize the radiotelegraph circuit only during a period when the circuit is not marked busy. In the case of a call's arriving on the radiotelegraph circuit after the occurrence of the first marker denoting the termination of a 20-second period, the time division will proceed on the basis of 60-second intervals (instead of 20-second ones), and everything that has been said about 20-second periods applies equally to 60-second periods. In particular if, during a 60-second period, it is already evident that the efficiency factor cannot reach an average value of at least 80%, forced release of the connection shall be ordered without waiting for the end of the period.

If the efficiency falls so far that the connection must be cut at the calling end of the ARQ circuit, a long time could elapse, in the event of very adverse transmission conditions, before the release signal could be sent to the called subscriber. Consequently, the called subscriber (especially in stations not supervised by a receiving operator) remains engaged and cannot be reached by other subscribers. Also, the re-establishment of the call by way of another channel becomes impossible. Therefore, it is desirable to be able to effect a release at the receiving end in unfavourable conditions. The method of release employed at the receiving end, however, should not initiate release more easily than at the calling end. It is proposed for this purpose that, once there is evidence at the receiving end that the mean efficiency factor has remained lower than 80% for two successive 60-second periods, release at the receiving end should follow.

7 Elimination of signals still registered in the memory

Once the decision has been made to break the established connection at either end, the signals that are still recorded in the ARQ equipment memory must be destroyed. It must be pointed out that in this case the forced release signal has been due to the bad transmission conditions; it is very probable that the subscriber, at the receiving end, will be released by the auxiliary safeguard measures (two successive periods of 60 seconds with the efficiency factor below 80%); the signals that the memory would continue to dispose of in the forward direction will probably not reach the called subscriber. For this reason the elimination of the signals still registered in the memory has been decided.

8 Advising the calling subscriber

It has been proposed that the calling subscriber should be advised by a special service signal preceding the forced release signal; in this way the calling subscriber would know that he must reforward his whole message. This service signal would above all have the advantage of enabling the automatic charging device to recognize that it is dealing with a connection that has been interrupted as a result of operation of the safeguard feature of an ARQ equipment and that the call must not be charged.

Although the principle of this solution may have escaped critiscism, its application has provoked objections. The first would be the cost and complexity of equipment that would ultimately be used for only a very small proportion of calls. Another objection would be the fact that, in certain types of apparatus, automatic transmission could not be interrupted by the reception of signals; the only result would be mutilation on the local copy of the transmitted text and of the service code; the meaning of these mutilations could be obscure to the subscriber. The aspect of the other end of the communication, which could also have a message in the process of transmission to the calling subscriber, must also be taken into account. Finally, the use of the clearing signal only, without the use of a preliminary service signal, was proposed.

9 Precautions to be taken before incorporating circuits with ARQ equipment in automatic switching networks

In spite of these precautions, fully-automatic operation on a radiotelegraph circuit incorporating ARQ equipment can be considered only if this circuit possesses adequate stability.

Before incorporating a circuit with ARQ equipment in the fully-automatic switching network, the Administrations must carry out extended trials. These trials should be made under normal traffic conditions, over a minimum period of three consecutive hours chosen from the busy period (or periods), when heavy traffic is foreseen to occur on the route under consideration (allowing for the traffic, whether terminal or transit, that prevails on the route according to the season). The condition that must be fulfilled before a circuit can be accepted for use in the fully-automatic network is that its mean efficiency factor, measured over periods of 20 consecutive seconds each, shall not fall below 80% for more than 10% of the total time involved in the measurements. The measurements must be repeated as often as will be necessary for the Administration to have an assessment of the suitability of the circuit.

The attention of Administrations is drawn to the fact that, before offering fully-automatic transit working on a radio route incorporating ARQ equipment, the grade of service on the route under consideration must be in accordance with that proposed in Recommendation F.68 [2], i.e. only one call lost in 50.

If these conditions are not complied with, it would be better to retain semi-automatic operation.

For these reasons, the CCITT

unanimously declares the following view

(1) Administrations operating radiotelegraph circuits equipped with ARQ systems that may be engaged in a fully-automatic telex call, such that the charging of the subscriber is made automatically in the originating country according to the elapsed time of the connection, must take precautions to avoid too great a difference between the charged time and the time during which the radiotelegraph circuit was efficient.

(2) If, in the course of an established connection, the mean value of the efficiency factor[1] is lower than 80% over a period of 60 consecutive seconds, the connection will be released and the clearing signal will be sent to the calling subscriber under the control of the ARQ equipment.

(3) For a circuit involved in a fully automatic telex network, measurements will be made, at those times when the circuit is not held by a call, in order to determine the mean efficiency factor based on periods of 20 consecutive seconds. If, during such a period, the mean efficiency factor falls below 80%, the circuit shall be marked busy on the first switching centre located backward of the ARQ equipment that assessed this situation. If, during a period of 20 consecutive seconds, the mean efficiency factor rises above 80%, the busy marking shall be removed and the circuit will be able to be seized by a call.

(4) Interruption of an established connection will occur, at the calling side when, during a 60-second period, it becomes apparent, without waiting until the end of the period, that the mean efficiency factor during the period will be lower than 80%. If, at the called side, the mean efficiency factor during two consecutive periods of 60 seconds is lower than 80%, the release of the connection will be given to the called end.

(5) In case of a forced release of the connection, the clearing signal will be sent to the calling end (and eventually to the receiving end) from the ARQ equipment. The signals that would still be stored in the memories at the moment of the sending of a forced release signal will be destroyed. Stop polarity will be transmitted across the radiotelegraph circuit while the store is being destroyed.

(6) In the case where two or more radio circuits using ARQ equipment would be used in tandem on a connection, each circuit will operate on its own, independently of the conditions on the other circuit(s).

References

[1] CCITT Recommendation *Use on radio circuits of 7-unit synchronous systems giving error correction by automatic repetition*, Rec. S.13.

[2] CCITT Recommendation *Establishment of the automatic intercontinental telex network*, Rec. F.68.

[1] **efficiency factor in time** is defined as:

The ratio of the time necessary to transmit a text automatically without repetition, at a specified modulation rate, to the time actually taken to receive the same text with a given error rate.

Note 1 – The whole of the apparatus comprising the communication is assumed to be in the normal conditions of adjustment and operation.

Note 2 – A telegraph communication may have a different efficiency factor in time for the two directions of transmission.

Note 3 – The actual conditions in which the measurement is made should be specified, in particular the duration of the measurement.

REQUIREMENTS FOR TELEX AND GENTEX OPERATION TO BE MET BY SYNCHRONOUS MULTIPLEX EQUIPMENT DESCRIBED IN RECOMMENDATION R.44

(Mar del Plata, 1968)

The CCITT,

considering

(a) that it may be desirable to use synchronous systems described in Recommendation R.44 in the teleprinter switching networks;

(b) that it is essential to transmit the full range of telex signals for types A, B and C signalling;

unanimously declares the view

(1) that where it is necessary to receive signals with a nominal cycle of 7 units (see the Recommendation cited in [1]), it will be necessary to insert suitable storage to reconcile the two character rates (400 and 411 per minute);

(2) that type A and B signals in accordance with Recommendation U.1 and U.2 and type C signals in accordance with Recommendation U.11 should be accepted for transmission through the synchronous system. However, in the case of type A signalling, the delay between the start of the call-confirmation signal and the proceed-to-select signal should be increased to, at least, 150 ms;

(3) that the call signal should be transmitted through the synchronous system with the minimum delay obtainable with the particular method of multiplexing in use, e.g., element interleaving, in order to reduce the incidence of head-on collisions with both-way operation. The maximum delay due to the multiplex equipment should be limited to 60 ms;

(4) that the maximum delay on the call-confirmation signal due to the multiplex equipment should be 60 ms in the case of type A signalling, and 120 ms in the case of type B signalling;

(5) that the maximum delay on the start of the reception-confirmation signal due to the multiplex equipment should be 60 ms in the case of type C signalling;

(6) that the maximum delay on the proceed-to-select signal due to the multiplex equipment should be 450 ms in the case of type A signalling, and 120 ms in the case of type B signalling;

(7) that the maximum delay on the call-connected signal due to the multiplex equipment should be 450 ms (type A and type B signalling);

(8) that the maximum delay on a teleprinter character due to the multiplex equipment should be 450 ms;

(9) that the maximum delay on the clear and clear-confirmation signals due to the multiplex equipment should be 450 ms;

(10) that the tolerance of the type A and B pulse signals after retransmission through the synchronous multiplex system will be stated below:

a) *Call-confirmation and proceed-to-select signal – type B signalling*

The duration of the pulse after transmission through the synchronous system will not be less than 17.5 ms nor more than 50 ms.

b) *Dial pulses – type B signalling*

Speed – ± 3% of the mean speed of input measured for digit 0 (normally 9 to 11 pulses per second).

Ratio – The duration of stop polarity pulses will not be less than 32 ms; the duration of start polarity pulses will not be less than 44 ms.

Under certain circumstances the retransmitted dial signals may include pulses of stop polarity having durations of up to 73 ms and pulses of start polarity having durations of up to 98 ms. Where this is so and the incoming switching equipment cannot accept pulses with these characteristics a dial pulse regenerator should be inserted between the output of the multiplex circuit and the input of the switching equipment.

c) *Service signals for ineffective calls – type B signalling*

The duration of the period of stop polarity, whether followed by teleprinter signals or not, will, after transmissions through a synchronous system, be not less than 145 ms and not more than 292 ms.

If several synchronous systems are placed in tandem, the duration of the period of stop polarity of the service signal at the output of this group of systems should not exceed 440 ms.

At the input of a synchronous system, a type B service signal will cause the return of a clear-confirmation signal from the synchronous equipment without waiting for the return of the clear-confirmation signal from the distant end of the connection. Following the recognition of the clearing signal in the service signal, permanent start polarity will be transmitted over the synchronous system.

d) *Call-connect – type A signalling*

The duration of the pulse of start polarity after transmission through several synchronous systems will be within the limits 140 ms to 160 ms.

ANNEX A

(to Recommendation U.24)

TABLE A-1/U.24

Telex signalling through the multiplex equipment — Type A signalling

Signalling condition	Signal received from telex (Recommendation U.1)	Signal on channel aggregate path	Signal transmitted to telex
Free line	Continuous A polarity on both signalling paths	Continuous A polarity	Continuous A polarity
Call	Inversion to Z polarity on forward signalling path	Inversion to Z polarity (within 9-35 ms from inversion in column 2) (see Notes 1 and 2)	Inversion to Z polarity (maximum delay of 60 ms from inversion in column 2)
Call-confirmation	Inversion to Z polarity on backward path within 150 ms of receipt of calling signal	As for call	As for call
Proceed-to-select	Teleprinter signals or 40 ms pulse of A polarity (± 8 ms) on backward path. Not to be returned within 150 ms of call-confirmation	Teleprinter signals or combination No. 22 (V)	Teleprinter signals or combination No. 22 (V) (see Note 3)
Selection	Teleprinter signals on the forward path	Teleprinter signals	Teleprinter signals (see Note 3)
Call-connect	Teleprinter signals or 150 ms (± 11 ms) pulse of A polarity followed by continuous Z polarity for 2 seconds minimum on the backward path	Teleprinter signals or one α combination followed by continuous Z polarity for 2 seconds minimum	Teleprinter signals or 145 5/6 ms pulse of A polarity followed by continuous Z polarity for 2 seconds minimum (see Note 3)
Service signals	Teleprinter signals on the backward path followed by clearing signal (see Note 4)	Teleprinter signals followed by one or two α combinations and then continuous A polarity (see Note 5)	Teleprinter signals followed by continuous A polarity (see Note 3)
Clear	Inversion to continuous A polarity on either signalling path (see Note 4)	One or two α combinations followed by continuous A polarity (see Note 5)	Inversion to A polarity (see Note 3)
Clear-confirmation	Inversion to continuous A polarity in opposite direction to clearing after a delay of 350-1500 ms following receipt of clearing signal	As for clear	As for clear

For notes, see Table A-3/U.24 .

TABLE A-2/U.24

Telex signalling through the multiplex equipment – Type B signalling

Signalling condition	Signal received from telex (Recommendations U.1 and U.2)	Signal on channel aggregate path	Signal transmitted to telex
Free line	As for type A	As for type A	As for type A
Call	As for type A	As for type A	As for type A
Call-confirmation	A 17.5-35 ms pulse of Z polarity on the backward signalling path, returned within 150 ms of receipt of calling signal	1 or 2 consecutive elements of Z polarity	32-50 ms pulse of Z polarity (see Note 7)
Proceed-to-select	As call-confirmation signal. The interval of A polarity separating the signals to be 100 ms minimum	As for call-confirmation	As for call-confirmation. The interval separating the pulses may be reduced to 60 ms minimum (see Note 7)
Selection signals	Teleprinter signals or dial pulses having the following limits: Speed: 9-11 p.p.s. Ratio: 1Z:1.9A	Teleprinter signals (see Note 2) or dial pulses, when each start polarity interval is transmitted as 1-4 elements of A polarity and each stop polarity interval is transmitted as 1-3 elements of Z polarity The mean speed of pulsing will be the same (± 3 %) as the input signals (see Note 6)	Teleprinter signals (see Note 3) or dial pulses at the same mean speed of the input (± 3 %) and having the following ratio limits: A polarity intervals: 44-98 ms Z polarity intervals: 32-73 ms
Call-connect	Continuous Z polarity for 2 seconds minimum on the backward signalling path	One β combination followed by continuous Z polarity for 2 seconds minimum (see Note 6)	Continuous Z polarity for 2 seconds minimum (see Note 7)
Service signals (busy pulse)	165-260 ms of Z polarity on the backward path followed by A polarity for 1500 ms (± 30 %) continuously repeated. The Z polarity period may be followed by teleprinter signals when the tolerance of the A polarity period is reduced to ± 20 %	One or two β signals followed (possibly) by teleprinter signals, then by one α combination and A polarity as in the input signal (see Note 6)	145-292 ms Z polarity, followed (possibly) by teleprinter signals and then by A polarity of minimum duration 950 ms (see Note 7)
Clear and clear-confirmation	As for type A	As for type A	As for type A

For notes, see Table A-3/U.24.

TABLE A-3/U.24

Type C signalling effected by multiplex equipment

Signalling condition	Signal received from telex (Recommendation U.11)	Signal on channel aggregate path	Signal transmitted to telex
Free line	Continuous A polarity on both signalling paths	Continuous A polarity	Continuous A polarity
Call signal (or automatic retest signal)	Inversion to Z polarity on the forward path for 150-300 ms followed by teleprinter signals	Inversion to Z polarity (within 9-35 ms from inversion in column 2) (see Notes 1 and 2)	Inversion to Z polarity (maximum delay of 60 ms from inversion in column 2). The period of Z polarity may be lengthened by 450 ms maximum
Reception-confirmation (or receiving equipment congestion signal)	Inversion to Z polarity on the backward path for 450 ms (± 10 %) followed by teleprinter signals (or clearing signal)	As for call	As for call
Clear and clear-confirmation	As for type A	As for type A	As for type A

Notes concerning Tables A-1/U.24 to A-3/U.24

Note 1 — Pulses of Z or A polarity from 0-9 ms (± 1 ms) should be rejected by the multiplex equipment.

Note 2 — The start-stop stores of either signalling path should be switched into circuit after a maximum delay of one β combination for all types of signalling except type B with dial selection.

Note 3 — Recognition time of the clearing signal is 300-1000 ms.

Note 4 — The start-stop stores of either signalling path should be switched out of circuit after a maximum delay of two α combinations.

Note 5 — For type B signalling with dial selection the start-stop stores of both signalling paths will be switched into circuit after recognition of a maximum delay of one β combination on the backward path with Z polarity on the forward path.

Note 6 — In order to meet the timing requirements of the type B service signals it may be necessary to delay the initial inversion to Z polarity by an amount (450 ms maximum) corresponding to the delay with teleprinter signals. The call-connect signal may also be similarly delayed. However, reversion to A polarity within 50 ms indicating a type B call-confirmation or proceed-to-select signal should cancel any further delay on the transmission of these signals.

Note 7 — Delays given in these tables do not include the propagation time of voice-frequency telegraph channels.

Reference

[1] CCITT Recommendation *Transmission characteristics of the load end with its termination (ITA No. 2)*, Rec. S.3, § 1.6.

REQUIREMENTS FOR TELEX AND GENTEX OPERATION TO BE MET BY CODE- AND SPEED-DEPENDENT TDM SYSTEMS CONFORMING TO RECOMMENDATION R.101

(Geneva, 1980)

The CCITT,

considering

(a) that it may be desirable to use code- and speed-dependent TDM systems described in Recommendation R.101 in the teleprinter switching networks;

(b) that it is essential to transmit the full range of telex signals for types A, B, C and D signalling;

unanimously declares

that the following requirements for telex and gentex operation should be met by code- and speed-dependent time division multiplex systems conforming to Recommendation R.101.

1 Transmission of type A (control) signals shall be accomplished within the tolerances specified in Table 1/U.25.

2 Transmission of type B (control) signals shall be accomplished within the tolerances specified in Table 2/U.25.

3 Transmission of type C signals shall be accomplished in accordance with Table 3/U.25.

4 Transmission of type D signals shall be accomplished in accordance with Recommendation U.12.

5 Each of the following modes of bothway telex signalling shall be capable of being accomplished on a single circuit:

a) type A in one direction and type B keyboard in the other;
b) type A in one direction and type B dial in the other;
c) type B keyboard in one direction and type B dial in the other;
d) type A in both directions;
e) type B dial in both directions;
f) type B keyboard in both directions;
g) type C to Table 1/U.11;
h) type C to Table 2/U.11;
i) type C to Table 3/U.11.

6 A single terminal shall be capable of handling any of the signalling combinations shown in § 5 above and at least five of them simultaneously.

7 The nominal pulse duration (other than dial pulses) shown in Tables 1/U.25, 2/U.25 and 3/U.25 for *Signal transmitted to telex* have a ± 3 ms tolerance except where otherwise indicated.

TABLE 1/U.25

Type A signalling

Signalling condition	Signal received from telex (Recommendation U.1)	Signal on aggregate path (Note 1)	Signal transmitted to telex
Free line	Continuous A polarity on both signalling paths	Continuous A polarity	Continuous A polarity
Call	Inversion to Z polarity on forward signalling path	Inversion to Z polarity	Inversion to Z polarity (within 50 ms of inversion in column 2) (Note 2)
Call-confirmation	Inversion to Z polarity on backward signalling path	As for call	As for call
Proceed to select	Teleprinter signals (semi-automatic) or an interval of Z polarity for not less than 100 ms followed by 40 ± 8 ms of A polarity on the backward path	Teleprinter signals (semi-automatic) or not less than 5 bits of Z polarity followed by 2 bits of A polarity	Teleprinter signals (semi-automatic) or Z polarity for not less than 97 ms followed by 40 ms of A polarity
Selection	Teleprinter signals on forward path	Teleprinter signals	Teleprinter signals
Call-connect	Teleprinter signals or 150 ms (± 11 ms) pulse of A polarity followed by a minimum of 2 s of Z polarity on the backward path	Teleprinter signals or 7 or 8 bits of A polarity followed by a minimum of 102 bits of Z polarity	Teleprinter signals or 140 or 157 ms pulse of A polarity followed by a minimum 1.997 s of Z polarity
Service signals	Teleprinter signals on backward path followed by a clearing signal	Teleprinter signals followed by continuous A polarity	Teleprinter signals followed by continuous A polarity
Clear	Inversion to A polarity on either signalling path	Inversion to A polarity	Inversion to A polarity
Clear-confirmation	Inversion to A polarity in opposite direction to clear after a delay of 350-1500 ms following receipt of the clear signal	As for clear	As for clear
Automatic retest	Z polarity for 2 s ± 10% followed by A polarity lasting at least 58 s ± 10% repeated	91-112 bits of Z polarity followed by at least 2665 bits of A polarity	1.782-2.194 s of Z polarity followed by at least 52.188 s of A polarity

For notes, see Table 3/U.25.

TABLE 2/U.25

Type B signalling

Signalling condition	Signal received from telex	Signal on aggregate path (Note 1)	Signal transmitted to telex
Free line	As for type A	As for type A	As for type A
Call	As for type A	As for type A	As for type A
Call confirmation	17-35 ms pulse of Z polarity on the backward path returned within 150 ms of receipt of the call signal	1-2 bits of Z polarity	20-40 ms pulse of Z polarity
Proceed-to-select	As for call-confirmation. The interval of A polarity separating the pulses will be 100 ms minimum	Interval of not less than 5 bits of A polarity followed by 1-2 bits of Z polarity	As for call-confirmation. The interval between the pulses to be nominally 100 ms minimum
Selection signals	Teleprinter signals or dial pulses having the following limits: Speed = 9-11 pps, Z: A ratio = 1:1.2 to 1:1.9 (Recommendation U.2)	Teleprinter signals or dial pulses, where each A polarity is transmitted as 2-4 bits and each Z polarity as at least 1 bit, the mean speed of pulsing being the same as the input	Teleprinter signals or dial pulses in accordance with Recommendation U.2
Call connected	Continuous Z polarity on the backward path (2 s minimum, possibly followed by teleprinter signals)	Continuous Z polarity (102 bits of Z polarity minimum, possibly followed by teleprinter signals)	Continuous Z polarity (1.997 s minimum, possibly followed by teleprinter signals)
Service signal (busy pulse)	165-260 ms of Z polarity on the backward path followed by A polarity for 1500 ms (± 30%) continuously repeated (the A polarity period may be preceded by teleprinter signals, in which case the tolerance of the A polarity is reduced to ± 20%)	8-14 bits of Z polarity followed by 53-100 bits of A polarity continuously repeated or 8-14 bits of Z polarity followed by teleprinter signals followed by 61-92 bits of A polarity continuously repeated	156-275 ms of Z polarity followed by A polarity of minimum duration 1037 ms (the A polarity period may be preceded by teleprinter signals)
Clear and clear-confirmation	As for type A	As for type A	As for type A
Automatic retest	As for type A	As for type A	As for type A

For notes, see Table 3/U.25.

TABLE 3/U.25

Type C signalling

Signalling condition	Signal received from telex (Recommendation U.11)	Signal on aggregate path (Note 1)	Signal transmitted to telex
Free line	Continuous A polarity on both signalling paths	Continuous A polarity	Continuous A polarity
Call or automatic retest	Inversion to Z polarity on forward path for 150-300 ms followed by teleprinter signals	Inversion to Z polarity for 7-16 bits followed by teleprinter signals	Inversion to Z polarity (within 50 ms of inversion in column 2) for 140-314 ms followed by teleprinter signals (Note 2)
Transit proceed to select	Z polarity for not less than 450 ms followed by code combination No. 22 (nominally 40 ms pulse of A polarity	Not less than 22 bits of Z polarity followed by 2 bits of A polarity	Not less than 430 ms of Z polarity followed by 40 ms of A polarity
Reception confirmation or equipment congestion	Inversion to Z polarity on backward path for 450 ms (± 10%) followed by teleprinter signals or clearing signal	Inversion to Z polarity for 20-26 bits followed by teleprinter signals or continuous A polarity	Inversion to Z polarity for 391-510 ms followed by teleprinter signals or continuous A polarity
Clear and clear-confirmation	As for type A	As for type A	As for type A

Notes concerning Tables 1/U.25 to 3/U.25

1. Actual polarity of each channel on the aggregate path will conform to § 5.5.1.1 (alternative A) or § 5.6.3 (alternative B) of Recommendation R.101.
2. The time delay of signals through the multiplex equipment shall not exceed 50 ms.
3. Pulses of Z or A polarity less than 10 ms shall be rejected by the multiplex equipment.
4. The tolerances shown for the *Signal transmitted to telex* shall not be exceeded when more than one pair of terminals are connected in tandem.
5. It is accepted that the *Signal transmitted to telex* may deviate from the tolerances given in the tables when the *Signal received from telex* conforms to Recommendation U.24 but not to Recommendation U.1 or U.11. In this event the *Signal transmitted to telex* shall not exceed the tolerances given in Recommendation U.24.

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SECTION 4

GENTEX SIGNALLING

Recommendation U.30

SIGNALLING CONDITIONS FOR USE IN THE INTERNATIONAL GENTEX NETWORK

(New Delhi, 1960)

The CCITT,

considering

(a) that the conditions in Recommendation U.1 concerning signalling in the international telex service, the specifications in Recommendation U.2 for standardization of dials and dial pulse generators in the international telex service, in Recommendation U.3 for the reduction of the effect of false calling signals, and in Recommendation U.5 on the characteristics of regenerative repeaters used in international calls, will hold good in the gentex network, except those referring specifically to manual or semi-automatic working. In some countries, indeed, no distinction is made between the gentex and the telex networks;

(b) that the differences between signalling conditions in the telex and the gentex networks are essentially due to the possibility of using overflow in the gentex network, and the absence of charges in it,

unanimously declares the following view

1 The recommendations in §§ 1 to 12 of Recommendation U.1 *(Signalling conditions to be applied in the international telex service)* shall also apply to the gentex network subject to the following changes:

1.1 *Proceed-to-transmit signal* (Recommendation U.1, § 5.2)

The proceed-to-transmit signal is not used in the gentex network, since switching is always automatic.

1.2 *Selection signals*

Recommendation U.1, § 6.3 should read as follows for the gentex network:

If there is selection towards a system in which selection is by teleprinter signal, the prepare-for-digits signal will normally be combination No. 30 (figure-shift). By agreement between the Administrations concerned, this combination could be replaced by another combination for gentex calls over circuits used for gentex and telex traffic simultaneously, if the network of the country of arrival can ensure barring between the two kinds of traffic.

2 Table 1b/U.1 (signal characteristics) applies to the gentex network.

3 Recommendation U.2 *(Standardization of dials and dial pulse generators for the international telex service)*, Recommendation U.3 *(Arrangements in switching equipment to minimize the effects of false calling signals)*, and Recommendation U.5 *(Requirements to be met by regenerative repeaters in international connections)*, apply to the gentex network.

PREVENTION OF CONNECTION TO FAULTY STATIONS AND/OR STATION LINES IN THE GENTEX SERVICE

(former CCIT Recommendation E.9, Geneva, 1956)

The CCITT,

considering

(a) that correct reception of the answerback code at the beginning and end of a telegram should safeguard the correct transmission of the telegram;

(b) that it accordingly becomes essential to provide adequate signalling for cases when a teleprinter is temporarily unable to participate in the international service, on account of paper trouble, faults, etc.;

unanimously declares the view

(1) that faults during the transmission of a telegram shall be signalled as far as possible by the automatic transmission of a clearing signal;

recognizing, however,

that it will be impossible to signal all faults that may occur on an established connection,

unanimously declares the view

(2) that it is essential that absence of paper on a receiving teleprinter should be signalled by the clearing signal; and

(3) that, since the receiving Administration is responsible for the receipt of the telegram when the answerback signals have been correctly exchanged, it is responsible for making the necessary arrangements to ensure security of operation (for example, if the tape should break or become jammed);

(4) that in the case of a faulty station line or teleprinter at the moment of the call, the existing automatic switching networks use one or more of the following signalling conditions : no call-connected signal, busy signal, service code **DER** or no return of answerback. All these signalling conditions ensure that a telegram is not transmitted over a faulty connection;

(5) that in the case of a faulty station line out of an office group it is essential that the faulty line should be busied out as quickly as possible so that traffic may be offered automatically to all the other lines in the group.

SECTION 5

PARTICULAR SIGNALLING FACILITIES

Recommendation U.40

REACTIONS BY AUTOMATIC TERMINALS CONNECTED TO THE TELEX NETWORK IN THE EVENT OF INEFFECTIVE CALL ATTEMPTS OR SIGNALLING INCIDENTS

(Geneva, 1980; amended at Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that equipment capable of automatically originating calls in the telex network can repeat unsuccessful calls until the call has been set up;

(b) that unlimited repetition of call attempts may cause congestion in the telex network;

(c) that manufacturers of automatic terminals for connection to the telex network should be given guidance on tolerable numbers of repeated call attempts and simultaneous calls;

unanimously declares the following view:

1 Ineffective outgoing call

1.1 *Non-return of the call-confirmation and/or proceed-to-select signal(s)*

1.1.1 The call signal could be maintained for a maximum period of 20 s. If, within this period, the call-confirmation and/or the proceed-to-select signal(s) have not been received from the network, the terminal sends the clear signal.

1.1.2 A further call attempt must not be made within a minimum period of 20 s.

1.1.3 After three such ineffective attempts, the incident should be reported to the staff at the terminal installation, specifying the nature of the fault.

1.2 *Slow or incomplete selection*

1.2.1 Once the terminal has sent a call signal and has received the call-confirmation and/or proceed-to-select signal(s), transmission of the selection digits must commence within a period of between 0.5 and 7 s, depending on the national network. If this delay is exceeded, the network may clear.

1.2.2 The same procedure applies in the event of incomplete selection by the terminal or, if an interval longer than 7 s occurs, between two selection digits.

1.3 *No response after selection*

1.3.1 If, after selection has been completed (but before the call has been set up), the terminal receives no signals within 60 s, it may send the clear signal. This delay may be increased to 120 s for international calls.

1.3.2 Further attempts may be made in accordance with §§ 1.1.2 and 1.1.3 above.

1.4 *Ineffective attempts followed by service signals*

1.4.1 *OCC*

1.4.1.1 If, after initiating a call, the terminal receives an **OCC** service signal followed by clear, it must wait at least 60 s before repeating the attempt. If **OCC** is received again, then second, third and fourth attempts shall be permitted at 180-second intervals.

1.4.1.2 If the distant terminal is still unavailable after a maximum of four such reattempts, this should be reported to the staff at the terminal installation indicating the number called and the service code received. Ten series of a maximum of four reattempts per series may be carried out at intervals between 480 and 3600 s, between each series.

1.4.1.3 Should the distant terminal remain unavailable after these call series, this should be reported and the call abandoned as far as the automatic terminal is concerned.

1.4.2 *NC*

1.4.2.1 If, after initiating a call, the terminal receives an **NC** service signal followed by clear, it must wait at least 60 s before repeating the attempt.

1.4.2.2 If the distant terminal is still unavailable after a maximum of four such reattempts, this should be reported to the staff at the terminal installation indicating the number called and the service code received. Ten series of a maximum of four reattempts per series may be carried out at intervals between 480 and 3600 s, between each series.

1.4.2.3 Should this second series still fail to reach the distant terminal, this should be reported and the call abandoned as far as the automatic terminal is concerned.

1.4.3 *ABS, NA, NP, NCH, DER or the service code CI*

1.4.3.1 If, after initiating a call, the terminal receives an **ABS**, **NA**, **NCH**, **NP** or **DER** service signal followed by clear, only one reattempt may be made after a minimum period of 2 s.

1.4.3.2 In the event of a second failure due to a service signal specified in § 1.4.3.1, the terminal should abandon the call and report the incident to the staff at the terminal installation indicating the number called and the service code received.

1.4.3.3 If the terminal receives the service code **CI** followed by clear, the procedure described in §§ 1.4.3.1 and 1.4.3.2 should also be applied.

1.5 *Ineffective calls characterized by a clearing signal without a preceding service signal*

1.5.1 If after having made a call, the terminal equipment receives a clearing signal without previous reception of a service signal, it must wait 2 s before a second attempt.

1.5.2 If the same phenomenon occurs three times in succession, a second series of three calls may be made again after a delay of 15 minutes.

1.5.3 If the second series of calls produces the same result, the terminal equipment should definitively abandon the call and report the incident to the staff at the terminal installation indicating the number called and that no service code was received.

1.6 *Reception of an answerback*

1.6.1 If, after having made a call, the terminal equipment receives an incorrect answerback, it may send the clearing signal and repeat the call only once after a period of 2 s.

1.6.2 If the second attempt fails in the same way, the terminal should abandon the call and report the incident to the staff at the terminal installation, indicating the number called and the fact that the expected answerback code was not received.

1.7 *Simultaneous calls*

1.7.1 If an automatic terminal equipment can initiate simultaneous call attempts on a number of outgoing lines, the number of such call attempts in progress at any one time shall not exceed a maximum prescribed by the Administration concerned.

1.7.2 In no case shall a multiple-line terminal equipment be allowed to present the same call simultaneously on more than one telex line. Moreover, the periodicity of a given repeated call and the number of attempts to be made in case of failure shall apply to this terminal equipment as indicated in Table 1/U.40, irrespective of whether the call is presented on the same line or on different lines.

TABLE 1/U.40

Summary of the required reactions to ineffective call attempts and signalling difficulties

Relevant point	Symptoms	Time-out or delay before clearing (seconds)	Maximum number of reattempts per series	Number of series	Minimum interval between series (seconds)	Minimum interval between attempts (seconds)
	Outgoing calls					
1.1	No call-confirmation and/or proceed-to-select	20	3	1	—	20
1.3	No response after selection:					
	national calls	60	3	1	—	20
	international calls	120	3	1	—	20
1.4.1	**OCC**	—	4	10	480 to 3600	60[a] 180[a]
1.4.2	**NC**	—	4	10	480 to 3600	60
1.4.3	**ABS, NA, NP, NCH, DER** or **CI**	—	1	1	—	2
1.5	Clearing without a service signal	—	3	2	900	2
1.6	Incorrect answer-back	0	2	1	—	2
	Incoming calls					
2.1	No signals after a "call" signal	30	—	—	—	—
	Conditions after call establishment					
3.1	Idle circuit (steady Z)	120	—	—	—	—
	Conditions after clearing					
3.2	No clear-confirmation	10	—	—	—	—

[a] In the case of **OCC**, the period between the original attempt and the first reattempt should be 60 s. Between subsequent reattempts this period should be extended to 180 s.

Note 1 — Where various combinations of service signals are encountered, the equipment making the reattempts shall obey the rules appropriate to the last service signal encountered. In no case, however, shall the total number of reattempts on any one call exceed 12.

Note 2 — This Recommendation is subject to amendment in the light of traffic experiments undertaken by Administrations.

2 Ineffective incoming calls

2.1 *False calls*

2.1.1 The terminal should disregard any "call" signal from the network that does not exceed 50 ms in duration.

2.1.2 If the terminal receives no signals within a period of up to 30 s after it has recognized a call signal from the network, it should return the clear signal to the network.

3 Incidents following call set-up

3.1 *Idle circuit without clearing signal*

3.1.1 Barring prior agreement to the contrary, if no signal is received after the beginning of the call or if the distant correspondent's transmission stops during an incoming call (i.e. steady stop polarity on the incoming path) for a period of more than 2 minutes, the receiving terminal may clear the call and report the incident to the staff at the terminal installation, indicating the nature of the suspected fault and, if possible, the number of the distant subscriber.

3.2 *No clear-confirmation*

3.2.1 Should the network fail to return the clear-confirmation signal after the terminal has been sending a clear signal for 10 s or more, the terminal should report the incident (giving the time at which it occurred) and withdraw the circuit from service until the necessary action has been taken.

Recommendation U.41

CHANGED ADDRESS INTERCEPTION AND CALL REDIRECTION IN THE TELEX SERVICE

(Geneva, 1980)

The CCITT,

considering

(a) that, with fully automatic working between telex subscribers, it is desirable to envisage the possibility of:

- a fully automatic changed address interception facility;
- a fully automatic call redirection facility;

(b) that the operation of such facilities has an influence upon telex calls originated by other Administrations and therefore requires international standardization;

unanimously declares the following view

1 Changed address interception

1.1 In existing networks, in the case of a call to a subscriber whose number has been changed, the incoming network may return the service code **NCH** followed by the clearing signal in accordance with Recommendations F.60 [1] and U.1, § 10.1 and Table 1/U.1.

1.2 In new networks and as far as possible in existing networks, it would be desirable to inform the calling subscriber of the new number to be selected by means of a suitable sequence of signals, which should have the following format:

≤≡↓**NCH**↑**:x. . .x**+↓ (where **x. . .x** represents the figures of the new number),

followed by the clearing signal. This sequence may be preceded by the call-connected signal and every step should be taken to ensure that the period between the call-connected signal and the clearing signal does not exceed 5 seconds, in order to avoid accounting in accordance with Recommendations U.1 and F.61 [2].

1.3 Operating Administrations may optionally offer automatic redirection to the new number of a call to one of their subscribers whose number has been changed. This redirection will be in accordance with § 2 below, which treats this subject, and in particular the call-connected signal should be given once only at the moment when an effective call has been established. This supplementary service shall be available for a limited period only. It may not be offered beyond the time during which the Administration informs calling subscribers of the change in the call number.

2 Call redirection

2.1 In new networks and as far as possible in existing networks, a call redirection should be signalled by the return to the calling station of a sequence of signals constituted by the code **RDI** followed by the indication of the new number to which the call is redirected, in accordance with the following format:

≤≡↓**RDI**↑**:x. . .x**+↓ (where **x. . .x** represents the new number),

followed if necessary by further letter-shifts (↓); the total number of characters in the sequence may in no case exceed 20.

Failing this, at least the code **RDI**, without any further indication, should be returned.

2.2 The signals indicated in § 2.1 above may be followed by other service signals employed in the signalling system applied in the network concerned. The call-connected signal should not be returned until the call has been extended to the station corresponding to the new number, in accordance with the procedure described in Recommendation U.1. It should be followed by the call-connected procedure for this station in accordance with the existing rules in the network in question.

2.3 Administrations offering call redirection facilities should take all necessary technical and administrative steps to ensure that the same call can in no circumstances give rise to more than one redirection and that the total number of circuits used to establish the call after redirection does not exceed the maximum tolerated in the transmission plan for the national network.

2.4 In the case described in § 1.3 above, where the calling station is connected to the new address, this address shall consist only of the national number.

2.5 With regard to the call redirection facility, redirection should not take place to addresses outside the jurisdiction of the Administration performing the redirection function.

References

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

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

Recommendation U.43

FOLLOW-ON CALLS

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that users of the telex service often have several messages ready to transmit at the same time to different subscribers and that it would therefore be an advantage for them to be able to transmit these messages one after the other, keeping the part of the communication chain already established in a seized condition and having the calls set up successively, without having to go through the whole procedure of setting up a new call for each message,

unanimously recommends

1 that Administrations should be able to offer the possibility of follow-on calls to their subscribers;

2 that the procedure and control of such calls are the responsibility of the originating country;

3 that if the originating country is not able to provide this facility to their subscribers, the terminating country only could perform the follow-on function taking into account the following restrictions:

3.1 that the Administration of the terminating country offering the possibility of follow-on calls shall take all the necessary steps to prohibit the use of this arrangement for setting up calls in transit to a third country;

3.2 that the chargeable duration for the caller shall be the whole time from the moment when the first call is set up to the moment when the last one is terminated, the duration of the intermediate dialling being included in the chargeable duration;

4 that if the alternative in § 3 is offered, the procedure should be as follows:

4.1 the caller in the originating country wishing to make a new call to a subscriber in the terminating country shall indicate his wish to do so by sending a signal consisting of a special sequence made up of five combinations No. 12 (**LLLLL**);

4.2 the terminating international exchange must be able to detect the signal, to which it shall reply by sending the proceed to select sequence (e.g. **GA**), inviting the caller to indicate the new number to be called;

4.3 the caller shall transmit the new number to be called, and the call shall then be set up in the terminating country in accordance with the usual procedure;

4.4 the originating network shall ignore this new dialling and shall simply keep the connection seized as if the first call were being continued.

Recommendation U.44

MULTI-ADDRESS CALLS IN REAL TIME FOR BROADCAST PURPOSES IN THE INTERNATIONAL TELEX SERVICE

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) the definitions of multi-address and broadcast calls;

(b) that new systems are capable of providing broadcast facilities, thereby permitting a telex subscriber to set up a call to a list of destinations such that signals transmitted by the originating subscriber are received virtually simultaneously by the called subscribers;

(c) that one, or more, of the destinations could be an international destination;

(d) the provisions of Recommendation F.61 [1] on signalling interworking rules;

(e) the provisions of Recommendation U.15 on signalling interworking rules;

(f) the provision of Recommendation U.1 on the receipt of text before or after the answerback code;

(g) the provisions of Recommendation U.41 on changed address interception and call redirection,

and further recognizing

that the calling and clearing procedures to be used in the originating exchange are a national matter,

unanimously recommends

that the following general principles be adopted when setting up broadcast calls in the international telex service:

1 The setting-up of the various outgoing calls in a broadcast call by the originating exchange preferably be done concurrently rather than sequentially in order to minimize the holding time of international circuits.

Where, however, calls are set up sequentially, then priority shall be given to the establishment of the national calls first.

2 The answerback codes of each called subscriber shall be returned to the originating exchange in accordance with the relevant Series U Recommendations. How the received sequence of answerback codes is to be sent to the calling subscriber is a national matter.

Receipt of a service signal shall be handled in a similar manner. The method of informing the calling subscriber of the received service signals, including the indication of any additional information received in accordance with § 10.1.2 of Recommendation U.1 is a national matter. This also applies to the RDI condition, in which case the message will not be delivered.

3 The standard text **BCT MOM**, in accordance with Recommendation E.60 [2], should be transmitted by the calling exchange to each called subscriber 150 ms after receipt of the respective answerback codes.

4 Should the national network of the calling subscriber also provide a camp-on service, then this service should be disabled in the case of broadcast calls.

5 The maximum number of international addresses in a broadcast call shall be limited to 5.

6 a) Having returned the list of received answerback codes (or service signals), the originating exchange shall advise the calling subscriber to commence the transmission of the message by the return of the standard text, **GA**, to his terminal in accordance with Recommendation F.60 [2].

The broadcast call should now be through-connected from the calling subscriber to all called parties.

b) It is recommended that the calling subscriber commence his transmission by forwarding his own answerback sequence to all called parties using the Here Is key on his terminal.

c) Alternatively, the originating exchange, it if can be so programmed, shall cause the transmission of the calling subscriber's answerback sequence to all called subscribers prior to the return of the **GA** signal.

7 It shall be possible for any of the called subscribers to clear his individual connection in accordance with the relevant Series U Recommendations.

Should all called subscribers clear their connections, then the originating exchange shall return the clearing signal to the calling subscriber.

8 However, it shall not be possible for any of the called subscribers to interrupt the transmission of signals from the calling subscriber to the other called parties.

9 The access by subscribers to an exchange in another country for the purpose of setting-up a broadcast call shall not be permitted. The provisions of Recommendation U.6 shall apply.

10 Each individual international connection shall be charged in accordance with the provisions of Recommendation F.61 [1].

11 The clearing procedures applied by the calling subscriber, including the receipt of advice from the originating exchange on such matters as charging information and premature clears by some called subscribers, is a national matter.

Note – Application of this procedure to destinations which use code conversion facilities is a matter for further study.

References

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

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

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SECTION 6

RADIOTELEX INTERWORKING

Recommendation U.60

GENERAL REQUIREMENTS TO BE MET IN INTERFACING THE INTERNATIONAL TELEX NETWORK WITH MARITIME SATELLITE SYSTEMS

(Geneva, 1980; amended at Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that, with fully automatic working between subscribers in the international telex service, it is desirable that the interface between the international telex network and maritime satellite systems be defined;

(b) that the CCIR is charged with the task of making Recommendations relating to the radio path of maritime satellite systems;

(c) that explanation of the detail of the interface between the international telex network and maritime satellite systems would be of assistance to the CCIR;

(d) that Recommendation U.61 specifies the detailed interface requirements,

unanimously recommends

(1) that maritime satellite systems should be capable of interfacing the international telex network with one or more signalling systems in accordance with:

- Recommendation U.1: Signalling conditions to be applied in the international telex service (type A and type B signalling);
- Recommendation U.11: Telex and gentex signalling on intercontinental circuits used for intercontinental automatic transit traffic (type C signalling);
- Recommendation U.12: Terminal and transit control signalling system for telex and similar services on international circuits (type D signalling);

(2) that type D signalling (Recommendation U.12) and, as a second choice, type C signalling (Recommendation U.11) are the preferred signalling systems, when they are available within the national boundaries, for the reasons given in Annex A;

(3) that as the maritime signalling from the ship to the coast earth station is in the same relationship as the connection from the subscriber to the originating exchange in the international network, it is necessary that the transit delays inherent in the maritime system should be considered in conjunction with the standards recommended for the international network.

(4) that the access of ship earth stations to store-and-forward units, if provided, should be in accordance with the relevant Series F and U Recommendations on international store-and-forward units.

ANNEX A

(to Recommendation U.60)

Signalling systems types C and D

A.1 These signalling systems have been developed in CCITT to permit the maximum utilization of the international telex network as well as to simplify the interface problems that exist between Administrations using different signalling systems within their national boundaries. In particular, types C and D signalling systems, which use telex destination codes in accordance with Recommendation F.69 [1], are of assistance in solving the problems of routing to and from maritime satellite systems where multiple access techniques are employed.

A.2 Type C signalling (Recommendation U.11) facilitates the use of improved techniques for switching traffic in the international network. In particular:

a) it permits any telegraph circuit capable of carrying International Telegraph Alphabet No. 2 (ITA 2) to be used without the need to convert supervisory signals to a form capable of being carried by the circuit;

b) it permits the automatic testing of the ability of the international circuit to transmit teleprinter characters before the call is established to the distant subscriber;

c) it permits the detection of head-on collision of calls and thus permits service protocols to be established in handling such collisions. It may be noted that head-on collisions may occur on telegraph circuits that are operated in the bothway mode due to the fact that the calling signal takes a finite time, depending upon the nature of the transmission path, before the receiving end of the circuit detects the seizure from the outgoing end;

d) it permits the efficient use of the international network with particular reference to the most economical use of automatic alternative routing and, by providing transit centre identification, permits full flexibility in routing as well as international accounting and subscriber billing.

A.3 Type D signalling (Recommendation U.12) facilitates the introduction into the international network of the following facilities (in addition to the advantages mentioned in § A.2 above):

a) user groups;

b) network identification signals;

c) identification of the calling station without the necessity of using the WRU signal;

d) identification of a call relating to service matters, which the international network carries as a non-chargeable call.

Reference

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

Recommendation U.61

DETAILED REQUIREMENTS TO BE MET IN INTERFACING THE INTERNATIONAL TELEX NETWORK WITH MARITIME SATELLITE SYSTEMS *

(Geneva, 1980; amended at Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that fully automatic working between subscribers in the international telex service and subscribers to a radiotelex service provided by a maritime satellite system is technically possible;

(b) Recommendation U.60, which gives the general requirements to be met in interfacing the international telex network with maritime satellite systems,

unanimously recommends

1 Maritime satellite systems should be capable of detecting the head-on collision condition at the coast earth station between a ship earth station request for call and a terrestrially originated call for that particular ship earth station and should:

- permit the ship-originated call to be connected to the international telex network; and
- terminate the call from the international telex network with an appropriate telex service signal (**OCC**) and a clear (Recommendation F.60 [1]).

2 Should the head-on collision condition occur in the connections in the terrestrial network between the coast earth station and the telex exchange, then the normal procedures in accordance with the appropriate Series U Recommendations (U.12, § 3.3, U.11, § 2, U.1 § 12.2) should prevail.

3 A call-connected signal or a telex service signal and clear shall be returned as soon as possible after the receipt of the end-of-selection character at the coast earth station for shore-originated calls. The signal return delay shall not exceed 35 seconds.

Note – For type C signalling (Recommendation U.11) the end-of-selection (EOS) character is combination No. 26 (+) in International Telegraph Alphabet No. 2. For type D signalling (Recommendation U.12) the EOS is character No. 11 in the Control Signalling Code (CSC). For signalling to Recommendation U.1, this signal shall be combination No. 26 (+) in International Telegraph Alphabet No. 2.

4 The maritime satellite system returns to the subscriber in the terrestrial network the service signal **DER** (Recommendation F.60 [1]), followed by a clearing signal when the maritime satellite system detects:

- that the ship's station (teleprinter, control logic, radio equipment) is faulty;
- failure of the answer-back from the ship's teleprinter.

5 At the termination of the call the requirements of the clearing and clear-confirmation signals shall apply to and from the international network (Recommendations U.1, U.11, U.12); the maritime satellite system may use different timings in the directions to and from the ship. It is preferred that the total times for such signal exchanges should have a minimum time addition to that quoted for the international network.

Note – Automatic calling equipment and subscribers in the international telex network may attempt, under certain conditions, to place a follow-on call to the same ship. Under conditions of long clear and clear-confirmation cycle times, such calls will not be successful.

6 In the first generation INMARSAT system, telex characters are transmitted in synchronous channels using 6-unit frames. A telex character is thus sent as one start element followed by the five information elements of International Telegraph Alphabet No. 2. Speed differences between the on-board teleprinter and the satellite circuit are compensated for by occasionally inserting six elements of Z polarity, i.e., whenever a frame is to be sent on the synchronous channel and there is no complete telex character available. When the characters are retransmitted into the telex network, a stop element nominally 1.5 units long is added. Therefore, a period of Z polarity equal to the duration of a telex character may occasionally appear in the data stream.

6.1 The design of the equipment interfacing the international network should preferably ensure the following:

6.1.1 When type C signalling is employed to connect into the international network, either:

- the class-of-traffic and selection signals should all be transmitted into the international network at cadence speed without any periods of Z polarity between the 7 1/2-unit characters; or
- the class-of-traffic signal, the class-of-traffic-check signal, the 2 or 3 digits of the destination code of the called network and the first two digits of the called station should be transmitted as a complete block at cadence speed without any periods of Z polarity between the 7 1/2-unit characters. The remaining selection signals for the called number and the EOS signal (+) may be transmitted with periods of Z polarity, providing that the signals are not delayed by more than 4 seconds.

6.1.2 When type D signalling is employed to connect into the international network, the class-of-traffic signal(s) or network selection signals and selection signals should be transmitted as a complete block at cadence speed without periods of Z polarity between the Control Signalling Code (CSC) characters.

6.1.3 If these options cannot be exercised, then the provisions of Recommendation U.11, § 13, Recommendation U.12, § 3.6 or Recommendation U.1, § 6.6 shall apply.

6.2 When operation to automatic terminals, store-and-forward units, etc., is required, it should be noted that periods of Z polarity may occur within an answerback and text during transmission at cadence speed. (See also Recommendation R.59.)

A method for avoiding periods of Z polarity within an answerback signal is described in Appendix II.

7 Since, for automatic calls in the international telex service, there are no arrangements for call priorities such as are envisaged for maritime satellite systems and since it is a principle that a telex call should not be broken down without transmitting a service signal to the affected terminals, maritime satellite systems should, on exercising the maritime priority:

a) attempt to set up the priority call by cutting down a call that is in the process of being set up, i.e. the call-connected signal was not yet transmitted to the international network before cutting down an established call;

b) when a call in the process of being set up is cut down, transmit a service signal (**NC**) followed by a clear to the international network;

c) where it is unavoidable that an established call be cut down, clear the call using the standard international clearing procedure.

Note – Special signals could be used within the maritime satellite system to reduce the setting-up times of priority calls within that system. Such signals are not required to be related to the time scale of the cut-down of calls from or to the international network.

8 When the international network is used to permit an authorized telex terminal to access a coast earth station for the purpose of making a group call to ships, then such a service can be provided technically:

a) *when the originating network cannot apply selective barring to their subscribers*, providing that the coast earth station authenticates the calling terrestrial telex station by the transmission of the WRU signal and checks the status of the characters received from the calling terminal's answerback;

It should be noted that the WRU should be transmitted after the call-connected signal and the coast earth station's answerback has been transmitted to the calling terminal;

b) *when the originating telex network can apply selective barring to its subscribers*, providing that the telex selection received by the coast earth station is of the format:

$$D_1D_2D_3X_1X_2X_3 \ldots X_k \text{ EOS}$$

where $D_1D_2D_3$ is the appropriate telex destination code assigned to the Maritime Satellite Service in accordance with Recommendation F.69 [2], and $X_1X_2X_3 \ldots X_k$ is the telex number at the coast earth station defining the particular group call request, which, in association with the calling terminal, may be used to identify the appropriate listing of ships to receive the group call. The character X_1 in combination with the Recommendation F.69 [2] code indicates to the international network that a maritime group call is being made. The character X_1 shall be the character 0 (zero). (See also Recommendation F.120.)

c) *when type D systems exist in the connection to the calling telex terminal.* In that case the "calling line identification" procedures of that system may be used during the setting-up phase of the connection to the coast earth station to authenticate the calling terminal's identity instead of the use of the WRU and answerback. Where the calling link identification is not available in the terrestrial network the Control Signalling Code (CSC) No. 12 will be received. Under these circumstances the WRU/answerback sequence should be used as detailed in § 7, a).

When the request for a maritime group call, from the international network, is rejected due to lack of authorization, the international network should be cleared with a service signal (**NA**) followed by a clearing signal.

Note – Group calls may also be set up via a store-and-forward unit associated with the coast earth station. This unit should be accessed by subscribers or other store-and-forward units in accordance with the relevant Series F and U Recommendations. The authentication of the calling telex subscriber should be done by the store-and-forward unit.

9 The composition of ship terminal's answerback codes should conform to Recommendation F.130 [3].

10 Appendix I gives the characteristics and timings for INMARSAT telex circuits. The example given is based on the implementation at the United States coast earth stations.

APPENDIX I

(to Recommendation U.61)

Signalling characteristics and timing of the INMARSAT telex service

I.1 *Introduction*

This Appendix describes the characteristics and time sequences of the international telex service operated over the INMARSAT maritime satellite communication system via the USA coast earth station.

I.2 *Ship Earth Station (SES) originated telex call*

Figure I-1/U.61 shows the signalling sequence for a telex call originated from an SES terminal in the INMARSAT system. Figure I-2/U.61 illustrates the telex signalling and timing sequence. The following is a general description of the sequence of events in establishing a telex call from an SES to a gateway switch.

I.2.1 To initiate a call, the SES sends a telex request message in the out-of-band request channel. The addressed coast earth station (CES) receiving the valid request message will send back an out-of-band assignment message on its normal TDM channel to the network coordination station (NCS). The NCS will repeat the assignment message on the common TDM channel to which the SES is listening.

I.2.2 Upon receipt of a valid out-of-band assignment message from the CES via the NCS, the SES tunes to the normal TDM and can then access its assigned channel. The SES will normally achieve carrier and bit timing synchronization within 0.58 s after receipt of the assignment message. This time includes assignment message decoding, carrier recovery and clock recovery. Transmission will normally start upon frame synchronization, which occurs in less than 5.25 s.

Therefore, the normal SES response time will be less than 5.8 s as seen at the SES or 6.6 s as seen at the coast earth station. The time that the assignment message remains active in the coast earth station is in addition to this 6.6 s, allowing enough time for the SES to start transmitting.

I.2.3 The coast earth station, which is continually transmitting a polarity, makes the transition A to Z polarity indicating call confirmation within one character (150 ms, not counting framing delays) after the assignment message is formatted. In cases of heavy traffic, the assignment message may be delayed in queue until after the transition has occurred, i.e. it is possible for the A to Z transition to be received by the SES before the assignment message.

I.2.4 The initial SES transmission is in the A polarity state. When Z polarity is received from the coast earth station, the SES changes its transmission from A to Z polarity. In the case when the A to Z polarity transition on the coast earth station to SES link reaches the terminal before the assignment message, the SES inserts no more than two characters of A polarity in the initial burst.

I.2.5 Once the coast earth station has received the SES's A to Z polarity transition, call processing is started between the coast earth station and the gateway switch. The coast earth station presents the Z polarity to the gateway switch and the gateway responds with a call confirmation within 150 ms. Within 3 s after the call confirmation, the gateway returns a call connected signal. The coast earth station then connects the gateway switch to the SES. The gateway then sends its header and a WRU to the SES. The SES will send its answerback in response to the WRU from the gateway switch. The SES's answerback is passed through the CES to the gateway switch. Upon verification of the answerback by the gateway switch, it will send a "**GA+**" (Go Ahead) and the SES can then send selection digits to the gateway switch.

I.2.6 After this connection, the coast earth station does not respond to any data on the line until it detects clearing.

I.2.7 The gateway switch, upon receipt of the selection sequence from the SES, proceeds to process the call to the desired terrestrial subscriber. As the INMARSAT system interfaces with various gateway switches, the signalling sequences proceed according to the protocol between the particular gateway switch and the terrestrial network.

Note – The signalling sequences shown between the gateway switch and the terrestrial network in Figure I-1/U.61 illustrates one method of signalling which can be employed.

I.3 *Terrestrial originated telex call*

I.3.1 Figures I-3/U.61 and I-4/U.61 illustrate the telex signalling and timing sequences for a telex call originated in a terrestrial network to an SES via the INMARSAT system. As the signalling sequences between the terrestrial networks and each gateway switch are not identical, that portion of the signalling sequences in Figure I-3/U.61 is for illustrative purposes only and no attempt is made to describe all the possible sequences.

I.3.2 The following paragraphs provide a description of the sequence of events which occur between a gateway switch and an SES for a telex call originated from the terrestrial network.

I.3.2.1 Upon receipt of the selection digits from the terrestrial network, the gateway switch starts the signalling sequence by sending a call request signal on an idle circuit to the coast earth station. Upon receipt, the coast earth station returns both a call confirmation and proceed-to-select signal within the proper intervals as shown in Figure I-4/U.61. The gateway switch can then proceed to send the selection digits to the coast earth station.

I.3.2.2 The coast earth station checks the validity of the selection digits and if correct, sends an out-of-band assignment message via the NCS to the SES requested. When the assignment message has been transmitted, the signalling proceeds in the same manner as a call from an SES to a coast earth station described in § 2. Once the coast earth station has received the satellite call connect from the SES, it sends a call connected signal to the gateway switch and cuts through the circuit between the SES and the gateway switch. From this point, the coast earth station is essentially transparent to all data on the line until it detects a clearing signal.

I.3.2.3 The gateway then sends a WRU to the SES. The SES responds to the gateway's WRU with its answerback. The gateway switch, upon receipt of the SES's answerback, sends its header to the SES and the SES's answerback to the terrestrial network and the call is now in progress.

I.4 *Telex clearing sequence*

I.4.1 The coast earth station recognizes a clearing signal as an A polarity condition of 400 to 1000 ms from either the gateway switch or an SES. After recognition of the clearing signal, the coast earth station will disconnect the circuit and send a clear confirmation signal in both directions.

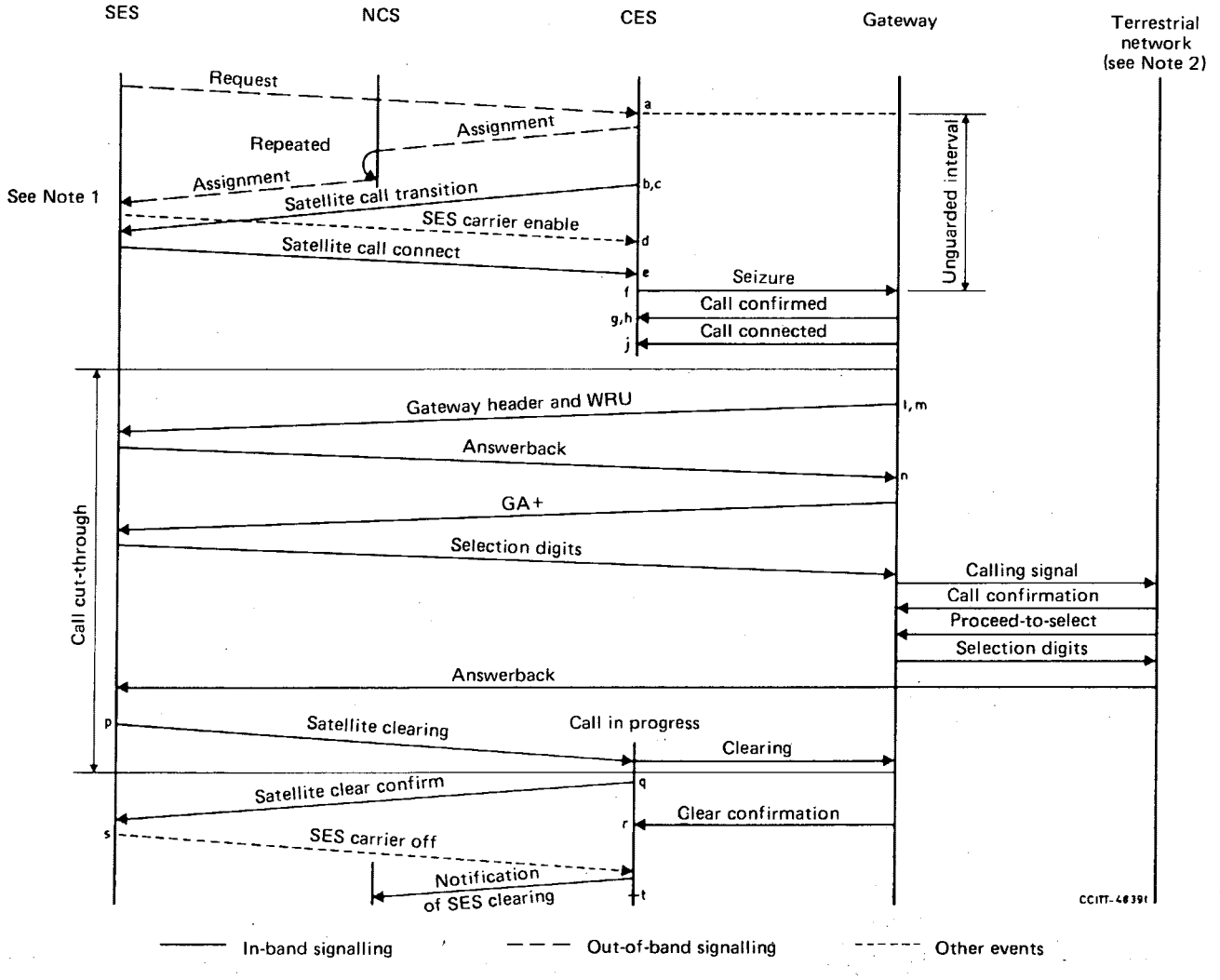
I.4.2 Release of the satellite circuit section is under the control of the coast earth station. The SES does not stop transmission of its RF carrier until:

a) it has returned a clear confirmation signal following the receipt of a clearing signal from the coast earth station; or

b) a clear confirmation signal is received from the coast earth station.

In either case, the SES maintains an A polarity signal for a maximum of 3.09 s before transmission is terminated.

I.4.3 For 6 seconds after the successful receipt of the clearing and clear confirmation signals over a circuit section between the coast earth station and a gateway switch, the coast earth station will not process any calls on that circuit section. The SES is also considered busy during this 6-second interval. This 6-second guard time is necessary to allow for proper clearing of the SES over the satellite circuit section. If another telex call is received for that SES during the 6-second guard time, the coast earth station will send back an OCC service signal. Once the guard time is past and the SES has been successfully cleared, the CES notifies the NCS that the SES is now idle.



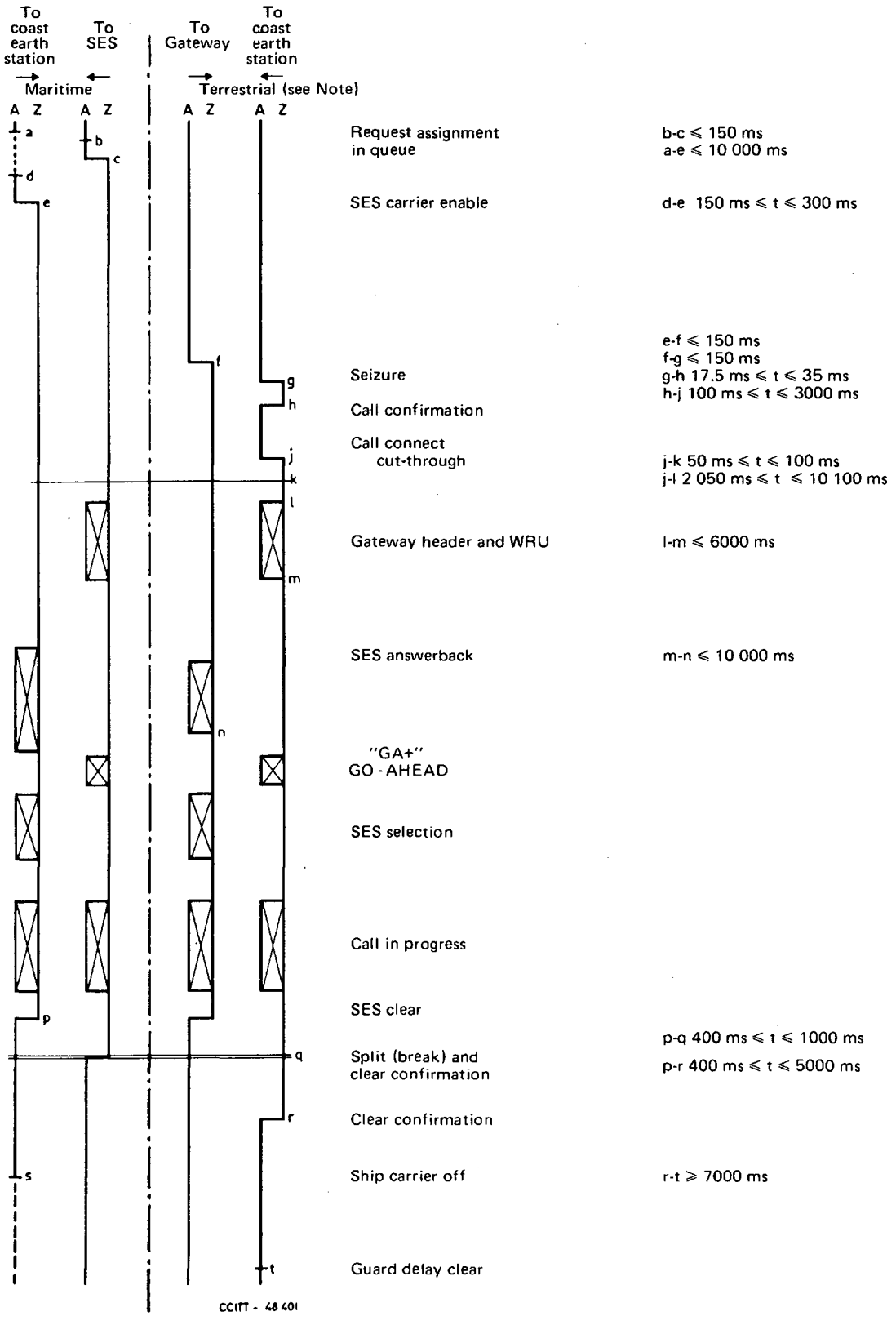
SES Ship earth station
CES Coast earth station
NCS Network coordination station

Note 1 – The assignment message and satellite call transition may arrive in either order.

Note 2 – Sequence between gateway and terrestrial network is for illustration only, as sequence can vary depending on the gateway involved.

FIGURE I-1/U.61

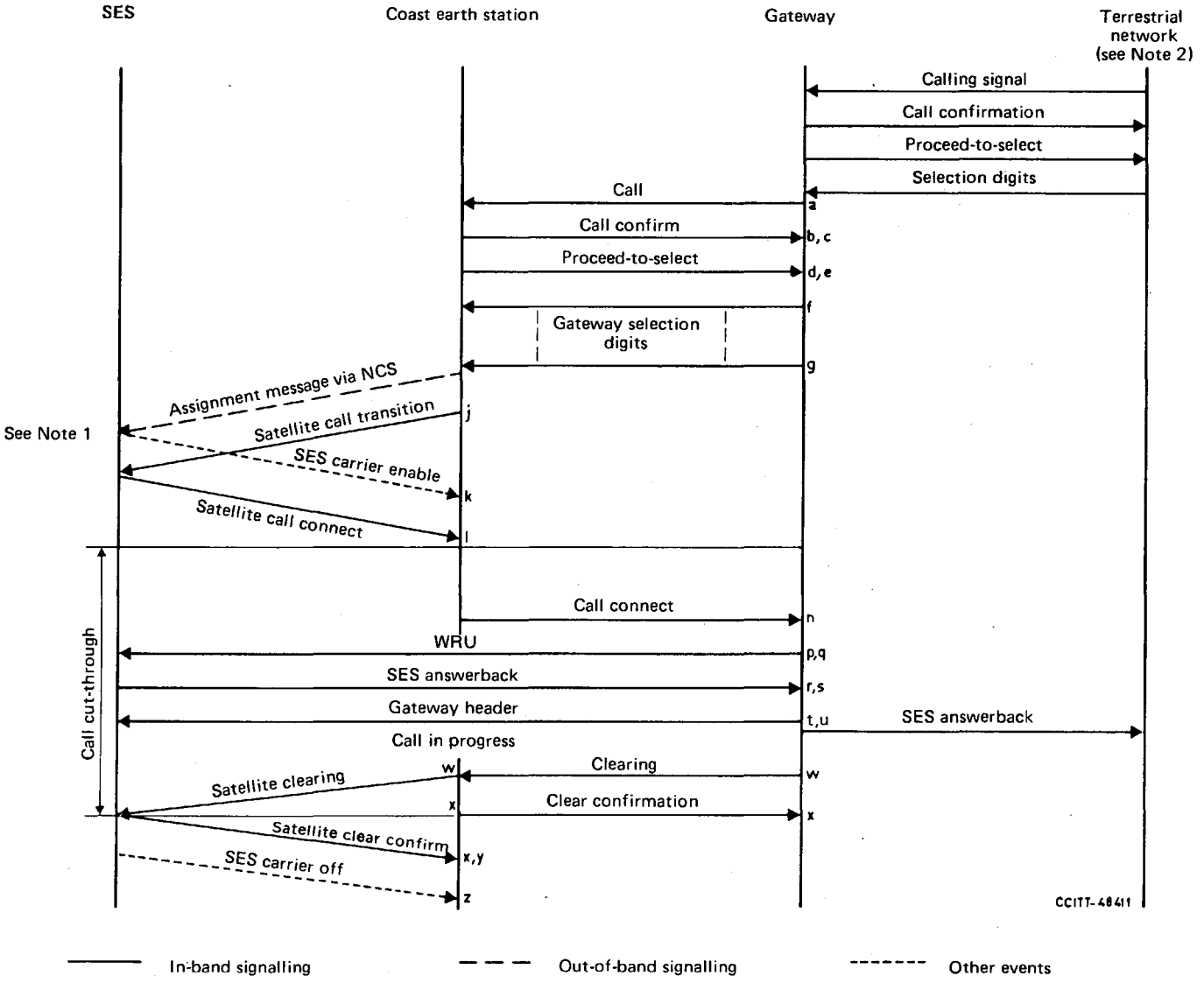
Signalling sequence for INMARSAT telex calls (SES to shore)



Note – USA coast earth station/gateway interface shown.

FIGURE I-2/U.61

Timing sequence for an SES originated INMARSAT telex call

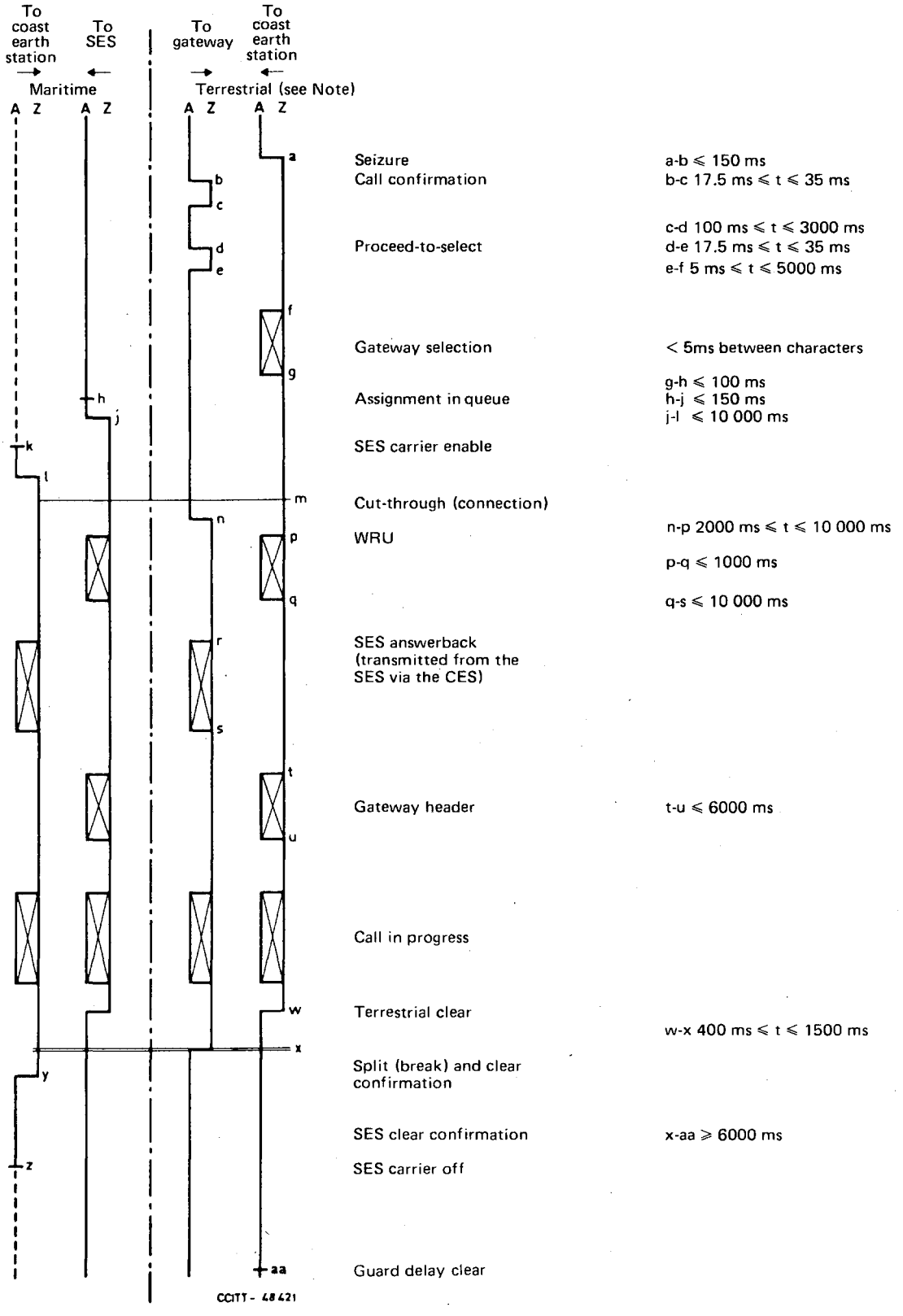


Note 1 – The assignment message and satellite call transition may arrive in either order.

Note 2 – Sequence between gateway and terrestrial network is for illustration only, as sequence can vary depending on the gateway involved.

FIGURE I-3/U.61

Signalling sequence for INMARSAT telex calls (terrestrial originated)



Note – USA coast earth station/gateway interface shown.

FIGURE I-4/U.61

Timing sequence for a terrestrial originated INMARSAT telex call

APPENDIX II

(to Recommendation U.61)

Method employed at the Nordic coast earth station to avoid periods of Z polarity within the answerback signal

The call set-up procedures employed at the Nordic coast earth station are similar to those shown in Appendix I. The coast earth station acts as an international gateway and is directly interconnected with the international telex exchange in Oslo.

The ship's answerback is obtained by the coast earth station for both ship originated and shore originated calls as soon as the satellite circuit has been established. The answerback is then stored at the coast earth station with any period of Z polarity omitted.

Whenever the coast earth station detects a WRU signal from the international telex network during the conversation phase, the path from the ship earth station is blocked as soon as the WRU signal has been sent to the ship. When the first few characters of the ship's answerback have been received at the coast earth station (in order to verify the continuity of the circuit), the coast earth station transmits the stored answerback into the international telex network at cadence speed.

References

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

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

[3] CCITT Recommendation *Maritime answer-back codes*, Rec. F.130.

Recommendation U.62

GENERAL REQUIREMENTS TO BE MET IN INTERFACING THE INTERNATIONAL TELEX NETWORK WITH THE FULLY AUTOMATED MARITIME VHF/UHF RADIO SYSTEM

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that it is desirable that the interface between the international telex service and the fully automated maritime VHF/UHF radio system be defined;

(b) that the CCIR is charged with the task of making recommendations relating to the radio path of the fully automated maritime VHF/UHF radio systems;

(c) that explanation of the detail of the interface between the international telex network and the fully automated maritive VHF/UHF radio systems would be of assistance to the CCIR,

unanimously recommends

that the interface between the international telex network and the automatic maritime VHF/UHF service should be in accordance with the following requirements:

1 General

1.1 In this Recommendation, the term mobile-service switching centre (MSC) is understood to mean the interworking point between the international or national telex network and the maritime VHF/UHF system. The MSC may have access to a junction called the location register which contains the current location of the mobile stations.

1.2 Fully automated maritime VHF/UHF radio systems should be capable of interfacing the international telex network in one or more ways:

- in accordance with:
  - i) Recommendation U.1, Signalling conditions to be applied in the international telex service (type A and type B signalling);
  - ii) Recommendation U.11, Telex and gentex signalling on intercontinental circuits used for intercontinental automatic transit traffic (type C signalling);
  - iii) Recommendation U.12, Terminal and transit control signalling system for telex and similar services on international circuits (type D signalling);
- in accordance with Recommendation F.132, Procedures for use of store and forward facilities in the maritime mobile services for ship-originated calls,
- in accordance with Series F and U Recommendations on international store and forward units.

1.3 Type D signalling (Recommendation U.12) and, as a second choice, type C signalling (Recommendation U.11) are the preferred signalling systems, when they are available within the national boundaries, for the reasons given in Annex A to Recommendation U.60.

1.4 The numbering and selection procedures should be in accordance with Recommendation F.121.

2 Ship originated calls

2.1 When accessing a store-and-forward unit, the shipboard subscriber should select, in accordance with Recommendation F.121, one of the access codes 21 or 22 possibly followed by the character "+" in order to gain access to the store-and-forward facility.

2.2 For direct access to the telex network, the procedures are given in § 3.4 of Recommendation F.121. The following points should be observed:

2.2.1 If the end-of-selection character "+" is not required for technical reasons on the radio path, it must be inserted by the MSC.

2.2.2 Access codes (possibly followed by additional digits) as defined in Recommendation F.121 for accessing special services or facilities, may be converted by the MSC to an appropriate number in the telex network when the service or facility is terminated at a point in the telex network other than the MSC.

2.3 Any service code generated in the telex network for a particular call should be returned to the calling ship.

3 Shore originated calls

3.1 *Interfacing methods*

The following interfacing methods are possible:

a) through a store-and-forward unit associated with one or more MCSs;

b) direct real-time access through an MSC. Here, the following sub-categories may exist:
   - i) MSC connected to location registers;
   - ii) MSCs not connected to location registers.

The technical solutions, including routing principles, required for each of these interfaces, are given below.

3.2 *Store-and-forward facilities*

3.2.1 The store-and-forward unit is accessed by normal telex procedures.

3.2.2 Procedures for forwarding messages to the store-and-forward unit and for retransmission of such messages should follow the normal procedures defined in Series F and U Recommendations.

3.2.3 Message should be retained for a period of time as defined in Recommendation F.110, § 4.4.

3.2.4 The store-and-forward unit may be connected to a location register for routing of calls to ships which are currently operating outside their home area.

The routing of such calls are described in Annex A.

3.2.5 For other applications of store-and-forward units, see § 3.3.6 below.

3.3 *MSCs connected to location registers*

3.3.1 The technical arrangement for location registers is outlined in Annex A.

3.3.2 A system with MSCs connected to location registers corresponds to the *level 3* of operation defined in § 3.2.4 of Recommendation F.121.

For simplicity, the MSC in which the ship station is permanently registered will be referred to as the home MSC. If the ship is not in its home area, the MSC in which the ship station is currently located will be referred to as the visited MSC.

3.3.3 The general selection procedures to be used for setting up calls to ships are given in Recommendation F.121. They may lead to the following possibilities:

i) The calling subscribers enters the following number sequence:

$$D_1D_2(D_3)A_1A_2(A_3)MIDX_4X_5X_6$$

where $D_1D_2(D_3)$ is the Recommendation F.69 destination code of the country in which the home MSC of the called ship is located, $A_1A_2(A_3)$ is the service access code in that country and $MIDX_4X_5X_6$ is the ship station number (MID = maritime identification digit). This can only consist of 6 digits for reasons given in Recommendation F.120. This implies that ship stations with more than 6 digits cannot be accessed automatically.

Note – The MID may on a regional basis be replaced by the digits 8Y thus permitting a seventh digit X_7 of the ship station number (see Recommendation F.120 for details).

The call is routed on the international telex network directly to the home MSC of the called ship station.

It may also be possible to employ two-stage selection where the first stage is used for accessing the location register in the country of destination and the second stage for transferring the ship station number. This procedure would allow ship station numbers to consist of up to 9 digits (see note to § 3.4.2).

ii) If the country of origin has its own location register and the country of destination has a class-of-traffic assigned to the maritime VHF/UHF service, it would in principle be possible to access a ship by the following selection sequence from the calling subscriber:

$$A_1A_2(A_3)MIDX_4 \ldots X_n$$

where $A_1A_2(A_3)$ is the service access code for maritime services in the country of origin or a Recommendation F.69 destination code allocated to the maritime VHF/UHF service, and $MIDX_4 \ldots X_n$ is a ship station number consisting of up to 9 digits.

Alternatively, two-stage selection may be used. The first stage is used for accessing the location register and the second stage for transferring the number of the called ship (see note to § 3.4.2).

The call is forwarded to the country of destination by the location register in the country of origin. This is done by sending the following address sequence of digits on the international network:

$$D_1D_2(D_3)MIDX_4 \ldots X_nC$$

where $D_1D_2(D_3)$ is the destination code of the country of destination and C is a class-of-traffic character identifying maritime VHF/UHF service in the country of destination. The destination code $D_1D_2(D_3)$ is uniquely determined from the MID part of the ship station number.

In order to operate such a system, class of traffic signals need to be defined or type A, C and D signalling. Type B signalling cannot support such a class of traffic signal.

3.3.4 If the called ship is currently located at another MSC than the home MSC, the home MSC may reroute the call to the required destination. The address format inserted by the home MSC for the purpose of rerouting would be one of those given in § 3.3.3 depending on the facilities available.

If the call cannot be rerouted, the service code ABS or another more suitable service code should be returned from the home MSC.

3.3.5 When operating a system where rerouting would be required, the following time-outs should be observed:

Types A and B signalling (Recommendation U.1)

The time from the end of selection, combination No. 26 (+), or last selection character received and the return of the call connected signal should not exceed 60 seconds.

Type C signalling (Recommendation U.11)

The time taken from the end of selection signal, combination No. 26 (+), to the call-connected signal should not exceed 60 seconds (see Table 1/U.11, remarks relating to the call-connected signal).

Type D signalling (Recommendation U.12)

The time taken from the end of selection signal, CSC code No. 11, to the call connected signal should not exceed 90 seconds (see Recommendation U.12, § 3.11).

Note – It should be noted that for type A, B and C signalling, the same timings pertain to service signals (**NP**, **NC**, **NA**, **OCC**, etc.), and that in addition for type D signalling the same timing pertains to the last backward path signalling characters and terminating-through connection.

3.3.6 For technical or operational reasons, e.g. when the time-out requirements of § 3.3.5 cannot be met, the home MSC (or home location register) of the called ship station may offer the calling subscriber, by an appropriate service code, a store-and-forward service for forwarding the call to the ship.

3.4 *MSCs not connected to location registers*

3.4.1 In the case of MSCs not connected to location registers, the calling telex subscriber must know the actual location of the called ship, e.g. country, MSC, coast station.

This situation would correspond to the *level 2* of operation as described in § 3.2.3 of Recommendation F.121. The required selection procedure is given in Recommendation F.121.

3.4.2 Two-stage selection may be used where the first stage is used for accessing the required MSC (or coast station) and the second stage for transferring the ship station number. This procedure would allow ship station numbers to consist of up to 9 digits.

Note – Two-stage selection may be difficult from an automatic terminal.

3.4.3 If the called ship does not respond to the call, the MSC (or coast station) should return the service code ABS or another more suitable service code.

3.5 *Service codes*

For unsuccessful calls, the MSC (or coast station) should return service codes as defined in Recommendation F.131.

3.6 *Maritime answerback code*

The answerback of the ship station should be in accordance with Recommendation F.130. The MSC (or the coast station) should ensure that the answerback which is sent into the telex network consists of 20 consecutive characters sent at cadence speed.

4 Maritime group calls

4.1 The composition of a group call address is defined in Recommendation F.120.

4.2 If group call services are at all permitted in the maritime VHF/UHF service, the MSCs (or coast stations) should only permit such calls from authorized telex subscribers.

The authorization may be established in one of the following ways:

i) when type A, B or C signalling is used between the MSC (coast station) and the telex network, the WRU answerback sequence should apply,

ii) when type D signalling is used, the calling line identification procedure should apply. If Control Signalling Code No. 12 is received, the WRU/answerback procedure defined above should be used.

4.3 Calls from unauthorized subscribers should be cleared with the service code **NA**.

ANNEX A

(to Recommendation U.67)

Use of location registers in the maritime VHF/UHF service

A.1 For the automatic maritime VHF/UHF radiotelephone service, CCIR Recommendation 586 describes the procedures to be used on the radio path for updating of location information. A similar procedure would be applicable for the radiotelex service. The location updating is initiated by the ship station when the station detects a change in the coast station identity after the criteria given in CCIR Recommendation 587.

A.2 Each MSC is connected to a location register which keeps an updated list of the current location of all ship stations registered in that MSC (the home MSC of the stations). The home MSC of a ship station should be uniquely determined from the MID and possibly one or two additional digits of the ship station number.

The location registers are interconnected for mutual updating of the location of ship stations.

A.3 Insofar as routing of telex calls to ships is concerned, there are several possibilities:

A.3.1 The telex call is always routed directly to the home MSC by the procedures given in § 3.3.3 i). If the called ship is at another MSC (a visited MSC) than the home MSC, the call is rerouted by the home MSC to the appropriate destination.

A.3.2 The call is routed to an MSC or location register in the calling subscriber's country by the method given in § 3.3.3 ii). The further routing of the call may then be done by either of the following methods:

i) the call is routed to the home MSC and, if required, rerouted by that MSC as described in § A.3.1 above;

ii) the MSC in the country of origin interrogates the home location register of the mobile station in order to obtain the required routing information. If the called ship station is located in some visited MSC, the MSC may then route the call directly to the required destination.

GENERAL REQUIREMENTS TO BE MET IN INTERFACING THE INTERNATIONAL TELEX NETWORK WITH THE MARITIME "DIRECT PRINTING" SYSTEM

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that it is desirable that the interface between the international telex service and the maritime "direct printing" system be defined;

(b) that the CCIR is charged with the task of making Recommendations relating to the radio path;

(c) that explanation of the details of the interface between the international telex network and the maritime "direct printing" system would be of assistance to the CCIR,

unanimously recommends

that the following points should be taken into consideration when interfacing the maritime "direct printing" system to the telex network:

1 General

1.1 The maritime "direct printing" system should be capable of interfacing the international telex network in one or more ways:

- in accordance with Recommendations U.1, U.11 and U.12 for direct real-time operation,
- in accordance with Recommendation F.132 for ship originated access to maritime store-and-forward units,
- in accordance with procedures defined in Series F and U Recommendations for store-and-forward access by terrestrial subscribers.

1.2 Answerback signals from the ship should be obtained both at the beginning and at the end of the call. When such signals are transmitted into the telex network, the coast station should make sure that they consist of 20 consecutive characters and are sent at cadence speed.

The answerback should be in accordance with Recommendation F.130.

1.3 If the coast station detects an end of telex message signal from the ship, the existing terrestrial connection (if any) must be cleared down and a new connection established for the next telex message. This should apply also when the next message is intended for the same terrestrial subscriber.

1.4 For ship originated calls, the coast station should be capable of returning to the ship any service codes received from the telex network.

1.5 For land originated calls, service codes should be returned to the telex network in accordance with Recommendation F.131.

2 Special conditions related to ship originated calls

2.1 The selection signals received from the ship should have formats in accordance with Recommendation F.60, § 3.2.2.

2.2 When accessing a maritime store-and-forward unit, the call control procedures should be in accordance with the relevant Recommendations in the Series F and U.

2.3 For direct access into the telex network, the normal telex procedures given in Recommendations U.1, U.11 and U.12 should be followed. In particular, the requirements given in these Recommendations with regard to the sending of selection signals, end of selection signals and class of traffic signals should be observed:

- Recommendation U.1, § 6,
- Recommendation U.11, §§ 7 and 9,
- Recommendation U.12, § 3.5.

3 Special conditions related to land originated calls

3.1 For direct access from the telex network, the time-out requirements of Recommendation U.1, U.11 and U.12 should be observed:

Types A and B signalling (Recommendation U.1)

The time from the end of selection, combination No. 26 (+), or last selection character received and the return of the call connected signal should not exceed 60 seconds.

Type C signalling (Recommendation U.11)

The time taken from the end of selection signal, combination No. 26 (+), to the call-connected signal should not exceed 60 seconds (see Table 1/U.11, remarks relating to the call-connected signal).

Type D signalling (Recommendation U.12)

The time taken from the end of selection signal, CSC code No. 11, to the call connected signal should not exceed 90 seconds (see Recommendation U.12, § 3.11).

Note – It should be noted that for types A, B and C signalling, the same timings pertain to service signals (**NP**, **NC**, **NA**, **OCC**, etc.), and that in addition for type D signalling the same timing pertains to the last backward path signalling characters and terminating-through-connection.

3.2 If the time-out requirements cannot be met, the coast station may offer the calling subscriber, by an appropriate service code, a store-and-forward unit for forwarding the call to the ship.

4 Maritime group calls

The provisions given in Recommendation U.62, § 4 apply.

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SECTION 7

INTERWORKING BETWEEN NEW INFORMATION SERVICES AND TELEX

Recommendation U.70

TELEX SERVICE SIGNALS FOR TELEX TO TELETEX INTERWORKING

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that a basic interworking on international connections will be at 50 bauds using an international telex network and that any telex subscriber can call conversion facilities in various countries;

(b) that Recommendation F.201 specifies:

- that a validation of a called Teletex terminal is mandatory. The validation is performed either by a direct validation call or by a data base access;
- that if a message delivery to a Teletex terminal fails in the case of interworking with two-stage selection procedure, the conversion facility should send a non-delivery notification to a telex terminal;

(c) that Recommendation S.90 specifies Teletex requirements for interworking with the telex service and Recommendations S.62 and S.70 specify control procedures and a network-independent basic transport service for a Teletex;

(d) that Recommendation X.96 specifies call progress signals in a public data network,

unanimously declares the following view

1 Scope

This Recommendation defines service signals which are to be sent back to the telex terminal in the event of unsuccessful validation for called Teletex terminal addresses, and service signals of the last delivery attempt to the Teletex terminal which are to be sent to the telex terminal as a part of non-delivery notification.

TABLE 1/U.70

Service signals for unsuccessful validation call and non-delivery notification

		Abnormal conditions	Service signals
Lower Level Protocols	PSDN and CSDN	Call-progress signals	
		No connection	NC
		Selection signal transmission error	NC
		Local procedure error	NC
		Network congestion	NC
		Invalid facility request	NC
		Change number	NCH
		Not obtainable	NP
		Access barred	NA
		Incompatible user class of service	NA
		Incompatible destination	NC
		Out of order	DER
		Network fault in local loop	DER
		DCE power off	ABS
		Uncontrolled not ready	DER
		Controlled not ready	ABS
		Number busy	OCC
		Call information service	INF
		Remote procedure error	DER
		Long-term network congestion	NC
		DTE originated	DER
		Carrier-off	NC
		No response (time-out)	DER
Lower Level	PSTN	Carrier off	NC
		Ring-back tone (No reply) [a]	ABS
		No dial tone [a]	NC
		Busy [a]	OCC
		Equipment engaged [a]	NC
		Number unobtainable [a]	NP
		No tone [a]	NP
Higher Level Protocols	Transport Layer	Transport Connection Clear (TCC) receipt	
		Reason not specified	DER
		Terminal occupied	OCC
		Terminal out of order	DER
		Address unknown	NP
		Transport Block Reject (TBR) receipt	
		Reason not specified	DER
		Function not implemented	DER
		Invalid block	DER
		Invalid parameter	DER
		Illegal command/response receipt	DER
		No response	DER
	Session Layer	Incorrect terminal identifier in Response Session Start Positive (RSSP)	NP
		Response Session Start Negative (RSSN) receipt	
		No specific reason stated	DER
		Memory full or out of recording paper	DER
		Explicit text message	DER
		Command Session Abort (CSA) receipt	
		Local terminal error	DER
		Unrecoverable procedural error	DER
		Reason not defined	DER
		Illegal command/response receipt	DER
		No response	DER
	Document Layer [b]	Response Document Page Boundary Negative (RDPBN) receipt	
		No specific reason stated	DER
		Memory full or out of recording paper	DER
		Sequence error	DER
		Local terminal error	DER
		Unrecoverable procedural error	DER
		Response Document General Reject (RDGR) receipt	DER
		Illegal command/response receipt	DER
		No response	DER

[a] It is recognized that these abnormal conditions can be detected if the automatic calling procedures incorporate detection facilities.

[b] Optional (if negotiation is not carried out).

PSDN Packed switched data network
CSDN Circuit switched data network
PSTN Public switched telephone network

2 Principles

The following principles should be taken into consideration:

2.1 Call progress signals arriving from the Teletex network will be converted without changing their original meaning as far as possible.

2.2 A faulty condition between the Teletex network and the conversion facility will be regarded as a faulty condition within the network.

2.3 A faulty condition between the Teletex network and the Teletex terminal will be regarded as a fault of the terminal.

3 Telex service signals

In general, telex service signals specified in Recommendation F.60 should be used. However, the telex service signals listed below will be used in the following circumstances:

3.1 If the format of the Teletex address part is incorrect, the service signal **NP** will be returned.

3.2 If the direct validation call is unsuccessful, the conversion facility will transmit the service signals specified in Table 1/U.70 to the telex terminal.

3.3 If the validation by data base access is unsuccessful, the conversion facility will transmit the service signals specified in Table 2/U.70.

3.4 If the message delivery to the Teletex terminal is unsuccessful, the conversion facility will transmit the service signals of the last delivery attempt which are specified in Table 1/U.70, as a part of non-delivery notification to the telex terminal.

TABLE 2/U.70

Service signals for unsuccessful validation by data base access

Abnormal conditions	Service signal
Unsuccessful results	**NP**

Note – In addition to the case "the number does not exist", other cases, for example, "the number is being temporarily prohibited" or "the number is out of order", might be considered as abnormal conditions. But at this moment such conditions and the service signals corresponding to them are for further study.

EXTRACTION OF TELEX SELECTION INFORMATION FROM A CALLING TELEX ANSWERBACK

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that there is a need for automatic address extraction from a telex answerback (e.g. access to a telex-Teletex conversion facility (CF) or an SFU);

(b) that Recommendation F.60 defines a preferred structure for the telex answerback;

(c) that different forms of answerbacks exist,

unanimously declares

that answerbacks are considered "technically processable" (i.e., the answerback can be interpreted unambiguously to determine the F.69 code and national call number) if they contain the minimum fields defined in Recommendation F.60, separated by detectable delimiters, with allowance made for the following additions:

- F.60 fields may or may not be in the preferred order;
- the Telex Network Identification Code (TNIC) should be preceded and succeeded by detectable delimiters:
  - i) preceding delimiters are national call number and space,
  - ii) succeeding delimiters are national call number, space or end of answerback (end of answerback means no more printable characters);
- one hyphen or one space with the national call number is ignored;
- the corresponding international access code for the "J" TNIC is:
  - i) 72, if the national call number consists of 5 digits,
  - ii) 720, if the national call number consists of less or more than 5 digits.

The international access code for all other TNICs follows Recommendation F.69. For conversion between TNICs and F.69 codes, see also Recommendation F.69.

An algorithm which meets the preceding criteria is shown in Figure 1/U.74.

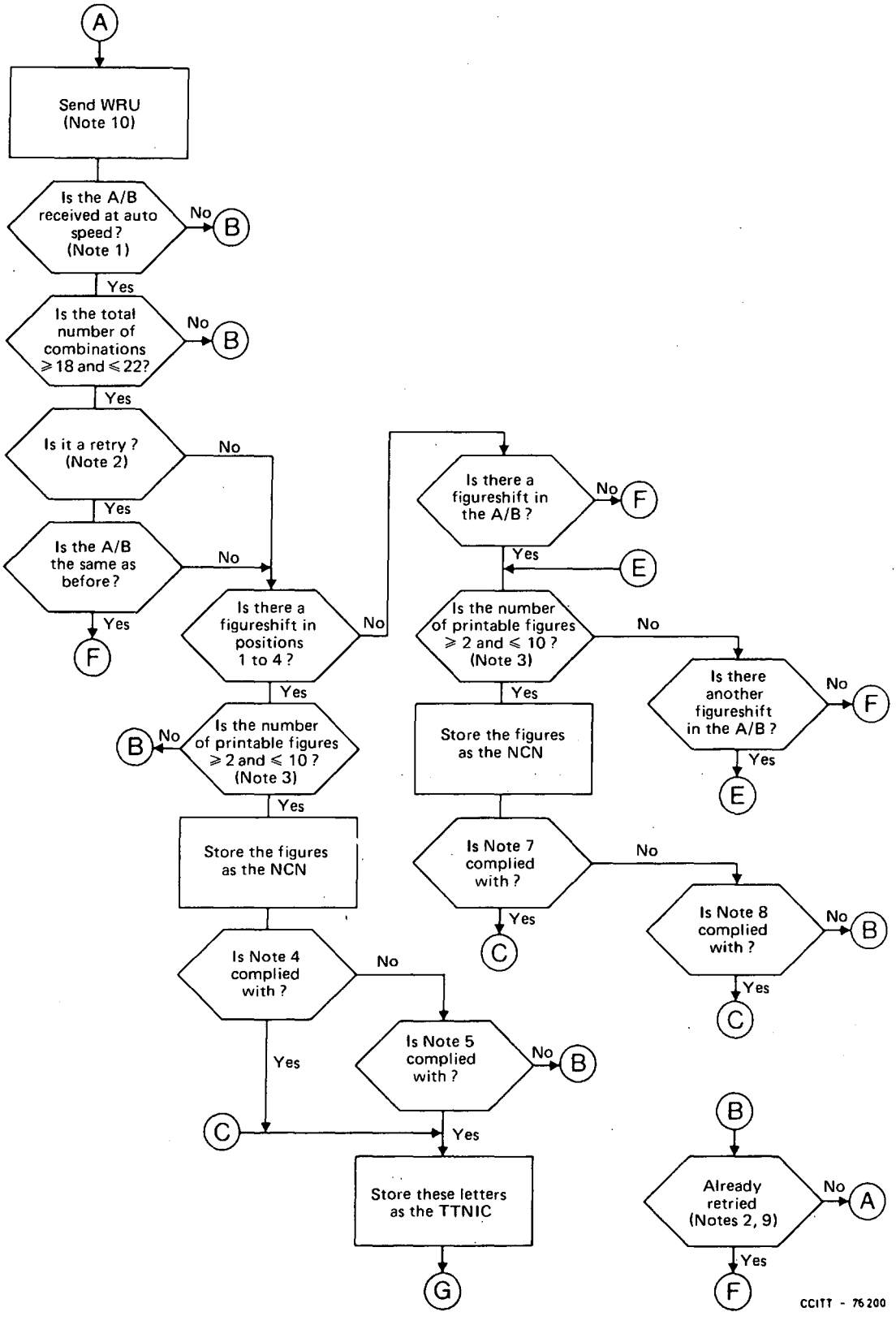
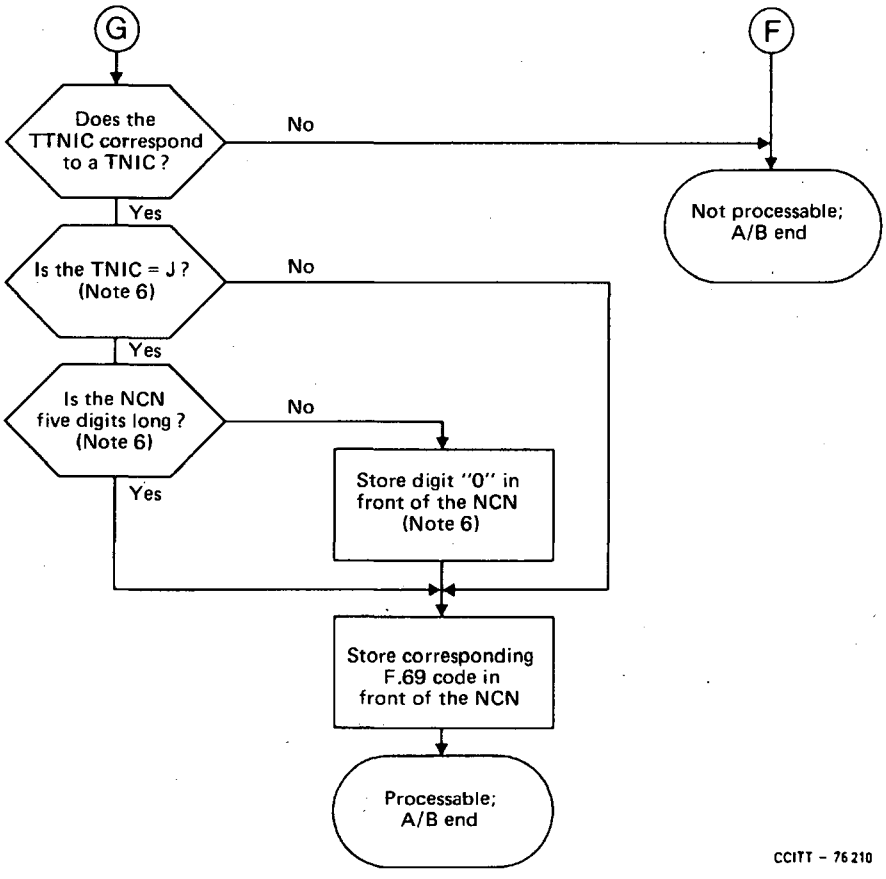


FIGURE 1/U.74 (Sheet 1 of 2)

Evaluation of a telex answerback



NCN	National call number
TTNIC	Temporary telex network identification code
TNIC	Telex network identification code
A/B	Answerback

FIGURE 1/U.74 (Sheet 2 of 2)

Evaluation of a telex answerback

Note 1 – Check the automatic emitting speed and wait for the end of the answerback. The answerback is considered to have ended after detection of a 300 ms period of idle.

Note 2 – "Retry" refers to another attempt to trigger the answerback.

Note 3 – Printable figures are combination No. 17 (1) to Combination No. 16 (0). Spaces and hyphens are allowed in this field, but are ignored.

Note 4 – Are there one or two printable letters at the end of the answerback, preceded by a space?

Note 5 – Are there one or two printable letters following immediately the "national call number" (without space between), with space after them?

Note 6 – In the case of a letter code single "J" corresponding F.69 code is:

- 72, if the "national call number" is 5 digits long.
- 720, if the "national call number" is less or more than 5 digits.

Note 7 – Are there one or two printable letters following the "national call number", and is there no further printable character following? One space between "national call number" and network identification code is allowed.

Note 8 – Are there one or two printable letters preceding immediately the "national call number" (without space between), but with a space in front of the letter(s).

Note 9 – If unsuccessful, perform one retry after 1.5 seconds, if allowed in the protocol.

Note 10 – If answerback is not received automatically.

AUTOMATIC CALLED TELEX ANSWERBACK CHECK

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that there is a need to check the answerback of the called telex number [e.g. delivery from a telex-Teletex conversion facility (CF)/ or store and forward unit (SFU)];

(b) that Recommendation F.60 defines a preferred structure for the telex answerback;

(c) that different forms of answerback exist,

unanimously declares

that the following requirements are recommended for automatic answerback check of a called telex terminal by an administration's equipment:

1 Case 1: reference information for the check is provided by the calling subscriber

This information can be in total or part of the called subscriber answerback (contiguous printable characters and space). There is no restriction on the number of characters supplied.

In this case, the called party answerback check consists of verifying the presence of the provided character string. Considering the information provided in the directories and terminal identifications, allowance is to be made for the following differences:

- one character mismatch in the letter part;
- one hyphen or one space is ignored in the national call number.

2 Case 2: no information on the answerback of the called terminal is provided by the calling suscriber

The reference information for the answerback check is the selection information provided by the calling subscriber.

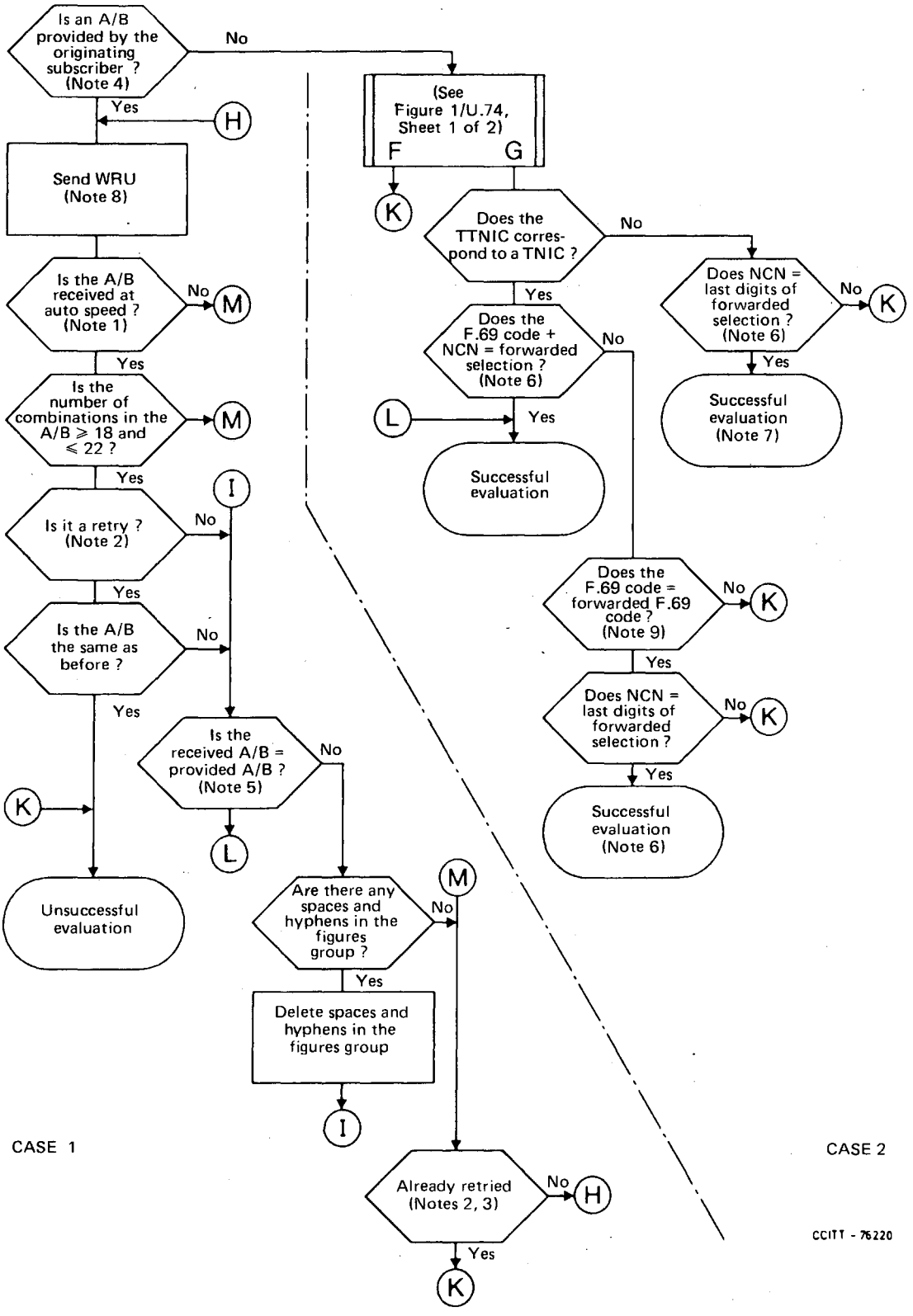
In this case, the called party answerback check consists of:

- extracting the national call number and F.69 code from the answerback;
- comparing the obtained national call number and F.69 code with the supplied selection information code. Allowance is made for the following cases of mismatch:
  a) a positive national call number match without a valid telex national identification code (TNIC) match,
  b) a match between the least significant part of the supplied selection information and the national call number obtained from the called party answerback, considered to be positive if the difference in field length is limited to two characters.

3 An algorithm which meets the preceding criteria for cases 1 and 2 is shown in Figure 1/U.75

In some circumstances, it may be necessary to compare the answerback of the called subscriber with the answerback received and recognized at the beginning of the call.

In such cases, if the received string consists of more characters than the previously recognized answerback, then a check should be made as to whether the recognized answerback is part of the received string.



A/B Answerback
TTNIC Temporary telex network identification code
TNIC Telex network identification code

FIGURE 1/U.75

Evaluation of called telex answerback

Note 1 – Check the automatic emitting speed and wait for the end of the answerback. The answerback is considered to have ended after detection of a 300 ms period of idle.

Note 2 – "Retry" refers to another attempt to trigger the answerback.

Note 3 – If unsuccessful, perform one retry if allowed in the protocol.

Note 4 – The answerback provided could be a contiguous part of the expected answerback or all of it.

In case of a return call to the calling subscriber (e.g. PDN (positive delivery notification) or NDN (negative delivery notification) delivery) the stored calling telex answerback is considered as a "provided" one.

Note 5 – This comparison is to verify the presence of the provided character string in the received answerback, allowing one character mismatch in the letter part.

Note 6 – A zero in the selection, but not in the answerback in front of the national number is to be ignored. If the received figure group is shorter than the selected one, consider it as match, but make a note in the call record "received figure group is not complete". It is possible that the received figure group includes the F.69 code.

Note 7 – Forward message, but make a note "area code-check was not possible" into the call record.

Note 8 – If called A/B is not available from previous procedures.

Note 9 – If a digit "0" appears at this stage between the F.69 code and the "NCN" it should be ignored.

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SECTION 8

TELEX STORE AND FORWARD

Recommendation U.80

INTERNATIONAL TELEX STORE AND FORWARD ACCESS FROM TELEX

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that telex store and forward units exist, and are being introduced increasingly into national networks;

(b) that access procedures and protocols differ significantly between different units;

(c) that to facilitate international access to store and forward units, a standard access procedure would be desirable;

unanimously declares the view

that the telex access procedure described in this Recommendation should be adopted for all future store and forward units providing incoming international telex access.

1 Scope

1.1 This Recommendation describes a procedure for a telex subscriber to gain access to a store and forward unit in a foreign country by using an international telex switched connection. The procedure uses two stage selection.

1.2 This Recommendation is one of a series which define telex store and forward services. The other Recommendations are:

- Recommendation F.72: International telex store and forward espace – espace General principles and operational aspects.
- Recommendation U.81: International telex store and forward espace – espace Delivery to telex.
- Recommendation U.82: International telex store and forward espace – espace Interconnection of telex store and forward units.

2 Outline of service features

2.1 The full range of service features is described in more detail in Recommendation F.72.

2.2 *Service principles*

2.2.1 The procedure defined in this Recommendation is a two stage selection procedure whereby a calling telex subscriber gains access to a foreign store and forward unit (SFU) in the first stage of selection and inputs the called address(es) and message in the second stage of selection, after the return of a call connected signal.

The option of a store and retrieval facility is for further study.

2.2.2 International access to the SFU should be offered on the basis of bilateral agreement between Administrations, and barring facilities should be provided to prevent unauthorised use. The method of barring shall be the responsibility of the Administration of the SFU service and is beyond the scope of this Recommendation. It may also be necessary for Administrations to make provision to selectively bar access to international telex SFU facilities in other countries.

2.2.3 Message input from both manual and automatic emitting devices should be accommodated. It is also possible that messages may be received from another SFU, and this type of input should also be accommodated by bilateral agreement.

2.2.4 For calling subscribers with answerbacks that cannot be processed to obtain the calling address, the SFU shall be able to handle direct input of the address from the subscriber, with or without prompt.

2.2.5 A status enquiry facility should be provided internationally to provide information on message delivery in response to a request from the originator. This message status enquiry point will be accessed by a separate access code to that used for message input.

If the SFU provides automatic advice of delivery and non-delivery facilities then the provision of status enquiry facilities is optional.

2.2.6 The input message should be accepted without validation of the address(es) of the called telex subscriber and therefore delivery of the message to that address cannot be guaranteed.

3 Outline of facilities

3.1 The full range of facilities is described in more detail in Recommendation F.72.

3.2 *Message input access*

3.2.1 Provision should be made for both single and multi-addressed calls.

3.2.2 Messages received by the SFU for delivery to destinations not served by that SFU should be given a Non-Delivery Notification with service code NA for the reason of non-delivery.

3.2.3 The maximum acceptable number of addresses in a multi-address call shall be agreed between Administrations, but should be at least 20. If the maximum number of addresses is exceeded, the SFU shall return the service code TMA and clear the connection.

3.2.4 An attention information field facility should be provided by the SFU which enables each addressee of a multi-address message to have a relevant attention prefix preceding the message.

3.2.5 Three classes of delivery service should be provided by the SFU:

a) normal delivery. The SFU delivers the message as soon as operationally feasible after receipt;

b) delayed delivery. The delay can be either:
   i) set by the Administration offering the SFU service, if the calling customer selects this option,
   ii) set by the calling subscriber, such that delivery of the message is not attempted until after the expiration of the indicated delay;

c) time limited delivery set by the calling subscriber, such that delivery of the message is attempted within a specified time limit.

The desired class of delivery should be selectable on a destination address basis.

3.2.6 Message reference number(s) should be returned to the calling subscriber.

3.2.7 Address correction procedures are considered desirable and may be provided.

3.2.8 Provision should be made to accept follow-on message(s) with their associated address(es) which may be sent as separate block(s) immediately after the first message. Provision should also be made to acknowledge acceptance of messages, if requested by the calling terminal, at any point during a transaction.

3.2.9 The SFU shall not accept the input of a message or follow-on messages (in the message input mode) unless adequate storage is available. The minimum storage available per message text input should be agreed bilaterally between Administrations. However, it is recommended that the minimum storage available on a per message basis should be 24 000 characters. For an interim period 12 000 characters is acceptable. Longer messages may be accepted if storage continues to be available.

3.2.10 An Input Transaction Accepted for Delivery (ITD) service signal should be returned to the calling subscriber to indicate that the SFU has accepted the message.

3.2.11 The following facilities are not accommodated in the procedures, do not form part of this Recommendation and are for further study:

a) use of pre-recorded address lists;

b) message editing facilities;

c) address collation facilities;

d) requests for positive delivery advices;

e) transparent mode in message input phase;

f) called address format checks.

3.3 *Status enquiry access*

3.3.1 Status information on messages should only be available for return to the originator of the message.

3.3.2 Status information may be requested on:

a) all addresses associated with a message reference number;

b) addresses which have not yet received the message;

c) a specific address.

4 Access procedures

4.1 *General*

4.1.1 Two basic access procedures should be provided:

a) *Interactive operation*

Input from manual calling terminals, where the SFU may return prompt signals.

b) *Non-interactive operation*

- Either, input from automatic emitting devices or from subscribers' terminals, where prompt signals from the SFU are not required;
- or, input from another SFU

Note – detection of this type of access will rely on the identification of the calling SFU answerback, the format of this answerback is for further study.

In this case the procedure used is described in Recommendation U.82.

4.1.2 Figure 1/U.80 shows the recommended access procedures.

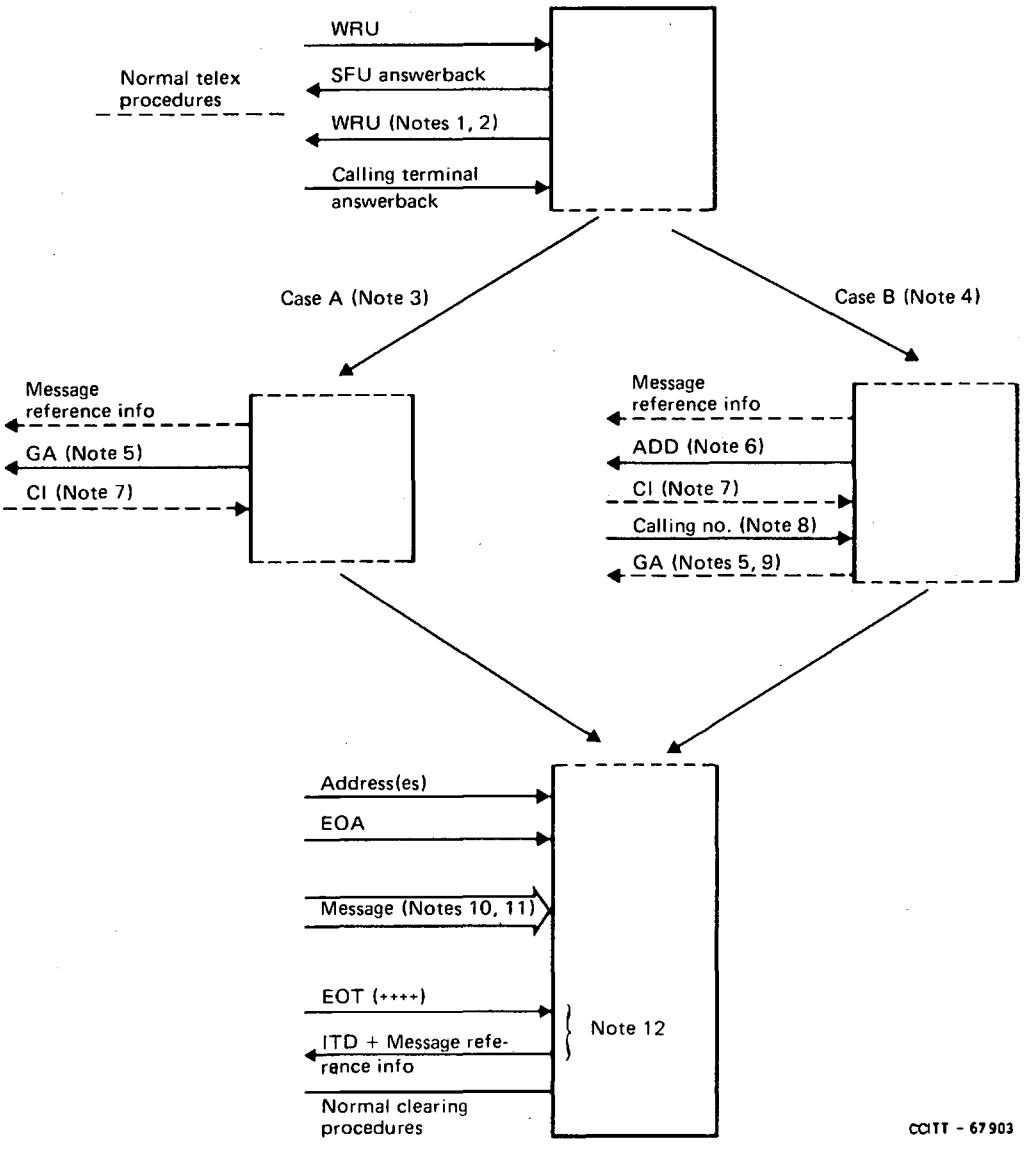


FIGURE 1/U.80

SFU access protocol

Note 1 – The WRU is transmitted 800 ms after transmission of the SFU answerback if the forward path remains idle.

Note 2 – One additional WRU shall be transmitted by the SFU if:

a) there was no response to the first WRU.

b) signals were received after the first WRU which could not be identified as an answerback.

This second WRU should be transmitted when a 300 ms idle condition has been detected from the calling terminal at least 10 seconds after the transmission of the first WRU.

Note 3 – Case A: Procedure when calling address can be determined from the calling terminal answerback.

Note 4 – Case B: Procedure when calling address cannot be determined from the calling terminal answerback.

Note 5 – In Case A the prompt GA shall be transmitted immediately after the message reference information.

In Case B the prompt GA shall normally be transmitted after receipt of the calling number.

Note 6 – The prompt "ADD" is used in Case B only and shall be transmitted immmediately after the message reference number.

Note 7 – The service request CI is transmitted when the terminal is operating in a non-interactive mode (e.g. an automatic terminal or a manual terminal using a tape transmitter).

Note 8 – If the calling address is expected and is not received within 15 seconds of the original "ADD" prompt, a further prompt shall be transmitted. The procedure is shown in Figure 2/U.80.

The calling address should be input in the format F.69 destination code followed by the national telex number followed by at least 2 carriage returns, line feed sequences when received in the non-interactive mode.

Note 9 – The prompt GA is inhibited in Case B if the service request CI has been received.

Note 10 – Several messages can be contained within the same transaction and are separated by EOM sequences, as in Figure 3/U.80.

Note 11 – The EOM signal may optionally be followed directly by an ACK request signal. The sequence will then be as shown in Figure 4/U.80.

Immediately following transmission of an IMA, the SFU shall return reference information for previous unacknowledged messages, the signal ←≡↓**GA**←≡ and then be prepared to accept further follow-on messages.

Note 12 – Following receipt of the EOT signal the SFU shall operate as shown in Figure 5/U.80.

a) If the EOT signal originated from a non-interactive telex terminal, the SFU should wait for up to 2 seconds for a WRU signal. If WRU is received, the SFU should return its answerback followed immediately by the ITD sequence. If WRU is not received in the 2 second period, the SFU should return the ITD sequence;

b) If the EOT signal originated from an interactive telex terminal, the SFU should return the ITD sequence as soon as possible;

c) The ITD signal and associated reference information must be returned within 5 seconds of the EOT signal.

Note 13 – If a WRU signal is received at any time during the procedure, the SFU shall return its own answerback.

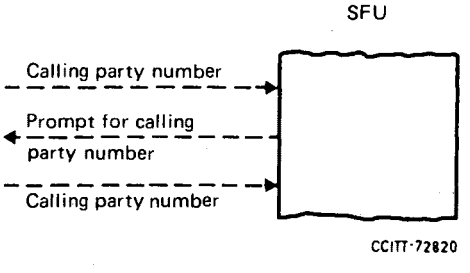


FIGURE 2/U.80

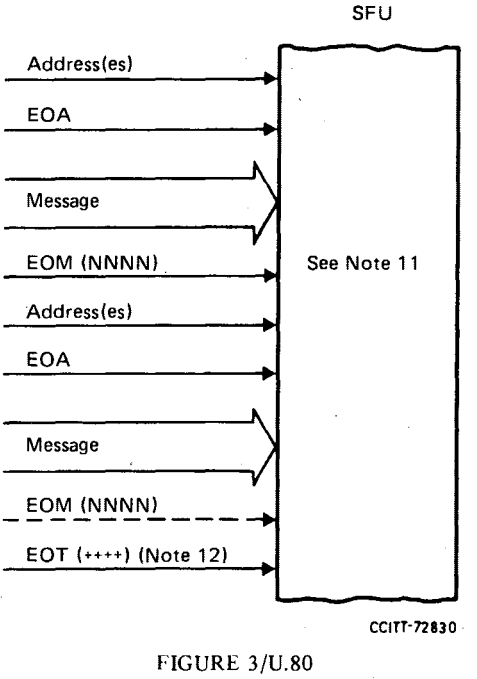


FIGURE 3/U.80

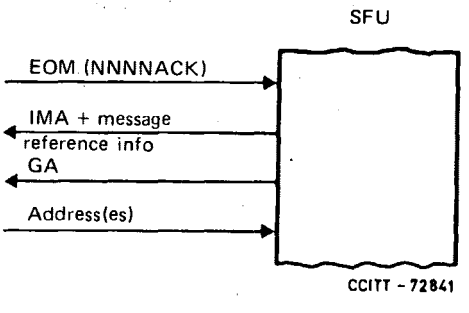


FIGURE 4/U.80

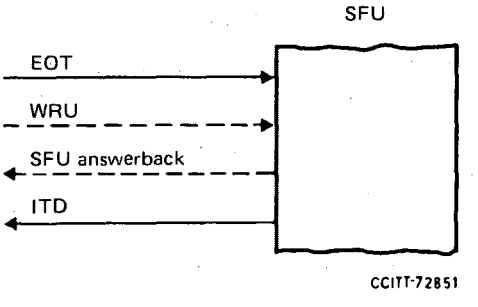


FIGURE 5/U.80

4.2 *Telex access*

4.2.1 The calling telex subscriber should establish a call to the SFU by means of normal telex procedures.

4.2.2 Following transmission of the SFU answerback, the SFU should not send a WRU immediately. The SFU should monitor the forward path and transmit the WRU only when an idle condition has persisted for at least 800 ms. If a 800 ms idle condition has not been detected within 15 s of the transmission of the SFU answerback, the call should be cleared.

Note – SFU answerback is not returned if the SFU cannot accept the guaranteed message length (see § 3.2.9). In this case OCC is returned.

4.2.3 An additional WRU should be transmitted if:

a) there is no response to the first WRU;

b) signals were received after the first WRU that could not be identified as an answerback.

The second WRU should be sent when a 300 ms idle condition has been received from the calling terminal at least 10 s after the transmission of the first WRU.

Note – The 300 ms and 10 s periods suggested here are provisional and may need to be changed in the light of experience.

If a continuous input of signals is detected for 15 seconds after the return of the SFU answerback, the SFU shall clear the call.

4.3 *Message reference information*

4.3.1 *Date and time*

4.3.1.1 The date and time of message input may be returned to the calling telex subscriber before message input. This date and time information would be returned within 300 ms of the capture of the calling answerback.

4.3.1.2 The transmitted date and time should be:

$$\leftarrow \equiv \uparrow YY-MM-DD/HH-NN$$

where

YY represents two numeric characters indicating the year;

MM represents two numeric characters indicating the month;

DD represents two numeric characters indicating the day;

HH represents two numeric characters indicating the hour on a 0-24 basis;

NN represents two numeric characters indicating the minute.

Note – Local time of the SFU should be used.

4.3.2 *Message reference number*

A message reference number may also be returned to the calling telex subscriber before message input.

The reference number would comprise up to six numeric characters and should follow immediately after the date and time information after a one space character.

The reference number should cycle through consecutively for follow-on messages within the same transaction. Accommodation should be made to cycle the last two or three digits for follow-on messages.

4.4 *Service request*

4.4.1 *Interactive service request*

The calling telex subscriber shall be recognized as interactive by the omission of the non-interactive service request (see § 4.4.2).

4.4.2 *Non-interactive service request*

The calling telex subscriber should indicate that the transmission is from an automatic terminal by commencing the procedure with the non-interactive service request (characters CI).

4.5 *Calling telex address*

4.5.1 The SFU shall use an algorithm (see Recommendation U.74) to attempt to determine the calling telex address from the captured calling answerback. If this cannot be achieved the SFU shall return a prompt signal (←≡↓**ADD**←≡) to solicit the calling subscriber number.

4.5.2 The calling address may be preceded by a CI character sequence which signifies the non-interactive service request (see § 4.4.2). The CI characters sequence may or may not be associated with carriage return, line feed or letter shift characters.

4.5.3 If the calling address is not received within 15 seconds of the original prompt signal (ADD), another prompt shall be returned once more to try to solicit the calling address. If another 15 seconds elapse the connection shall be cleared.

4.5.4 Address input can be cancelled (in the case of mistakes) using the same procedure as § 4.7.10.

4.5.5 The calling address should be input in the format: F.69 code followed by the national telex number and must be followed by at least two carriage return, line-feed sequences when received in the non-interactive operation. Spaces, hyphens, pluses and preceding zeros shall be ignored.

4.6 *Commence input signal*

If the calling address is capable of being extracted from the answerback (see § 4.5.1) then the SFU shall return a commence input signal comprising the characters ←≡↓**GA**←≡.

If the address is not capable of being extracted from the answerback, the SFU shall not return the GA sequence, but shall return the ADD prompt (see § 4.5.1).

In this latter case the GA prompt shall normally be returned immediately after the receipt of the calling address. However, the GA prompt should be inhibited if the service request CI precedes the calling address.

4.7 *Address input*

4.7.1 The format of each address line should be as follows:

a) address;
b) expected answerback or part of answerback;
c) attention information;
d) delayed delivery.

However, only field a) is mandatory to the subscriber. Each address line should not be longer than 69 printable or space characters. Each address line is normally delimited by carriage return and line feed.

Note 1 – Additional shift or carriage control characters have to be ignored.

Note 2 – Address lines containing more than 69 characters are for further study.

4.7.2 Each field within an address line should be delimited by different combinations for each field. These combinations will be:

Combination No. 26: +	End of each address
Combination No. 24: /	Start of expected answerback or part of answerback
Combination No. 11: (	Attention line information to be combined within these delimiters
Combination No. 12:)	
Combination No. 14: ,	Start of delayed delivery information

Note 1 – With the exception of combination No. 26 (+) the other combinations need not be used if the subscriber does not want to use those fields.

Note 2 – The optional fields may be input in any order.

Note 3 – Handling of abnormal conditions is for further study.

4.7.3 The SFU shall return a service signal (TMA) and clear the connection if the agreed maximum number of addresses is exceeded (see § 3.2.3).

4.7.4 The address line(s) shall be delimited from the message by means of an EOA signal which shall be:

←≡↓**BT**

It is acceptable for the EOA signal to appear on the same line as the last address.

4.7.5 *Address*

This field is the only mandatory field of the address line and is the called international telex address (in the format of the Recommendation F.69 destination code and national telex number).

The action of the SFU if addresses are not received with a valid format is for further study.

The address must be terminated by a combination No. 26 (+) whether or not optional fields are used.

4.7.6 *Expected answerback or part of answerback*

The character sequence in this field should be used as an additional check on the called subscriber answerback before the message is delivered. The inclusion of this field is optional.

4.7.7 *Attention information*

This field may convey the name and address of the recipient in a confidential manner. The inclusion of this field is optional.

4.7.8 *Delivery indicator*

This field indicates the type of delivery required. Omission of this field indicates that normal delivery is required. The format of the field should be:

a) D if the calling subscriber leaves the period of delay to the discretion of the Administration providing the SFU service;

b) DXY where XY are numeric characters which specify the minimum desired delay in hours from 01-23;

c) LXY where XY are numeric characters which specify the maximum limit for delivering the message to the addressee.

4.7.9 *Examples of the format of address lines:*

a) 41994531+/994531 FUG D, D

b) 41662724+(ATTENTION MR S SMITH), D12

c) 41246178+/246178 ADAC D (ATTENTION MR SMITH)

d) 4625000+

4.7.10 Address line editing facilities, if provided, should operate as follows:

Any address line entered may be cancelled by the receipt of two consecutive = = characters (upper case combination No. 22).

4.8 *Message input*

4.8.1 Characters received in the message text (with the exception of Figures D) should be transmitted transparently by the SFU.

4.8.2 § 6 details the action the SFU should undertake if abnormal conditions are encountered during message input.

4.9 *End of message (EOM) signal*

Normally, if the calling subscriber wants to input more than one message, an end of message signal is used. This may be one of two types as follows:

a) four combinations No. 14 (NNNN), which is simply used to separate messages;

b) four combinations No. 14, then combinations 1, 3 and 11 (NNNNACK) which is used to separate messages *and* to request the SFU for an input messsage acknowledgement (IMA) plus reference information of those messages not previously acknowledged (see § 4.11.4 for format).

Once this type of EOM is received the SFU shall accept responsibility for delivery of the message, even if the subscriber clears.

4.10 *End of transaction (EOT)*

4.10.1 The calling telex subscriber should indicate end of transaction by transmitting four combinations No. 26 to the SFU (+ + + +).

4.10.2 This signal is normally used at the end of the last (or single) message input during the transaction.

4.11 *Input transaction accepted for delivery signal (ITD)*

4.11.1 After receipt of the EOT signal from a non-interactive calling telex subscriber the SFU should wait up to 2 seconds to detect any further signals on the forward path. If a WRU signal is received in this period the SFU should respond with the SFU answerback followed by the ITD signal. If no further signals are received during this period the SFU should return the ITD signal, plus reference information (as in § 4.3) followed by clear.

4.11.2 After receipt of the EOT signal from an interactive telex terminal the SFU should return the ITD signal as soon as possible.

4.11.3 ITD reference information must be returned within 5 seconds of the EOT signal in § 4.11.1 and § 4.11.2 above to avoid excessive holding times.

4.11.4 The ITD signal should be followed by the date and time, message reference number(s) and an indication of the total number of messages. When more than one message has been received, the reference information returned shall be that of the first and last message, e.g.:

ITD YY-MM-DD/HH-NN

(XXXABC-XXXDEF) P

where

XXXABC is the first serial number

XXXDEF is the last serial number

P is the number of messages acknowledged.

5 Status enquiry

Note – This facility is for further study.

5.1 *Status enquiry request*

5.1.1 A calling telex subscriber, having selected the status enquiry point (see §§ 2.2.5 and 3.3) must give the SFU the following information:

a) the message reference information (see § 4.3);

b) an indication of whether the enquiry concerns all addresses associated with a message, *or* whether the enquiry concerns only address(es) which have not yet received the message, *or* a specified address.

Status report information should be provided for all addresses unless the message reference number is followed by combination No. 22 (=), which signifies that the enquiry concerns only addresses which have not yet received the message. Also, if this character is followed by an address, this shall signify a status request on a specific address. Several reference number lines may be entered each separated by carriage return, line feed.

Termination of a status enquiry request will be indicated by the end of status request signal (EOSR), combination No. 26 (+).

5.1.2 If characters are not received on the forward path within 3 seconds of the status enquiry mode being selected, the SFU shall return a prompt signal which shall comprise combination No.2 (?).

5.1.3 If a message reference number is not received either in full, or in part, within 20 seconds of the prompt being returned, the SFU should clear the connection.

5.1.4 If an EOSR signal is not received within 20 s of the message reference number(s) input, the SFU shall continue as if an EOSR signal had been received.

5.2 *The status report*

5.2.1 The status report format will be consistent with the notification advice format dealt with in Recommendation U.81.

Two types of status report are returned:

a) delivered;

b) not delivered.

See Recommendation U.81, § 4.3.6 for report formats.

6 Abnormal conditions during message input

6.1 *Telex subscriber clearing during text input without EOT*

The SFU shall not forward the message to the called telex subscriber(s)

The incomplete message should either be cancelled or optionally sent to an operator assistance position. Messages previously acknowledged in the same transaction shall be transmitted normally.

6.2 *Telex subscriber stopping transmission for a certain time without transmitting the EOT signal, or transmitting a partial or invalid EOT signal*

See Figure 6/U.80.

If at any time between the SFU returning the GA prompt (Case A), or the calling address prompt (Case B) and the detection of the EOT signal the SFU detects a 30 second period of idle, the following shall apply: the SFU shall send a GA prompt to the telex subscriber in order to request more information input (text, EOM or EOT). If after a further 30 s no more characters are received, the SFU shall:

a) either send BMC service code and clear the call (if the SFU cancels incomplete messages); or

b) clear the call (if the SFU sends the message to an operator assistance position).

If previous message(s) in the same transaction were delimited by NNNNACK, these shall be transmitted normally.

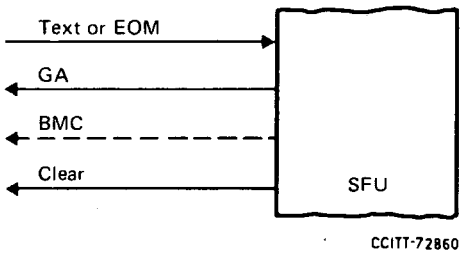


FIGURE 6/U.80

6.3 *Telex subscriber sending WRU to the SFU during text input*

The SFU should return its answerback after receiving a WRU. In addition, if:

a) WRU is followed by text, message input is continued after the SFU answerback. Also, the WRU is deleted from the message text.

b) WRU is followed by a clear from telex, the SFU proceeds in § 6.1 above.

c) WRU is followed by a lack of transmission (pause), the SFU proceeds as in § 6.2 above.

6.4 *Telex subscriber sending text after the EOT signal*

See Figure 7/U.80.

6.4.1 Any characters received between EOT and ITD (with the exception of WRU) will be ignored.

6.4.2 The SFU should immediately attempt to prevent further characters being sent by transmitting a sequence of TTT... characters for a maximum of 20 s.

6.4.3 If the calling terminal stops transmission for 150 ms within a 20 second period, the SFU shall return an ITD service signal followed by a clear.

6.4.4 If the terminal continues to transmit characters after the 20 second period, the SFU should forcefully clear the connection back to the calling terminal.

6.4.5 The SFU should attempt to deliver the message text received before EOT as for a normal message input.

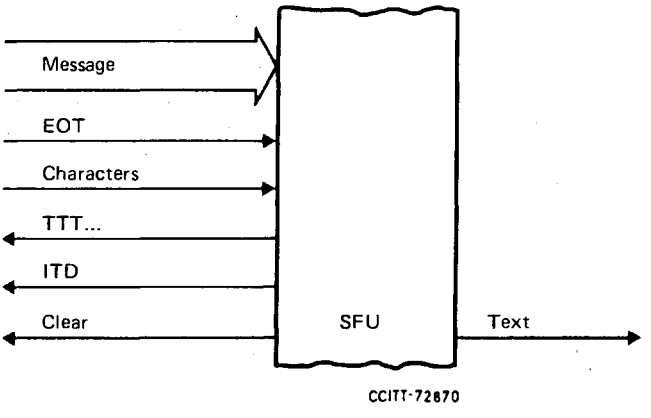


FIGURE 7/U.80

6.5 *Telex subscriber clearing after EOT, but before ITD*

The message shall be forwarded normally by the SFU under these circumstances.

6.6 *Telex subscriber sending national variants of ITA No. 2 alphabet (↑F, ↑G, ↑H)*

Since Recommendation F.60, § A.3.8 recommends that these combinations should not be used for international communications, the SFU should not monitor for their use and these combinations will be passed on to the called subscribers if received.

6.7 *Telex subscriber sending J, Bell combination (↑J)*

The SFU should also transmit this combination if received, to the called party.

6.8 *SFU storage capacity overflow during telex message input*

6.8.1 If the number of characters received by the SFU during a message input exceeds the available storage to that input (which may be greater than the agreed minimum storage, see § 3.2.9), the SFU should discard the excess characters, no attempt should be made by the SFU to overwrite previously stored characters.

6.8.2 When this occurs the SFU should immediately attempt to prevent the calling telex subscriber from sending further characters by transmitting a sequence of TTT... characters for a maximum of 20 s.

6.8.3 If the calling terminal stops transmission for 150 ms within a 20 second period, the SFU should return the message length exceeded indication (LDE) and then wait for the EOT or NNNNACK in accordance with § 6.2.

6.8.4 If the terminal continues to transmit characters after the 20 second period, the SFU should forcefully clear the connection back to the calling terminal.

6.8.5 If an EOT/NNNNACK is received within the 20 second period, the SFU should attempt to deliver the message text, accepted and stored, preceded by a special text prefix to indicate to the called telex subscriber that the message may be incomplete. If an EOT/NNNNACK is not received the SFU shall proceed as in § 6.1.

6.8.6 If the SFU has insufficient storage to receive messages (see § 3.2.9) it should still continue to process status enquiry requests.

6.9 *Maximum input duration exceeded*

If the time taken for a single transaction exceeds 2 hours, the SFU shall act in accordance with § 6.8.

6.10 *Repeated characters during message input*

The SFU shall be capable of detecting continuous reception of one character combination and shall recognize this as a "tape stuck" condition. The SFU shall detect this condition only after receipt of 80 identical combinations received consecutively. The SFU shall attempt to signal the calling terminal by transmitting a sequence of TTT... characters for a maximum of 20 s. If the character combinations become different the SFU shall continue with the message input and deliver all characters received. If the "tape struck" condition remains at the end of 20 s, the SFU shall clear the connection and follow the procedure outlined in § 6.1 above.

Recommendation U.81

INTERNATIONAL TELEX STORE AND FORWARD – DELIVERY TO TELEX

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) that telex store and forward units exist and are being introduced increasingly into national networks;

(b) that delivery procedures differ significantly between different units;

(c) that a standard delivery procedure would be desirable for international working,

unanimously declares the view

that the international telex delivery procedure described in this Recommendation should be adopted for all future telex store and forward units.

1 Scope

1.1 This Recommendation outlines procedures for the delivery of international telex messages by a store and forward unit (SFU).

1.2 The Recommendation comprises the following:

1.2.1 Message forwarding procedure.

1.2.2 Call retry procedures.

1.2.3 Notification procedure.

1.3 The procedures detailed in this Recommendation specify the minimum requirement that should be provided by the telex SFU.

1.4 The procedures should apply to all classes of message delivery.

1.5 The priority and time of message delivery should be the responsibility of the telex SFU that has accepted the input message for delivery.

In the case of international interworking between telex SFUs, the priority and time of message delivery may be controlled by the originating or destination SFU, subject to bilateral agreement between the Administrations concerned.

1.6 This Recommendation is one of a series which define telex store and forward services. These Recommendations are:

- Recommendation F.72: International telex store and forward – General principles and operational aspects.
- Recommendation U.80: International telex store and forward – Access from telex.
- Recommendation U.81: International telex store and forward – Delivery to telex.
- Recommendation U.82: International telex store and forward – International interconnection of telex store and forward units.

2 Definitions

2.1 The term **delivery of messages** applies to the forwarding of messages input into a telex SFU by an originating telex subscriber to a destination telex subscriber over an international telex network.

2.2 The term **notification** applies to the forwarding of an advice of delivery/non-delivery of a message to the originating telex subscriber over an international telex circuit.

3 Telex message forwarding procedures

3.1 The sequence of the message forwarding procedure components are illustrated in Figures 1/U.81 and 2/U.81.

3.2 The components of message forwarding procedures are as follows:

3.2.1 *Call set-up*

Call set-up is the establishment of a connection by an SFU over the telex network up to and including the receipt of the call connect signal.

In the event of an unsuccessful call set-up attempt, action shall be taken in accordance with § 5.

3.2.2 *Called subscriber answerback validation*

3.2.2.1 To ensure security of delivery the answerback of the called subscriber should be compared with the anticipated answerback of the called subscriber, if supplied by the originating telex subscriber.

3.2.2.2 The evaluation procedure is given in Recommendation U.75.

3.2.3 *Store and forward unit identification*

The telex SFU identification shall comprise:

- the service code CI,
- an indication that the call is from a telex SFU,
- the date and time of transmission (optional).

3.2.4 *Message identification*

The telex SFU should transmit to the called subscriber a message identification sequence comprising:

a) the message reference as allocated and advised to the originating subscriber at the time of input of the telex message for onward delivery;

b) the date and time of message input as issued to the originating telex subscriber in accordance with Recommendation U.80.

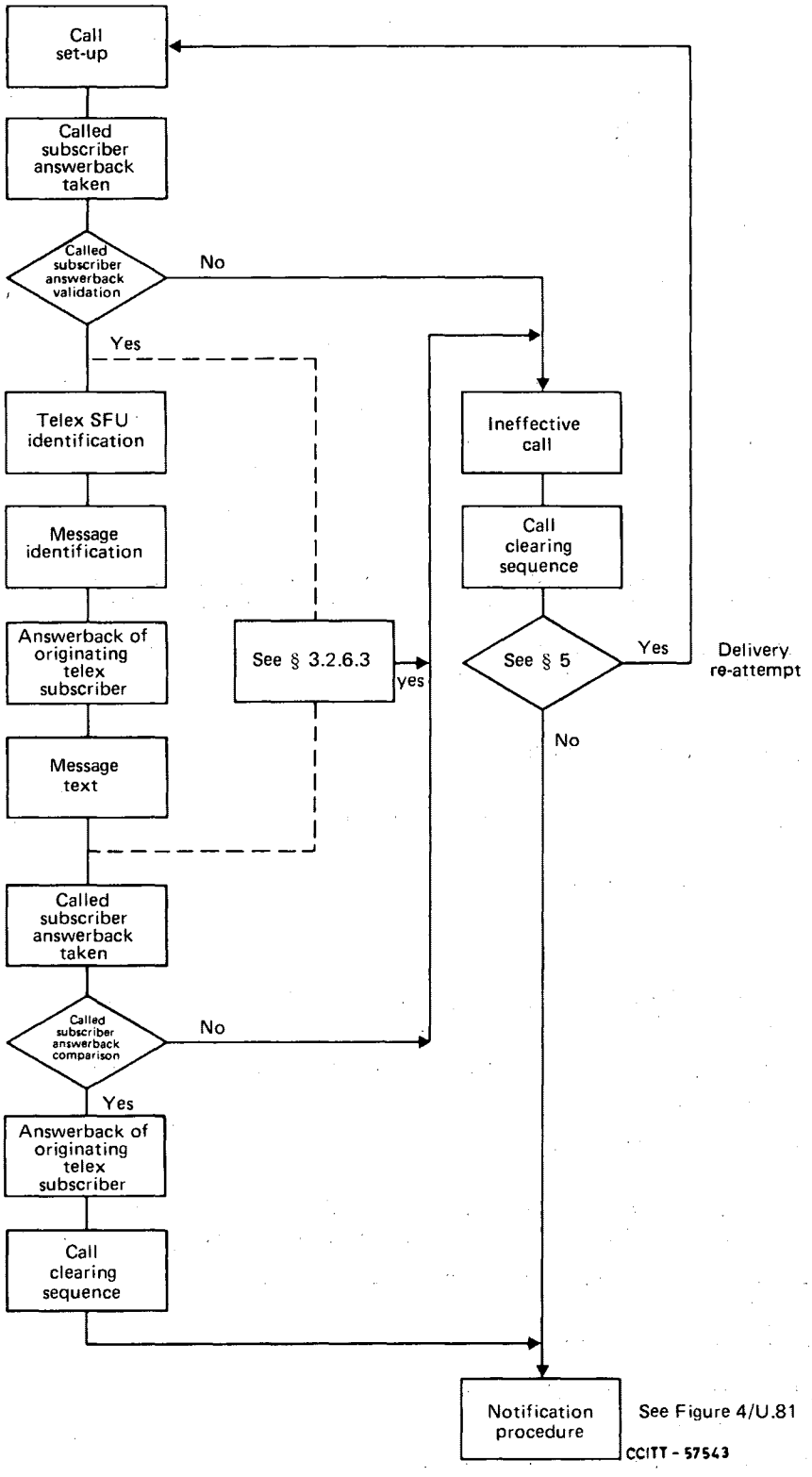
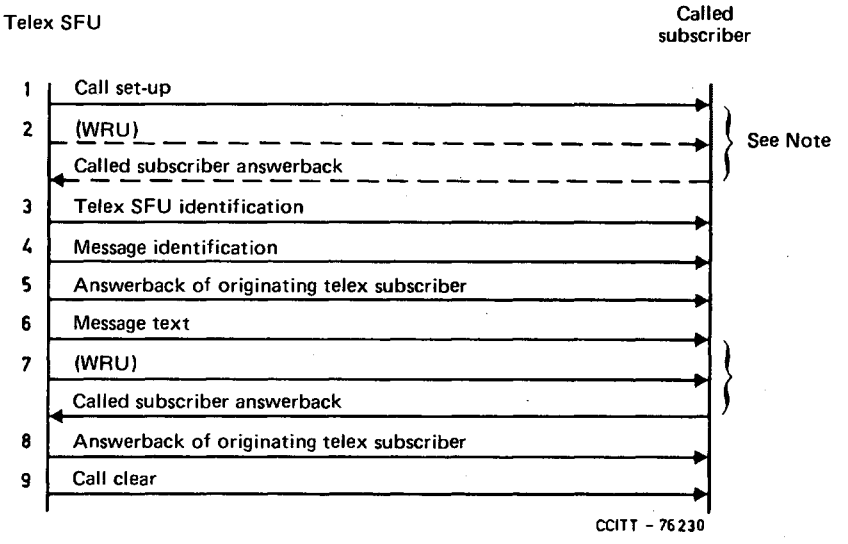


FIGURE 1/U.81

Telex message forwarding procedure



Note – Optional answerback capture if not available from Step 1.

FIGURE 2/U.81

Sequence of events for telex message forwarding procedure

3.2.5 *Answerback of originating telex subscriber*

The telex SFU shall transmit to the called subscriber the answerback of the originating subscriber as received at the time of message input.

3.2.6 *Message text*

3.2.6.1 The telex SFU should transmit to the called subscriber any message header information together with the stored message in the format in which it was originated by the calling subscriber.

3.2.6.2 The EOM/EOT separators and WRU shall not be transmitted.

3.2.6.3 If any signal is received on the backward path during the message text delivery, transmission of the message text shall be stopped for 2 seconds. If during that time further signals or a clearing condition is received, the call shall be cleared and the message delivery deemed unsuccessful, and action taken in accordance with § 5.4. If no further signals are seen on the backward path during that time, transmission of the message text shall be resumed.

3.2.7 *Called subscriber answerback comparison*

3.2.7.1 The answerback of the called subscriber shall be taken and compared with that received at the start of message delivery.

3.2.7.2 In the event of a mismatch of answerbacks, the answerback of the called subscriber shall be taken once again, and if there is a match with that received at the start of message delivery, the delivery of the message shall be deemed successful. If there is a second mismatch, the delivery of the message shall be considered as unsuccessful, and further delivery attempts shall be made in accordance with § 5.4.

3.2.8 *Answerback of originating telex subscriber*

The answerback of the originating subscriber, as per § 3.2.5, shall then be sent to the called subscriber.

3.2.9 *Call clearing sequence*

The SFU should clear the call using normal telex clearing procedures.

4 Notification procedures

4.1 *General*

4.1.1 The advice of non-delivery shall be provided.

4.1.2 The advice of delivery over an international telex circuit may be provided subject to bilateral agreement between the Administration concerned.

4.1.3 Information concerning delivery/non-delivery of messages should be stored and kept available for enquiries from the originator for a pre-defined period of at least 72 hours.

4.1.4 Notification of message delivery/non-delivery may be on a "per message" or "per address" basis.

This Recommendation assumes that notification will be returned on a "per message" basis.

The provision of a periodic (e.g. daily) notification or journal shall be considered an acceptable form of notification. For a typical, acceptable journal format see Figure 3/U.81.

4.2 The sequence of notification forwarding procedure components are illustrated in Figures 4/U.81 and 5/U.81.

✠
421000Z UIT CH
CI SFU CH
TO: 421000 UIT CH
HERE IS YOUR JOURNAL FOR 28 APR 1983

REF	CALLED	ANSWERBACK	TOD	DURATION
12345	080271666	71666 HKTEL HX	1005	3.1
12987	051261848	261848 THQPH G	1043	2.1
36365	07222500	KDD TOKYO J22500	1240	1.8
36365	0230652464	TRANS A LSA	1240	1.9
36365	02105827847	CDN MARCO MTL	2045	1.8
36365	423635	423635 HERTZ CH	-ABW	CANCELLED
41696	07514899	14899 CWI HQ PS	1633	6.0
89635	090522222		-ABS	PENDING
89777	023232323	232323 RCAEX UR	1731	1.6
89900	02105566412		-DER	CANCELLED
TOTAL MINS				24.4

TOD 1983 04 29 0401

SFU CH ✠
421000Z UIT CH

FIGURE 3/U.81

Typical journal format

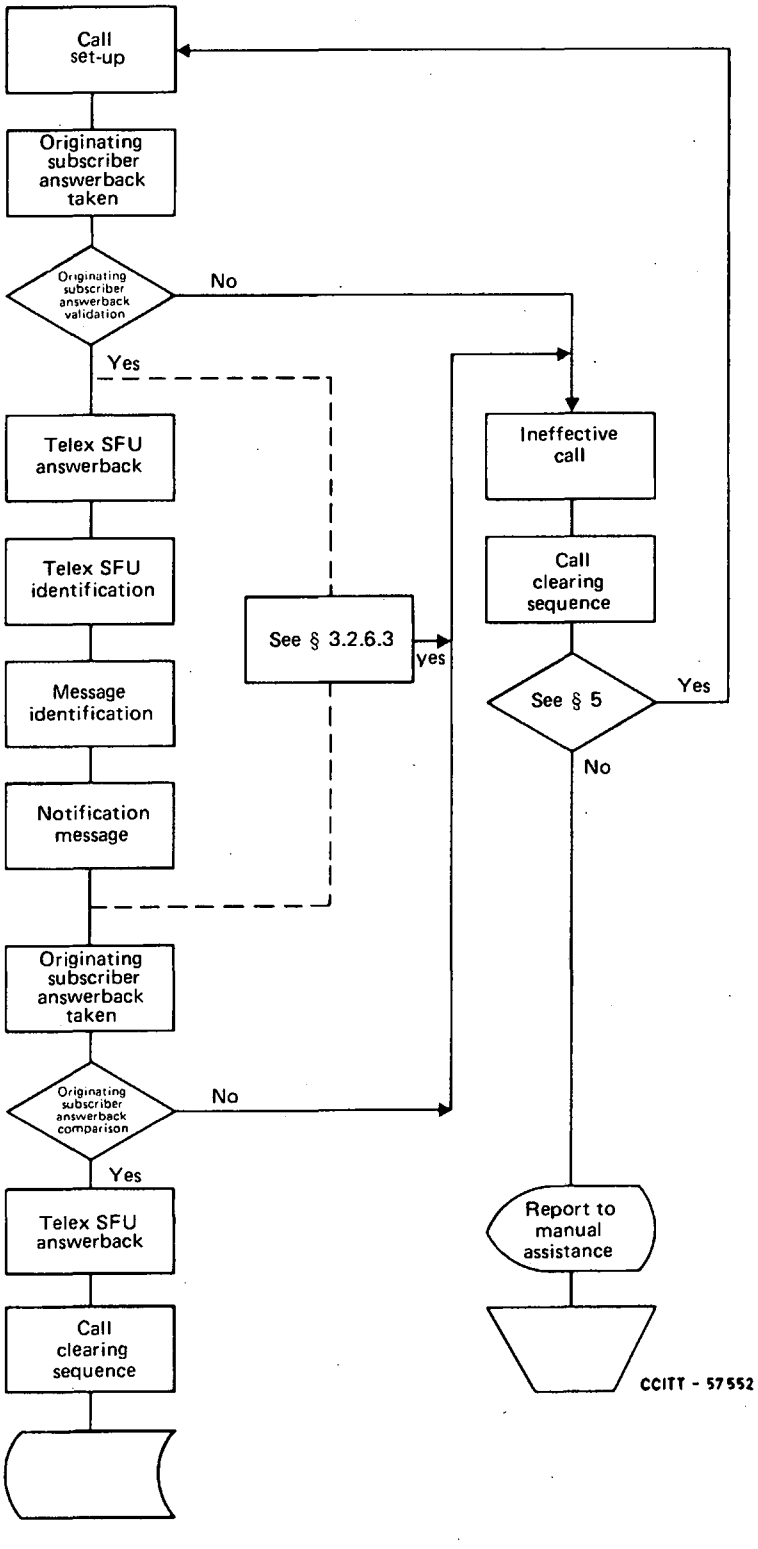
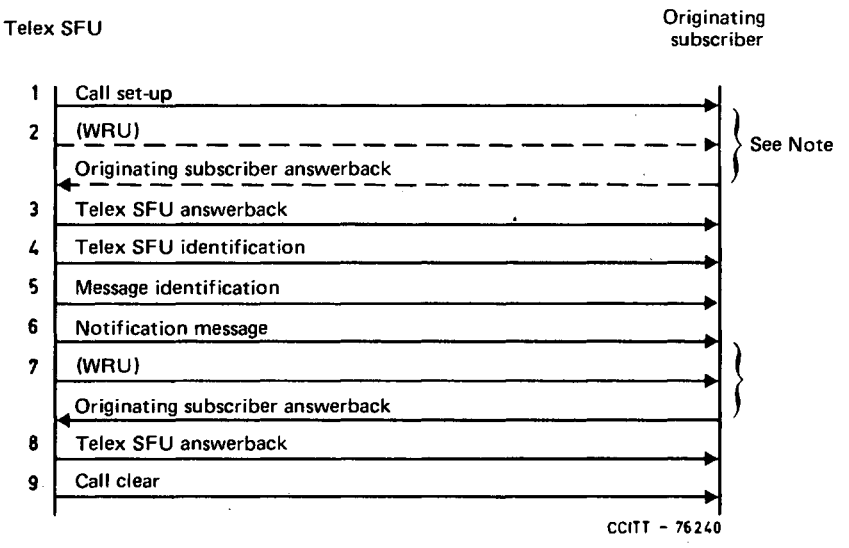


FIGURE 4/U.81

Notification procedure



Note – Optional answerback capture if not available from Step 1.

FIGURE 5/U.81

Sequence of events for notification procedure

4.3 The components of notification forwarding procedure are as follows:

4.3.1 *Call Set-Up*

The call set-up should be in accordance with § 3.2.1.

4.3.2 *Originating subscriber answerback validation*

4.3.2.1 To ensure security of delivery of the notification, the answerback of the originating telex subscriber is taken and compared with the answerback taken from the subscriber at the time of message input.

4.3.2.2 The evaluation procedure is given in Recommendation U.75.

4.3.3 *Store and forward unit answerback*

The answerback of the telex SFU shall be transmitted to the called subscriber.

4.3.4 *Store and forward unit identification*

The telex SFU identification shall be transmitted as per § 3.2.3.

4.3.5 *Message identification*

The telex SFU shall transmit to the called subscriber the message identification sequence issued at the time of input of the message.

The format of the message identification should be in accordance with § 3.2.4.

4.3.6 *Notification message*

The notification advice may comprise for each applicable address of a single or multi-address message the following:

(See Figure 6/U.81 for example of suggested format.)

Example of Delivery Advice

5519751	19751 MIPEN DK	Address – Expected A/B
DELIVERED	19751 MIPEN DK	Advice – Received A/B
18:00	01M 20S	Time of Delivery – Duration

Example of Non-Delivery

5519751	19751 MIPEN DK	Address – Expected A/B
NOT DELIVERED		Advice – Received A/B
		(See Note)
OCC	4	Reason – No. of Attempts.

Note – Only used if incorrect answerback is reason for non-delivery.

FIGURE 6/U.81

4.3.6.1 *Non-delivery advice*

- selection information (telex address)
- expected answerback (as provided at message input)
- notification, i.e. "NOT DELIVERED"
- received answerback (if applicable)
- reason for non-delivery
- number of attempts.

4.3.6.2 *Delivery advice*

- selection information (telex address)
- expected answerback (as provided at message input)
- notification, i.e. "DELIVERED"
- received answerback
- date and time of delivery
- duration of call.

4.3.7 *Called subscriber answerback validation*

4.3.7.1 Answerback comparison of the called subscriber shall be in accordance with § 3.2.7.

4.3.8 *Telex SFU answerback*

The answerback of the SFU shall be transmitted to the called subscriber.

4.3.9 *Call clear*

The calling telex SFU should clear the call using normal telex procedures.

5 Delivery re-attempt procedures

5.1. The principles of Recommendation U.40 shall be applied for all delivery/notification re-attempt requirements.

5.2 If the service signal RDI or NCH is received during call set-up more than once in any one message delivery/notification attempt cycle, the message shall be considered undeliverable.

5.3 *Recorded message from called subscriber*

5.3.1 If the recorded message is followed by clear, the message shall be considered undeliverable.

5.3.2 Action to be taken by the telex SFU if the recorded message is not followed by clear, needs further study.

5.4 In the failure of an established connection per cases mentioned in § 3.2.6.3 or 3.2.7.2 above, one further attempt to deliver the message may be made after an interval of at least 3 minutes; in this case the message text shall be preceded by POSSIBLE DUPLICATE MESSAGE.

5.5 The action to be taken when a notification cannot be delivered should be the responsibility of the Administration offering the telex SFU service and is a national matter.

Recommendation U.82

INTERNATIONAL TELEX STORE AND FORWARD – INTERCONNECTION OF TELEX STORE AND FORWARD UNITS

(Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) the need for telex store and forward services;

(b) the increasing need to transfer messages of different types and having a variety of formats;

(c) that the Series F Recommendations define existing telex and new telematic services, that the Series S of Recommendations define control procedures for new telematic services;

(d) that Recommendations X.60, X.61, X.70, X.71, X.75 and X.121 permit international connection between public data networks;

(e) that the Series V Recommendations provide the means for data communication over the telephone network;

(f) that the Series X Recommendations define message handling systems;

unanimously declares the following

1 Scope

1.1 This Recommendation defines the interworking procedures to facilitate the international exchange of messages between computer-based telex store and forward units.

1.2 This Recommendation is one of a series of Recommendations which define international telex store and forward services. These Recommendations are:

- Recommendation F.72: International telex store and forward – general principles and operational aspects
- Recommendation U.80: International telex store and forward – access from telex
- Recommendation U.81: International telex store and forward – delivery to telex
- Recommendation U.82: International telex store and forward – interconnection of telex store and forward units

1.3 *Definitions*

The following terms used in this Recommendation have the undermentioned definitions:

1.3.1 **store and forward unit (SFU)**

Computer equipment with associated storage that accepts messages from telex subscribers for subsequent delivery to specified telex address or addresses. Conversational mode operation is not provided.

1.3.2 **network management boundary**

The boundary within which the telex store and forward service is provided by one or more telex SFUs under the control of one Administration.

1.3.3 **originating SFU**

The telex SFU forwarding the telex message.

1.3.4 **destination SFU**

The telex SFU receiving the telex message.

1.3.5 **inter-telex SFU messages (IM)**

Messages transferred between telex SFUs to complete the function of message transfer.

1.3.6 **message transfer unit (MXU)**

The basic element of the inter-telex SFU message transfer procedure.

1.3.7 **user message transfer unit (UMXU)**

Used to carry the message submitted by a telex subscriber for delivery to a specified address.

1.3.8 **service message transfer unit (SMXU)**

Used to convey service information about messages.

1.3.9 **text transfer (TT)**

A type of UMXU used to transfer address information and the subscriber message.

1.3.10 **status request (SRQ)**

A type of SMXU used to request, from a destination telex SFU, the present status of the message.

1.3.11 **status report (SRPT)**

A type of SMXU used to report the status of a message and sent only in response to an SRQ.

1.3.12 **delivery notification (DN)**

A type of SMXU used to provide information on an address or addresses to which a message has been delivered.

1.3.13 **non-delivery notification (NDN)**

A type of SMXU used to provide information on an address or addresses to which the message has not been delivered.

1.3.14 **combined delivery/non-delivery notification (CN)**

A type of SMXU used to provide information on whether a message has been delivered or not delivered to a number of addresses.

1.3.15 **header**

The portion of the MXU which contains the information to service the control need of the calling telex SFU.

1.3.16 **message block**

The portion of the MXU which contains the information to be transferred between the telex SFUs.

2 Service outline

2.1 The telex SFU service allows a telex subscriber to deposit single or multi-address messages with a telex SFU for subsequent delivery to the specified address or addresses. (The services and facilities to be offered internationally are the subject of Recommendation F.72)

2.2 In the event of a failure to deliver to any address or addresses, a non-delivery notification is issued to the originating telex subscriber. The requirement to send a non-delivery notification is mandatory. Transmission of non-delivery notifications may occur on a per address or per multi-address basis.

2.3 A delivery notification for successful delivery and/or subscriber initiated status enquiry information may also be issued.

3 International interconnection

3.1 The extension of telex SFU services beyond the management network boundary of an Administration requires co-operation between telex SFUs across international connections.

3.2 In the international interconnection of telex SFUs the responsibility to deliver single and multi-address messages is transferred from the originating Administration to one or a number of destination Administrations.

3.3 In the basic service, messages addressed to more than one destination telex SFU management network should be separated at the originating management network.

3.4 The possibility of forwarding messages via transit management networks is for further study.

3.5 In the international interconnection of telex SFUs it is necessary to return delivery/non-delivery status information to the originating telex SFU. This information is compiled on a per address basis at the destination telex SFU either when the message has been delivered or when no further attempts to deliver will be made to that address.

3.6 The return of delivery and non-delivery information to the originating telex SFU may be on a per address or per message basis.

3.7 When information is issued on a per message basis the originating telex SFU may request interim message delivery status reports by transmitting message status requests.

3.8 Delivery and non-delivery information provided on a per message address basis requires explicit notification to the originating telex SFU.

3.9 Delivery and non-delivery information provided on a per message basis may require only explicit notification of non-deliveries and implicit notification of deliveries.

3.10 The method employed on an international connection between telex SFUs to transfer delivery/non-delivery status information should be the subject of bilateral agreement. Account must be taken of the means by which the interconnection is established and the possible effects on service.

3.11 The storage of messages during the specified period for messages (or addresses) requiring delayed delivery should generally be carried out by the originating telex SFU. In this case the delay indicator is omitted in the corresponding message to the destination telex SFU. When the delay action is not carried out in the originating telex SFU, the appropriate delay indicator should be retained.

4 Message transfer

4.1 International connection between telex SFUs may be achieved by use of the following:

a) telex network;

b) packet switched data networks (PSDN);

c) circuit switched data networks (CSDN);

d) public switched telephone network (PSTN);

e) direct circuits (50 baud and medium speed).

4.2 The cooperation of two or more telex SFUs may be required to complete the function of a message transfer. Such cooperation between telex SFUs is achieved by use of an inter-telex SFU message transfer procedure.

4.3 The general structure of an inter-telex SFU message transfer procedure is described in Figure 1/U.82.

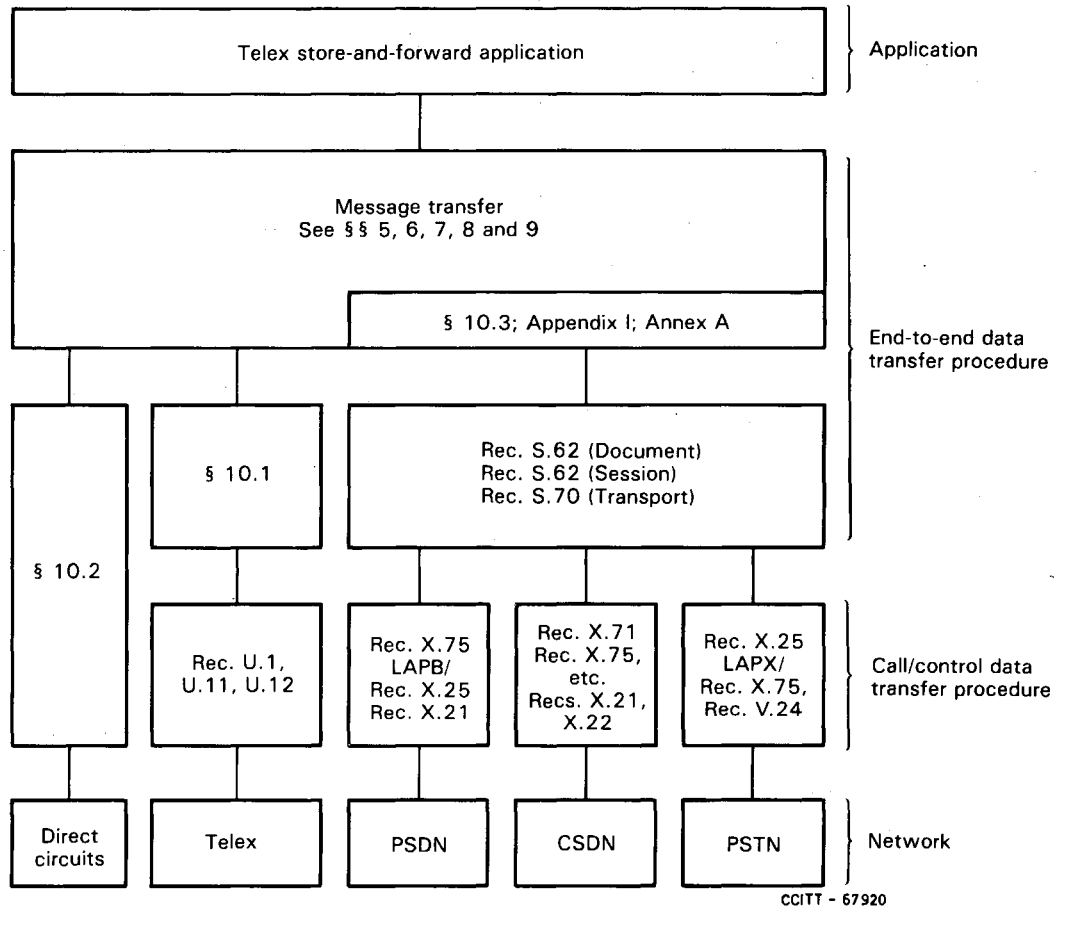


FIGURE 1/U.82

General structure of an inter-telex store and forward unit message transfer

5 Elements of inter-telex SFU message (IM) transfer procedure

5.1 The basic element of the IM transfer procedure is the message transfer unit (MXU). The MXU is classified as either a user MXU (UMXU) or service MXU (SMXU) allowing easy identification of the function(s) for which cooperation is required.

5.2 UMXUs carry messages submitted by a telex customer for delivery to a specified address or addresses.

5.3 SMXUs do not contain telex customer messages but are used to convey service information about messages. SMXUs of two types have been identified:

a) notification (delivery and/or non-delivery)

b) status (enquiry/report)

Use of other SMXU types is for further study.

5.4 Notification SMXUs are issued automatically by the telex SFU. Status SMXUs are generated by the telex SFU as a result of a customer request or in response to a received status SMXU.

5.5 There are 6 types of MXU used to provide a telex SFU interworking capability.

5.5.1 *Text transfer (TT)*

TT is used to transfer address information and the message as a UMXU.

5.5.2 *Status request (SRQ)*

SRQ is an SMXU and is used to request from a destination telex SFU the present status of message delivery to:

a) all addresses

b) those addresses to which the message has not been delivered

c) specified addresses.

5.5.3 *Status report (SRPT)*

SRPT is an SMXU and is only used in response to an SRQ.

5.5.4 *Delivery notification (DN)*

DN is an SMXU and is used to provide information on an address or addresses to which the message has been delivered.

5.5.5 *Non-delivery notification (NDN)*

NDN is an SMXU and is used to provide information on an address or addresses to which the message has not been delivered.

5.5.6 *Combined delivery/non-delivery notification (CN)*

An SMXU used to provide information on whether a message has or has not been delivered to a number of addresses.

5.6 The originating and destination telex SFUs transmit MXUs in accordance with Figure 2/U.82.

Generated by	
Originating SFU	Destination SFU
UMXU – TT	SMXU – DN SMXU – NDN SMXU – CN
SMXU – SRQ	SMXU – SRPT

FIGURE 2/U.82

Generation of MUXs

6 Methods of interworking

6.1 Administrations may provide telex SFU interworking service by any of three methods. These methods are shown diagrammatically in Figure 3/U.82.

The method of interworking should be agreed bilaterally between Administrations.

The following paragraphs describe operational procedures and are included for explanatory purposes.

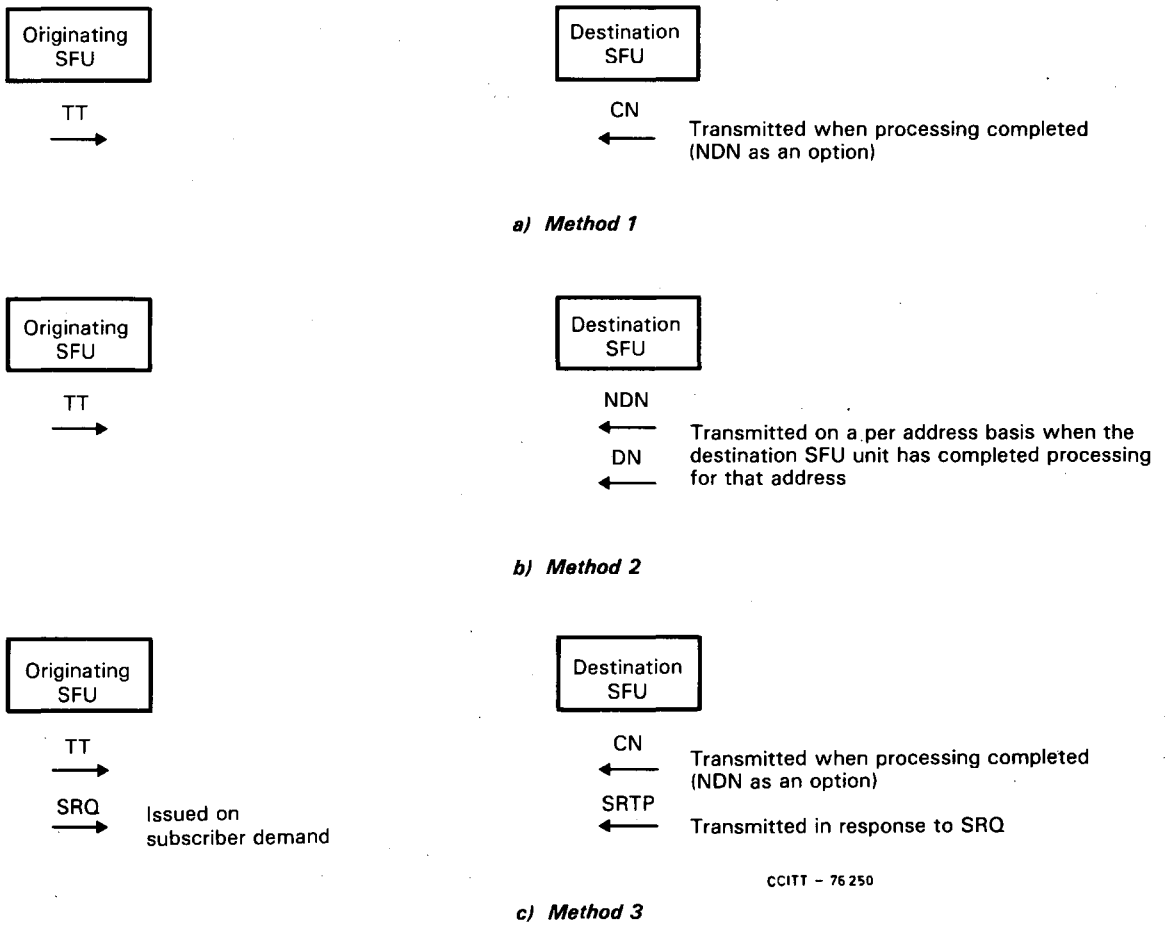


FIGURE 3/U.82

SFU interworking

6.1.1 *Method 1*

6.1.1.1 TT is issued by the originating unit.

6.1.1.2 When the destination unit has completed call processing, CN is returned to the originating unit.

6.1.1.3 It may only be necessary to transmit NDN instead of CN since deliveries are implicit (see § 3.9).

6.1.1.4 No SRQ or SRPT MXUs are issued.

6.1.2 *Method 2*

6.1.2.1 TT is issued by the originating unit.

6.1.2.2 NDN and DN MXUs are issued by the destination unit on a per address basis at the time the destination unit has completed processing for that address.

6.1.2.3 No SRQ or SRPT MXUs are issued.

6.1.3 *Method 3*

6.1.3.1 TT is issued by the originating unit.

6.1.3.2 SRQ MXUs are issued by the originating unit at the time of a customer demand.

6.1.3.3 SRPT MXUs are issued by the destination unit in response to SRQ MXUs.

6.1.3.4 When the destination unit has completed call processing CN is returned to the originating unit.

6.1.3.5 It may only be necessary to transmit NDN instead of CN since deliveries are implicit (see § 3.9).

6.1.4 The preferred operation is method 3. The generation of UMXU-TT, SMXU-CN, SMXU-SRQ and SMXU-SRPT is considered mandatory. The generation of SMXU-DN and SMXU-NDN is optional.

7 Message transfer unit (MXU) formation

7.1 An MXU is composed of a header and a message block.

7.1.1 *Header*

7.1.1.1 The header refers to the portion of an MXU which contains information to serve the control need of the calling telex SFU.

7.1.1.2 For an UMXU the header is constructed by the originating telex SFU at the time a customer telex message is deposited with that unit, while in the case of an SMXU the header is created when the service message is generated.

7.1.1.3 Changing, adding to, or deleting from header information during the passage of an MXU through the telex SFU is for further study.

7.1.2 *Message block*

7.1.2.1 The message block contains that information that is to be transferred between telex SFUs and which is the reason the MXU has been generated.

7.1.2.2 The message block in an UMXU contains the text which is the customer message to be transferred from the originating telex subscriber to the specified address or addresses.

7.1.2.3 The customer message is inserted in the message block of an UMXU when a message deposited in a telex SFU is to be transmitted via another telex SFU. The message block is passed through the telex SFU and subsequent telex SFU(s) transparently.

7.1.2.4 The message block of an SMXU contains the service information which is inserted when the service message is generated. This information may or may not be passed transparently through the telex SFU to the message originating customer. The exact use of this information is a national matter and is outside the scope of this Recommendation.

7.1.2.5 Service information required for insertion into the message block of a notification SMXU is stored at the telex SFU and is continually updated until it is automatically released to the originating telex SFU.

7.1.2.6 The information stored at the telex SFU may also be released in its interim form to the originating telex SFU as a status report SMXU.

7.1.2.7 The status report SMXU is an interim version of the resultant notification SMXU.

8 Message transfer unit (MXU) structure

8.1 MXUs may be of two classes: UMXU or SMXU.

8.1.1 SMXUs of two types have been identified:

a) notification (delivery and/or non-delivery)

b) status (enquiry/report)

8.2 *User MXU*

Text transfer

Header:	MXU type identifier Message identity Destination telex SFU identity Message code indicator	
	Delivery address Expected answerback Attention information Delay indication	Notes 1 and 4
Message block:	Subscriber text	

8.3 *Service MXU*

a) *delivery notification*

Header:	MXU type identifier Message identity (originator) Destination telex SFU identity Message code indicator Transit identities, (Note 2)	
Message block:	Status Called address Received answerback Date/time of last attempt (delivery date/time) Chargeable duration	Note 1

b) *non-delivery notification*

Header:	MXU type identifier Message identity (originator) Destination telex identity Message code indicator Transit identities (Note 2)	
Message block:	Status Called address Answerback, if received Date/time of last attempt Reason	Note 1

c) *combined delivery/non-delivery notification*

Header:	MXU type identifier Message identity (originator) Destination telex SFU identity Message code indicator Transit identities (Note 2)	

Message block:	Status Called address Answerback, if received Date/time of last attempt Reason Chargeable duration	Notes 1 and 3

d) *status request*

Header:
- MXU type identifier
- Message identity (originator)
- Destination telex SFU identity
- Message code indicator

Message block:
- either i) request status report on all message addresses associated with message
- or ii) request status report on addresses to which message has not been delivered
- or iii) request status report on specified address(es) (Note 5)

e) *status report*

Header:
- MXU type identifier
- Message identity (originator)
- Destination telex SFU identity
- Message code indicator
- Transit identities (Note 2)

Message block:	Status Called address Answerback, if received Date/time of last attempt Reason Chargeable duration	Note 1

Note 1 – This information may be repeated on a per address basis.

Note 2 – The use of transit identities is for further study.

Note 3 – Reason and chargeable duration are mutually exclusive.

Note 4 – In the absence of any field, the field should be indicated by an end of field delimiter. See Annex A and Appendix I.

Note 5 – This message block contains the specified delivery addresses.

8.4 Table 1/U.82 summarizes the MXU structure.

TABLE 1/U.82

Message transfer unit structure

Type	UMXU	SMXU				
	Text transfer (TT)	Delivery notification (DN)	Non-delivery notification (NDN)	Combined delivery/ non-delivery notification (CN)	Status request (SRQ)	Status Report (SRPT)
Header	Type identity	Type identity	Type identity	Type identity	Type identity	Type identity
	Message identity (Note 1)	Message identity (Note 1)	Message identity (Note 1)	Message identity (Note 1)	Message identity (Note 1)	Message identity (Note 1)
	Destination SFU identity (Note 6)	Destination SFU identity (Note 6)	Destination SFU identity (Note 6)	Destination SFU identity (Note 6)	Destination SFU identity (Note 6)	Destination SFU identity (Note 6)
	Message code indicator	Message code indicator	Message code indicator	Message code indicator	Message code indicator	Message code indicator
		Transit identities	Transit identities	Transit identities		Transit identities
	Delivery address (Note 2)					
	Expected answerback (Notes 2, 7)					
	Attention information (Notes 2, 7)					
	Delay indication (Notes 2, 7)					
Message block (Note 5)	Subscriber text	Status	Status	Status		Status
		Called address	Called address	Called address		Called address
		Received answerback	Answerback if received	Answerback if received		Answerback if received
		Date and time Last attempt	Date and time Last attempt	Date and time Last attempt		Date and time Last attempt
			Reason	Reason (Note 3)		Reason (Note 3)
		Chargeable duration (Note 3)		Chargeable duration (Note 3)		Chargeable duration (Note 3)
					Request type	
					Specified address (Notes 2, 4)	

Note 1 – Message identity contains originating country reference; originating SFU reference; message serial number; date/time. These items may be repeated on a per address basis.

Note 2 – These items may be repeated on a per address basis.

Note 3 – Reason and chargeable duration are mutually exclusive.

Note 4 – This field is only present when it is necessary to specify delivery addresses.

Note 5 – Message block fields in notification and status report SMXUs are repeated on a per address basis.

Note 6 – The destination telex SFU identity is the identity of the unit to which the responsibility to deliver is, or has been, devolved. This will be the called or calling telex SFU identity depending on the type of message transfer.

Note 7 – These fields are optional.

9 MXU information fields

9.1 *Type Identity*

Types of MXU are identified by a type code of two numeric characters. The first character identifies the type and the second the function as described in Table 2/U.82. The identification of further types of MXU is for further study.

TABLE 2/U.82

MXU type identity

Type	MXU description	Function	Type identity	
			1st digit	2nd digit
0	User message transfer	Text transfer	0	1
1	Notification	Delivery	1	1
		Non-delivery	1	2
		Combined delivery/non-delivery	1	3
2	Status	Request	2	1
		Report	2	2

Note – 1st digit is the first digit to be transmitted.

9.2 *Message identity*

9.2.1 The message identity should consist of four fields as shown in Table 3/U.82.

TABLE 3/U.82

Field	Content
Originating country reference	F.69 country code
Originating telex SFU reference	4-character numeric code
Message serial number	Serial number issued to the subscriber in the format specified in Recommendation U.80
Date and time	Date and time of message submission issued to the customer in the format specified in Recommendation U.80

9.3 *Destination telex SFU identity*

9.3.1 The destination telex SFU identity should consist of two fields as shown in Table 4/U.82:

TABLE 4/U.82

Field	Content
Destination country reference	F.69 country code
Destination telex SFU identity	4-character numeric code

9.4 *Delivery address(es), expected answerback(s), attention information, and delay indication*

9.4.1 The delivery address(es), expected answerback(s), attention information, and delay indication should be in the format specified in Recommendation U.80. Expected answerback, attention information and delay indication are optional fields.

9.5 *Message code indicator*

9.5.1 This field indicates the format in which the message text is transmitted.

The message code is indicated by a single numeric character; the following values have been assigned:

International Telegraph Alphabet No. 2 (ITA2)	0
International Alphabet No. 5 (IA5)	1
Recommendation S.61 (Teletex)	2

Additional values of message code are for further study.

9.6 *Delivery information*

9.6.1 The delivery information should conform to the format and content specified in Recommendation U.81.

9.7 *Non-delivery notification*

9.7.1 The non-delivery information should conform to the format and content specified in Recommendation U.81.

9.8 *Combined delivery and non-delivery information*

9.8.1 The combined delivery and non-delivery information should conform to the format and content specified in Recommendation U.81.

9.9 *Status request information*

9.9.1 The status request information should conform to the content and format specified in Recommendation U.80.

9.10 *status report information*

9.10.1 The status report information should conform to the content and format specified in Recommendation U.81.

9.11 *Status*

9.11.1 The status field should indicate whether or not the message has been delivered to a specified address.

The status is indicated by a single numeric character; the following values have been assigned:

Delivered	0
Non-delivery	1

Additional values of status are for further study.

9.12 *Request type*

9.12.1 The request type indicates whether a status request is required for all addresses, those to which the message has not been delivered or for those specified addresses included in the SRQ message block. See § 8.3 d).

The following values have been assigned:

Request on all addresses	0
Request non-delivery reports only	1
Request report on specified address(es)	2

9.13 *Transit identities*

9.13.1 The transit identity field is reserved for future use and may be required for administrative purposes.

The content and format of the field is for further study.

10 Principles of procedures and coding of inter-telex SFU messages

10.1 *Use of the telex network*

10.1.1 The principles for message transfers are illustrated graphically in Figures 4/U.82 to 8/U.82.

10.1.2 Call set-up should use normal telex call procedures.

10.1.3 Operation will normally be half duplex. Exceptionally, responses to MXU headers may be transmitted whilst operating in full duplex mode. The capability to operate full duplex is subject to bilateral agreement.

10.1.4 Inter-telex SFU messages should be distinguished from telex subscriber access messages by an interworking service request identifier (IRQ) which will be acknowledged by a service acknowledgement signal (IACK).

10.1.5 For link control purposes a preamble should precede the message header. This should consist of a character sequence as a block identity, a 3 alpha character circuit identity and a 3 numeric character serial reference.

10.1.6 The numeric character serial reference should increment sequentially and cyclically for each block transferred. No action is required by an SFU when the numbers received are not sequential, but this may be used nationally by Administrations to indicate possible fault conditions.

10.1.7 An end of message signal should be sent by the originating telex SFU which should be acknowledged by a message block acknowledgement signal from the destination telex SFU. The acknowledgement signal should be a character sequence similar to the preamble detailed in § 10.1.5 indicating the circuit on which the message was originally transmitted and the serial reference.

10.1.8 If the originating telex SFU does not receive both acknowledgement signals the original whole message (header and text) should be retransmitted.

10.1.9 Follow-on messages should be indicated by the receipt of a new message header. See Figure 6/U.82.

10.1.10 It should be possible for either telex SFU to interrupt an incoming transmission by using an interrupt transmission signal.

10.1.11 After the reception of the last block acknowledgement, an end of transmission signal should be transmitted by the originating unit before normal telex clearing procedures.

10.1.12 When the receiving telex SFU cannot offer the interworking service or when the telex SFU cannot accept message text transfers, because of storage limitations or failure conditions, the service signal NC followed by a clear signal should be transmitted.

10.1.13 When service signals are to be transmitted by the destination telex SFU to an originating SFU that is itself transmitting, the destination SFU shall transmit an interrupt transmission signal (see Table 5/U.82) until received transmission ceases. This shall be subject to an overall timeout of 20 seconds. The service signal shall then be transmitted following transmission of a mark signal for 3 seconds.

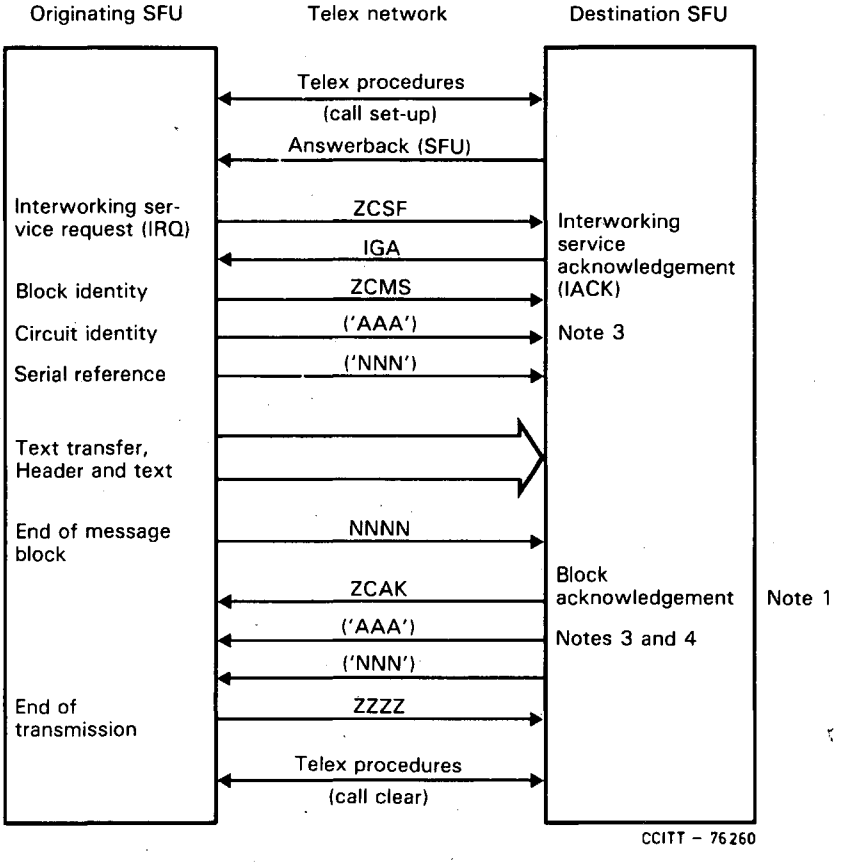
10.1.14 All information should be coded in accordance with ITA2.

10.1.15 The action to be taken in the event of abnormal conditions during the message transfer stage should be the subject of bilateral agreement. Standardization of this action is for further study.

10.1.16 Table 5/U.82 shows the coding for interworking signals.

10.1.17 The field delimiter for all fields in an MXU should be combination No. 26 (+). This should be preceded by combination No. 30 (F/S) when necessary. The delimiters within the fields specified in § 9.4 should be in accordance with Recommendation U.80.

10.1.18 Examples of field coding and content of MXUs when using the telex network are shown in Appendix I.



Note 1 – Further message text transfers may be achieved by the originating SFU following receipt of the message block acknowledgement by repeating the procedures from block identity.

Note 2 – If a mutilated signal or no signal is received the procedure should be recommenced from IRQ.

Note 3 – 'AAA' indicates 3 alpha characters for the circuit identity.
'NNN' indicates 3 numeric characters for the serial reference.

Note 4 – The 3 alpha and 3 numeric characters of the block acknowledgement are the same alpha and numeric character sequences of the block identity.

FIGURE 4/U.82

Message transfer procedures

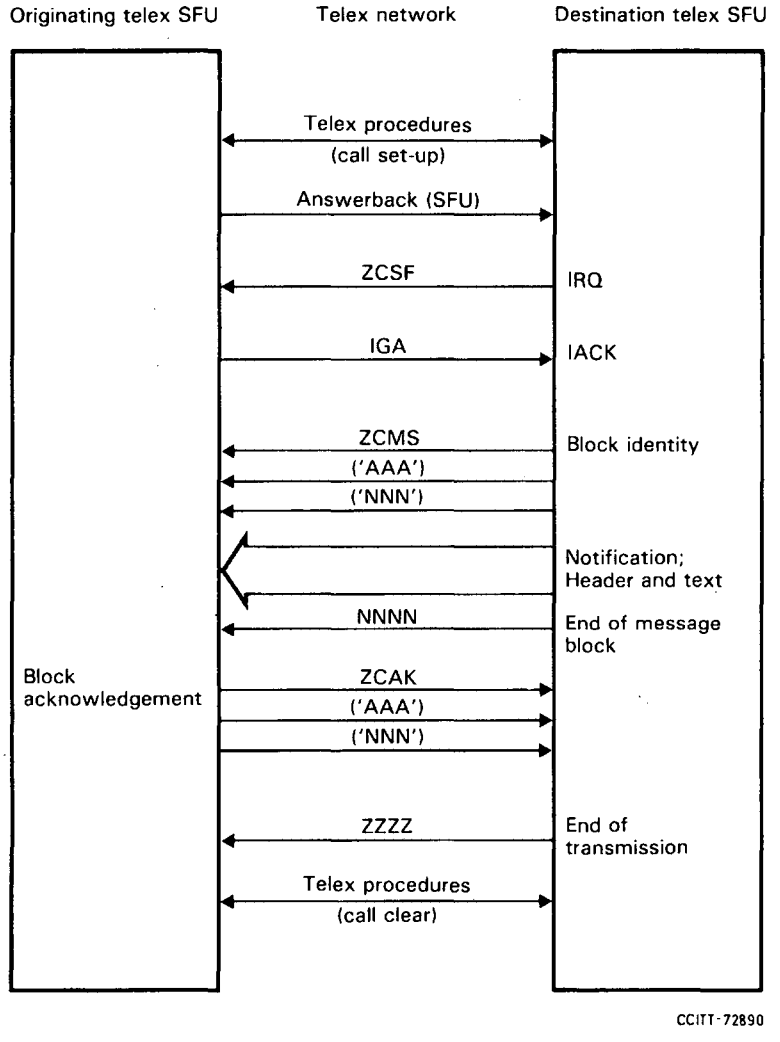
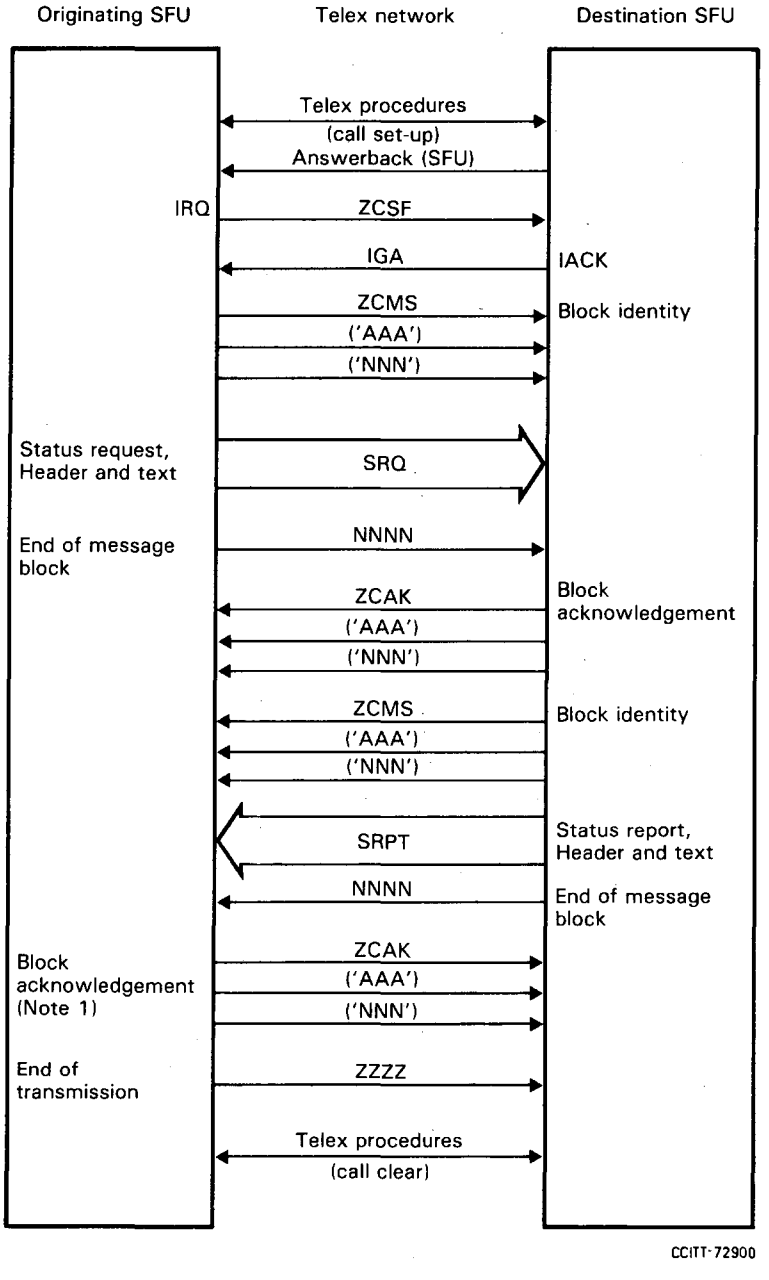


FIGURE 5/U.82

Notification message transfer procedure



Note 1 – If the status report is not acknowledged by transmission of the block acknowledgement by the originating SFU, the procedure may be recommenced from the IRQ signal. The procedure to be adopted if the originating SFU clears the call is for further study.

Note 2 – Further status reports may be requested by repeating the procedure from the block identity.

FIGURE 6/U.82

Status request and report message transfer procedure

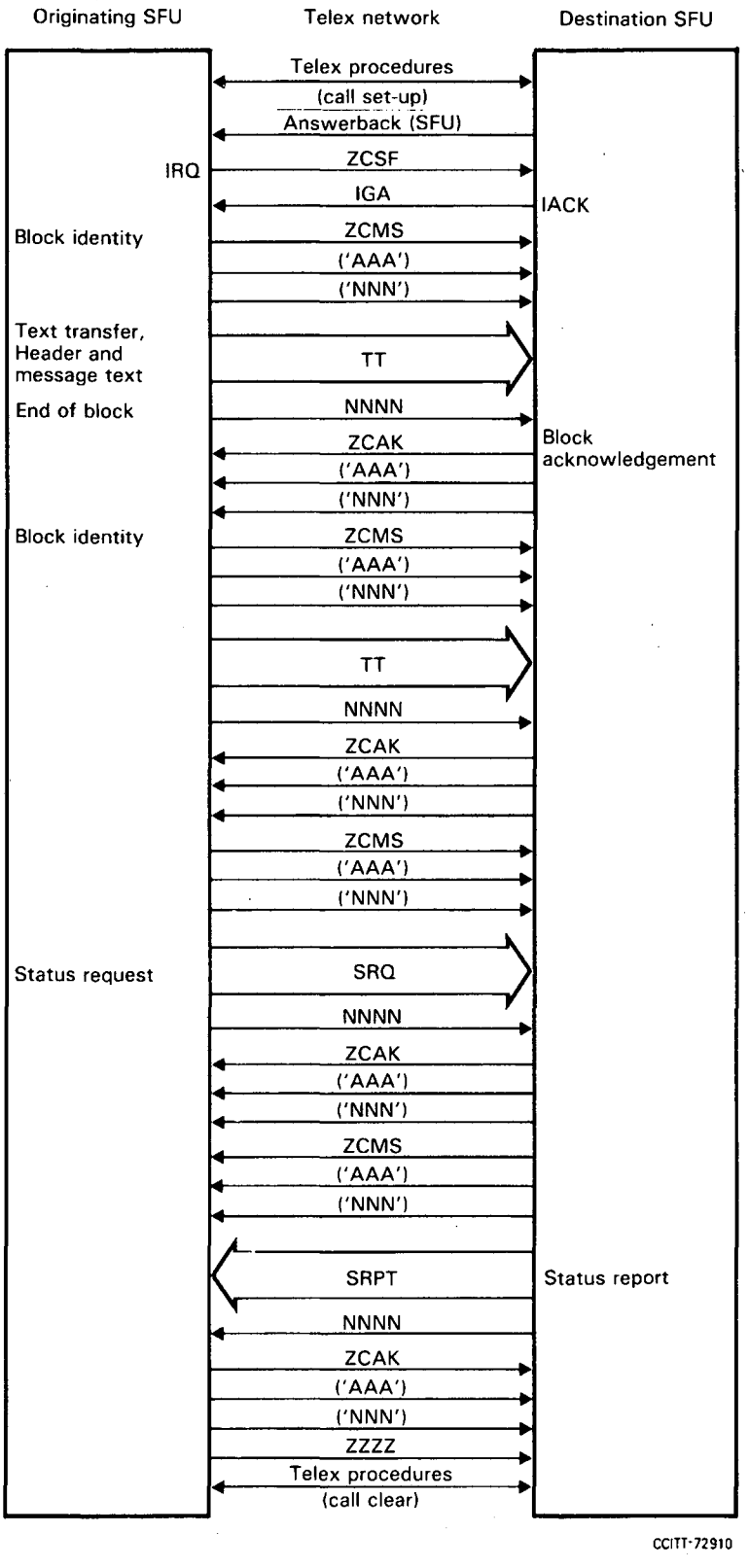
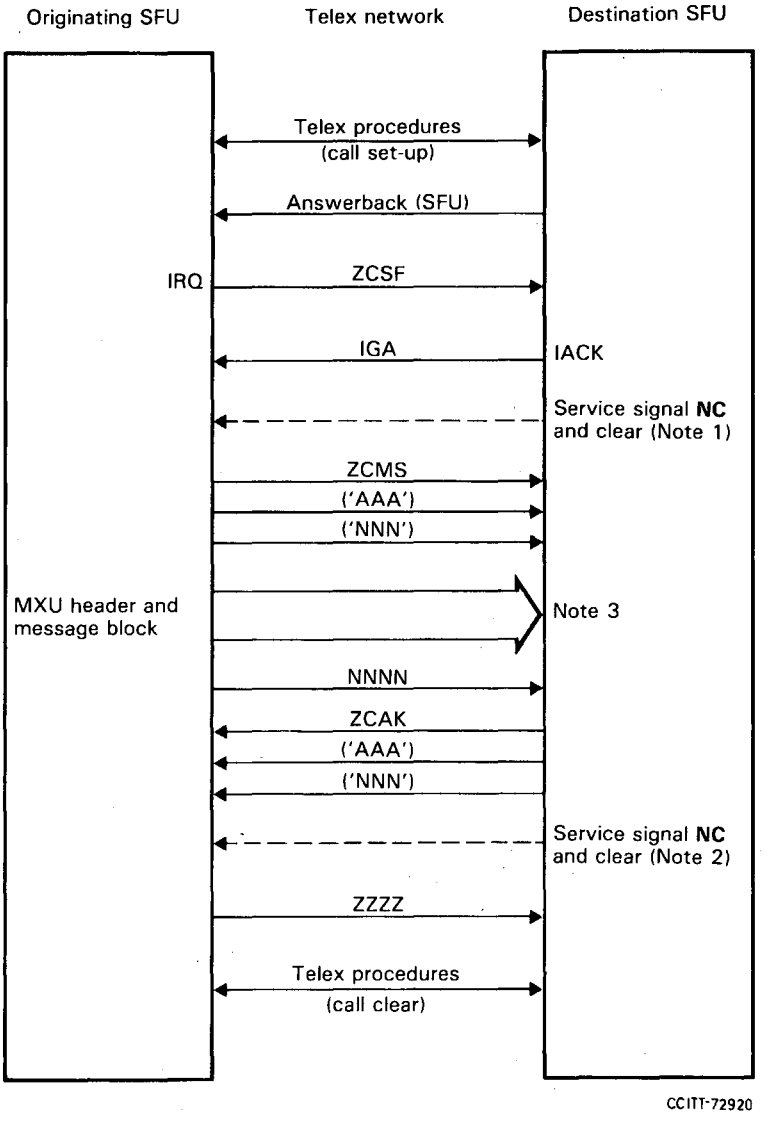


FIGURE 7/U.82

Follow on message transfer procedure



Note 1 – **NC** should be transmitted if the receiving SFU is unable to offer the interworking service at that time.

Note 2 – **NC** should be transmitted if the receiving SFU is unable to accept further message transfers.

Note 3 – When the header information indicates a message text transfer and the destination SFU has insufficient storage, **NC** is transmitted. This service signal is preceded by the interrupt transmission signal (see § 10.1.13). Status requests or notifications should be accepted.

FIGURE 8/U.82

Message transfer procedure with restricted interworking capability

TABLE 5/U.82

Interworking signals

Description	Coding ITA2
IRQ	Combination No. 29, combination No. 26, combination No. 3, combination No. 19, combination No. 6 (ZCSF)
IACK	Combination No. 29 followed by combination No. 9, combination No. 7, combination No. 1 (IGA)
Block identity	Combination No. 26, combination No. 3, combination No. 13, combination No. 19 (ZCMS)
Circuit identity	3 alpha characters
Serial reference	3 numeric characters
End of message block	4 combinations No. 14 (NNNN)
Block acknowledgement	Combination No. 26, combination No. 3, combination No. 1, combination No. 11 (ZCAK). See § 10.1.6
End of transmission	4 combinations No. 26 (ZZZZ)
Interrupt transmission	Continuous combinations No. 20 until received transmission ceases (TTTTTT...)

10.2 *Use of direct circuits for asynchronous transmission*

10.2.1 The direct circuit should be used in a half duplex mode to allow for acknowledgements of the information transmitted. The data transmission rate to be used on the international circuit should be agreed bilaterally.

10.2.2 The procedures and coding when using direct circuits for interconnection between telex SFUs should be identical to those in the case of use of the telex network but without the call set-up and call clearing phases. Thus, the procedures commence with the transmission of the IRQ signal.

10.2.3 The characters may be coded in either ITA2 or IA5. The coding should be fixed on a direct circuit basis and the code used should be agreed bilaterally.

10.2.4 Where circuits are used in a bothway mode the telex call collision procedures should be agreed bilaterally.

10.2.5 Call collision should be detected by checking the response to the service request signal (IRQ). In cases where the response is a service request signal from the other unit a call collision situation is indicated.

10.2.6 On circuits used for bothway transmission bilateral agreement will be required to determine usage in each direction to minimize the occurrence of call collisions.

10.2.7 Examples of field coding and content of MXUs when using asynchronous circuits are shown in Appendix I.

10.3 *Use of public switched data networks*

10.3.1 *asynchronous circuit switched data networks*

10.3.1.1 These procedures apply to data networks operating for Recommendation X.1 user classes of service 1 and 2. The data transmission rate to be used should be agreed bilaterally.

10.3.1.2 Call connections between telex SFUs should be established in accordance with Recommendation X.70.

10.3.1.3 Telex SFU addresses used to establish the connection should conform to Recommendation X.121.

10.3.1.4 Calling and called line identifications may be requested to verify correct connection.

10.3.1.5 Following establishment of a connection between telex SFUs, MXUs should be transferred in accordance with the procedures described in § 10.1 for the telex network.

10.3.1.6 Coding should be in IA5 or ITA2 or the character set defined in Recommendation S.61 with the message code indicator set accordingly. The coding used on a connection between any 2 telex SFUs should be agreed bilaterally and should not be negotiable on a per call basis.

10.3.1.7 Access to the interworking service may be restricted by means of closed user group characters.

10.3.1.8 Character conversion between ITA2 and IA5 should be carried out by each telex SFU in accordance with Recommendation S.18 and between ITA2 and Recommendation S.61 in accordance with Recommendation S.60.

10.3.1.9 Administrations may, following call set-up, operate in accordance with § 10.3.2. This method of operating is a matter for further study.

10.3.2 *Synchronous data networks*

10.3.2.1 The procedures described in this section apply to calls established between telex SFUs over data networks operating for Recommendation X.1 user classes 3 to 11. The data transmission rate to be used on the international circuit should be agreed bilaterally.

10.3.2.2 The procedures may also apply to user classes 1 and 2 after call set-up (see § 10.3.1).

10.3.2.3 The call set-up and transport procedures should be generally in accordance with Recommendation S.70 with the following qualifications:

i) the network layer should be Recommendation X.75 for PSDNs and Recommendation X.71 for CSDNs;

ii) a special class of traffic signal may be used on CSDNs;

iii) a special traffic class indication may be used on PSDNs.

10.3.2.4 Control procedures for the transfer of messages between telex SFUs should be based on Recommendation S.62, CCITT *Yellow Book*, 1980.

10.3.2.5 The preferred operation for the basic telex SFU interconnection should be the TWA session mode. The TWA mode is preferable when status reports are requested from the distant telex SFU. The use of the OWC session mode may also be used and should be the subject of bilateral agreement.

10.3.2.6 Telex SFUs may also operate in a TWS session mode in order to increase the speed of interchange when messages are required in both directions. The principle of operating in the TWS session mode should be agreed bilaterally.

10.3.2.7 The MXU should be transferred in session and document elements of procedure.

10.3.2.8 The UMXU should be transferred as a control document containing the header, including delivery address(es), expected answerback, attention information and delay indication, in the control text together with an associated normal document containing the message block.

10.3.2.9 The UMXU document structure is shown in Figure 9/U.82.

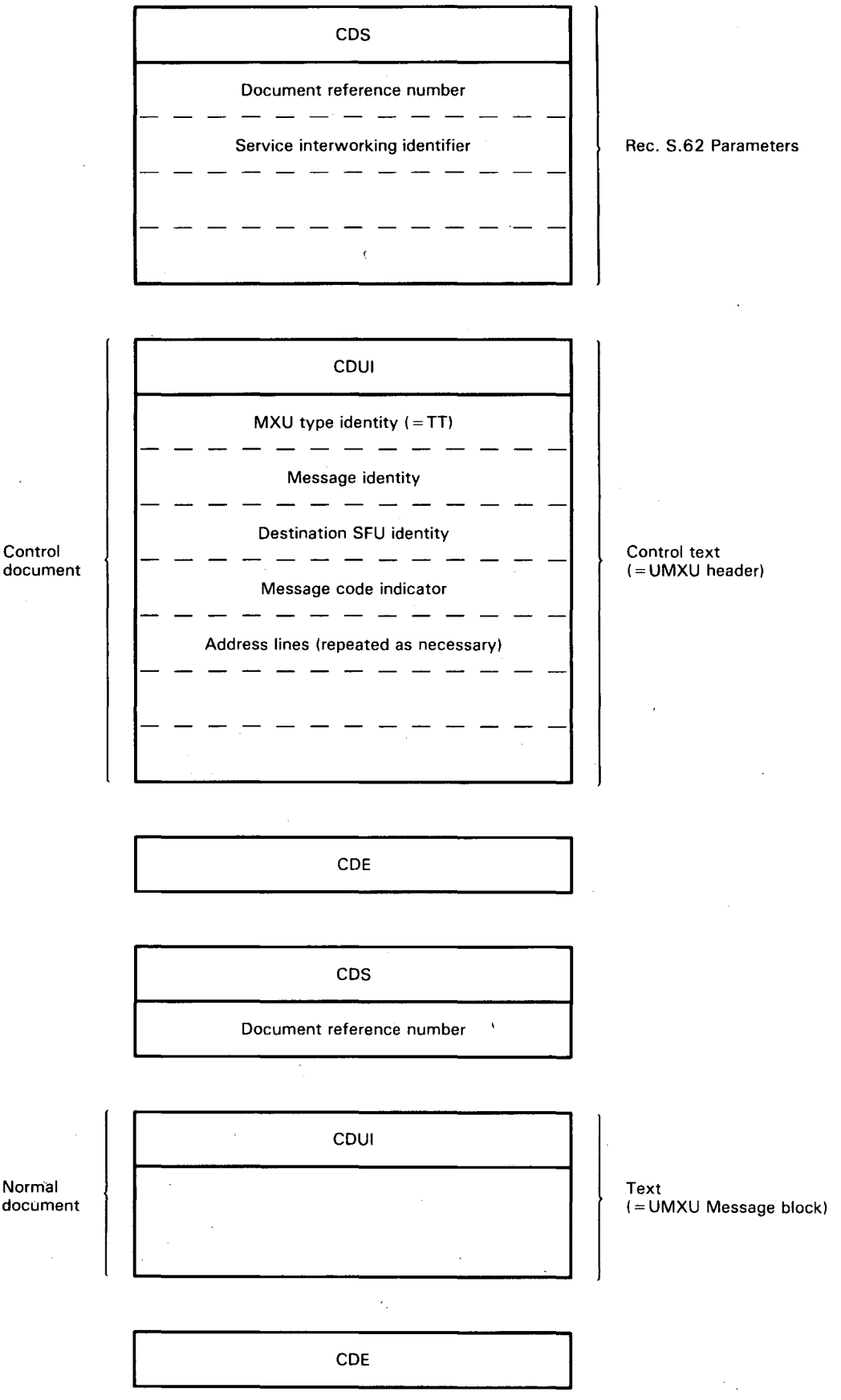
10.3.2.10 The absence of the document identifier shall indicate the normal document.

10.3.2.11 The UMXU control document shall be transmitted first followed immediately by the normal document.

10.3.2.12 The SMXU should be transferred as a control document.

10.3.2.13 The SMXU structure is shown in Figure 10/U.82.

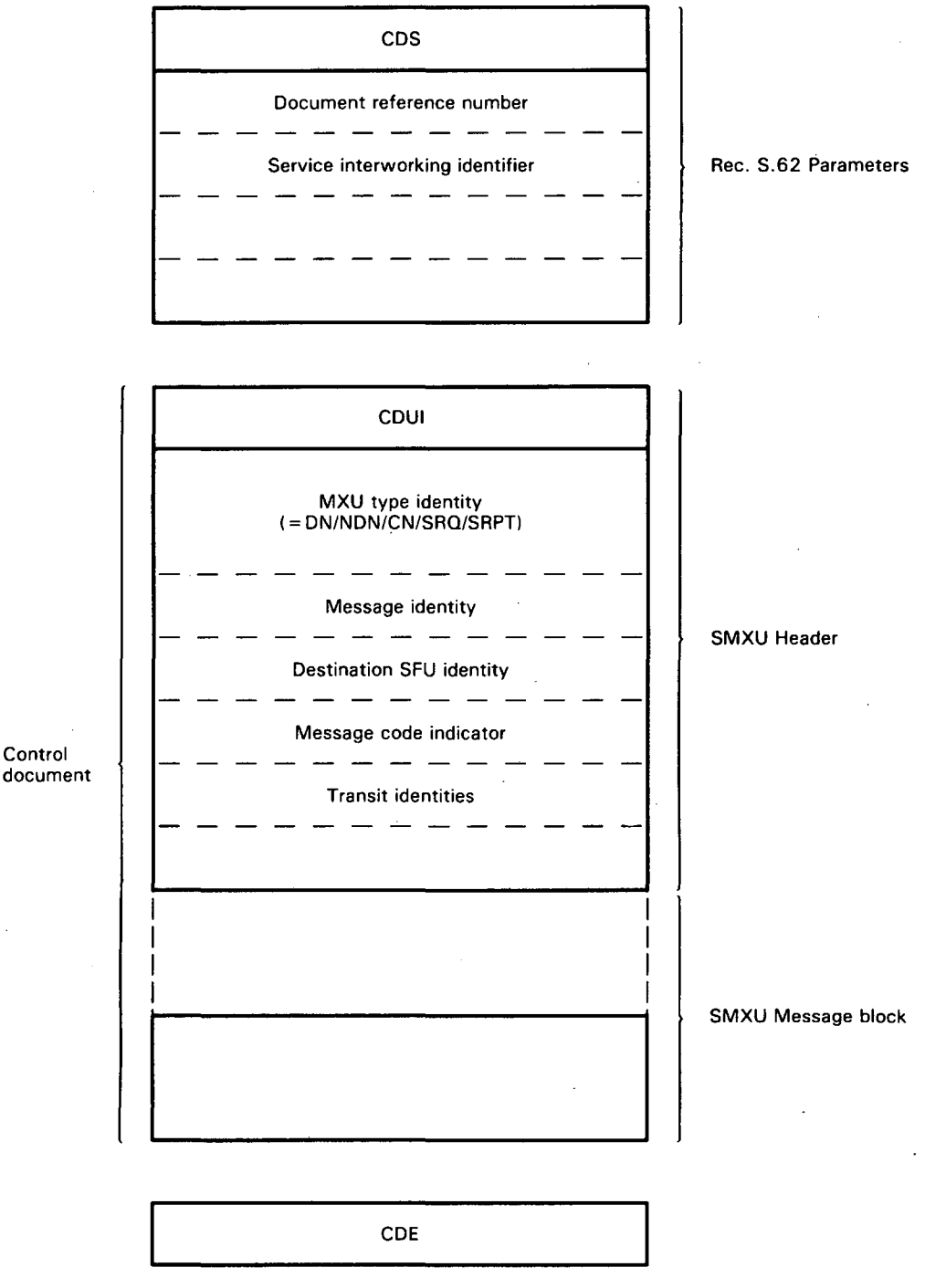
10.3.2.14 Any number of control and normal documents may be transferred during a session. Figure 11/U.82 shows an example of a document transfer session.



Note – The use of non-mandatory parameters is for further study.

FIGURE 9/U.82

Structure of control and normal document for UMXUs



Note – The use of non-mandatory parameters is for further study.

FIGURE 10/U.82

Structure of control document for SMXUs

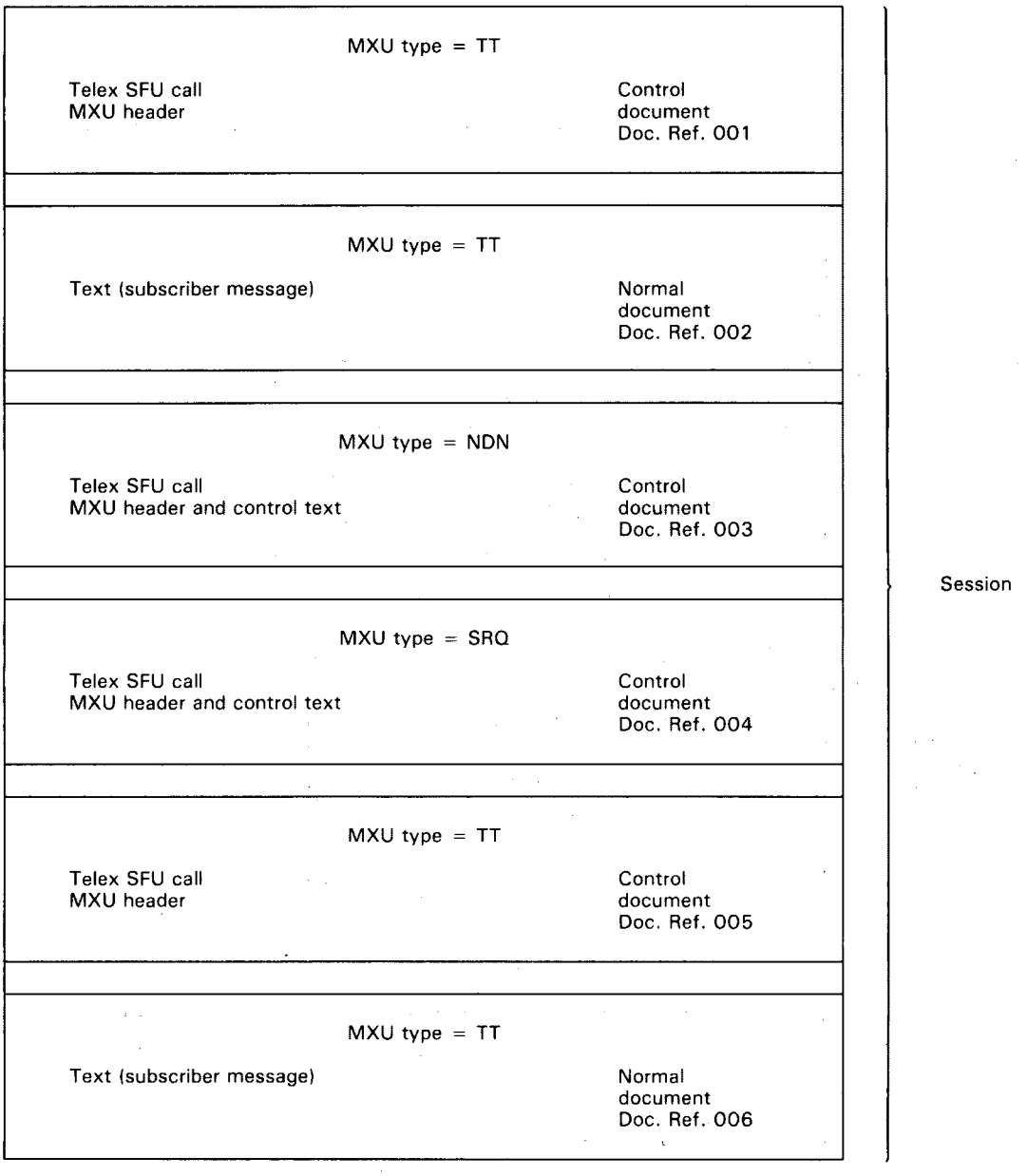


FIGURE 11/U.82

Example of a document transfer session

10.3.2.15 Page boundaries may be transmitted by the originating SFU in a text transfer MXU in the message block. These check points will be recognized by the destination SFU for error recovery purposes and may also be included in the message output to the telex subscriber by the insertion of 10 line feeds (ITA2 combination No. 28).

10.3.2.16 When the message block text has no page boundary, error recovery procedures may be based on Annex G of Recommendation S.62.

10.3.2.17 Any one MXU should normally be transferred during a single session. If a session is interrupted it may be possible to continue the transfer using CDC after setting up a new session.

10.3.2.18 The basic telex SFU interworking connection should only use those PGIs and PIs defined as mandatory in Tables 9/S.62 and 10/S.62.

10.3.2.19 The use of other PGIs and PIs defined in Recommendation S.62 is for further study.

10.3.2.20 Delivery address, expected answerback and attention information should be transferred in a control document immediately following establishment of document level procedures.

10.3.2.21 MXU message blocks should be transferred in normal and control documents as a sequence of characters coded as defined by the message code indicator. Examples of the control text in the control document are shown in Annex A.

10.3.2.22 The control document content may serve two purposes:

a) to provide management information that may be used for accounting, statistics, etc.

b) to provide subscriber information.

To achieve b) the information should be in a format suitable for forwarding directly to the customer.

10.3.2.23 The use of the control document to provide subscriber information is a national matter.

10.3.2.24 The parameter values should be coded in accordance with the rules defined in Recommendation S.62. Thus, sequences of graphic characters will be coded using the character repertoire defined in Recommendation S.61.

10.3.2.25 The assignment of coding to the various parameter values relevant to the mandatory PGIs and PIs defined in Recommendation S.62 is shown below:

10.3.2.25.1 *Terminal identifier of the called terminal*

A sequence of graphic characters as defined in Recommendation U.81.

10.3.2.25.2 *Terminal identifier of the calling terminal*

A sequence of graphic characters as defined in Recommendation U.81.

10.3.2.25.3 *Date and time*

A sequence of graphic characters in the format defined in Recommendation U.81. The values should indicate the time of transmission of the relevant command except for command document continue (CDC) where the date and time will be those in the command document start (CDS) of the first attempt to transmit the document.

10.3.2.25.4 *Service identifier*

Bit 3 of the first octet should be set to 1 with all other bits set to 0 to indicate the telex SFU interworking service.

All other codings are for further study.

10.3.2.25.5 *All other mandatory parameters*

In accordance with Recommendation S.62.

10.3.2.26 Assignment of coding for the identifiers contained in the control text of the control document is as follows:

10.3.2.26.1 *MXU type identity*

This parameter is a binary coded field of fixed length of one octet identifying the MXU type as given in Table 6/U.82.

The hexadecimal representation of these octets is in accordance with Table 2/U.82.

All other binary values are reserved for future standardization.

TABLE 6/U.82

MXU type	Bit 8 7 6 5 4 3 2 1
Text transfer (TT)	0 0 0 0 0 0 0 1
Delivery notification (DN)	0 0 0 1 0 0 0 1
Non-delivery notification (NDN)	0 0 0 1 0 0 1 0
Combined delivery/non-delivery notification (CN)	0 0 0 1 0 0 1 1
Status request (SRQ)	0 0 1 0 0 0 0 1
Status report (SRPT)	0 0 1 0 0 0 1 0

10.3.2.26.2 *Message identity*

A sequence of graphic characters as defined in § 8.

10.3.2.26.3 *Destination telex SFU identity*

A sequence of graphic characters as defined in § 8.

10.3.2.26.4 *Transit identities*

The use of this parameter is for further study.

10.3.2.26.5 *Message code indicator*

A binary encoded field of fixed length of one octet as in Table 7/U.82.

All other binary values are reserved for future standardization.

TABLE 7/U.82

	Bit 8 7 6 5 4 3 2 1
ITA2	0 0 0 0 0 0 0 0
IA5	0 0 0 0 0 0 0 1
S.61	0 0 0 0 0 0 1 0

10.3.2.27 *Service Interworking Identifier*

10.3.2.27.1 Coding of the interworking identifier is for further study.

10.3.2.28 A formal definition of telex SFU MXUs and the field coding is shown in Annex A.

10.4 *Use of the public switched telephone network*

10.4.1 Connection between SFUs should be automatically established using normal telephone procedures.

10.4.2 Following call establishment the procedures should be as defined in § 10.3 for PSDNs but using the data transfer phase of Recommendation X.25.

10.4.3 The normal mode of operation should be full duplex at 2400 bit/s using LAPX or level 2 of Recommendation X.75.

10.4.4 Exceptionally Administrations may agree bilaterally to operate using half duplex and/or at speeds other than 2400 bit/s.

10.5 *Use of medium speed direct synchronous circuit*

10.5.1 The procedures should be as defined in § 10.3.2 for PSDNs but using the call set-up phase.

10.5.2 The normal mode of operation should be full duplex using LAPX or level 2 of Recommendation X.75.

10.5.3 Links between telex SFUs can be used for multiple session and bothway working by means of a number of logical channels.

ANNEX A

(to Recommendation U.82)

Examples of field coding and content of MXUs for interconnection of telex SFUs when using the synchronous data network procedures

A.1 *Introduction*

This annex specifies the structure and coding of MXUs using the notation defined in Recommendation X.409.

This structure should be used when telex SFUs are interconnected with each other using the synchronous data network procedures described in § 10.3.2.

A number of data types that appear in the formal definition of MXUs are described in more detail in the following paragraphs.

The formal definition of MXUs is shown in § A.3 and examples of the coding are shown in Figures A-1/U.82 to A-4/U.82.

A.2 *Description of data types*

In general the data types are described in § 9. Certain data types are described below to provide clarification on format.

A.2.1 *Type identity*

The MXU type is identified by a type number coded in accordance with Table 2/U.82.

TypeIdentity ::= [APPLICATION 3] IMPLICIT INTEGER{
TT(1),**DN**(17),**ND**(18),**CN**(19),**SRQ**(33),**SRPT**(34)}

where

TT	Text transfer
DN	Delivery notification
ND	Non-delivery notification
CN	Combined delivery/non-delivery notification
SRQ	Status request
SRPT	Status report

A.2.2 *Message identity*

The message identity is described in § 9.2.

MessageIdentity ::= [APPLICATION 4] IMPLICIT SEQUENCE{

origCountryRef	NumericString,
origSFURef	NumericString,
messagesSerialNumber	NumericString,
origTime	DateandTime}

The originating country reference is the 2 or 3 digits F.69 country code.

The originating SFU reference is a 4 character numeric code.

Message serial number is a 6 digit number.

The originating time is defined as a date and time type and represents the local time at the originating telex SFU.

OrigTime ::= DateandTime

DateandTime ::= [UNIVERSAL 24] IMPLICIT IA5String

Thus an originating (local) time of 12.22 PM on 9 May 1983 which is represented by the value "8305091222" can be encoded as:

DateandTime	Length	Contents
18	OA	38333035303931323232
16	16	16

A.2.3 *Message code indicador*

The message code indicator describes the coding of the message text contained in the MXU message block and can be ITA2, IA5 or S.61.

MessageCodeIndicator ::= [APPLICATION 6] IMPLICIT INTEGER{
ITA(0),IA5(1),S61(2)}

It should be noted that the message code indicator only refers to the coding of the MXU message block and is not applicable to any other data types. Although the text coding is also described in the UMXU message block structure (§ A.2.4) this indicator is retained for completeness in the structure of an MXU Header.

A.2.4 *UMXU message block*

The **UMXU** message block contains the message text received from the subscriber and can be coded in ITA2, IA5 or S.61. The coding must be in accordance with the message code indicator.

UMXUMessageBlock ::= [APPLICATION 1] CHOICE{
ITA2String,
[0] IMPLICIT S61String
[1] IMPLICIT IA5String}

A.2.5 *ITA2 string*

An ITA2 String represents an ordered set of zero or more characters chosen from the set defined by Recommendation F.1 in Table 1/F.1.

The ITA2 String is formally defined below. Each octet contains a single 5 unit code. Bits 8-6 of each octet are zero and bits 5-1 correspond to element numbers 5-1 using the F1 element numbering convention.

ITA2String :: [APPLICATION 7] IMPLICIT OCTET STRING

A.2.6 *Delivery information*

The delivery information contains one data type, delivery address, that will always be present. The remaining data types are optional in the sense that they will be present if and only if the originating SFU has been supplied with the information.

DeliveryInformation ::= SEQUENCE{
deliveryAddress[0] IMPLICIT NumericString,
expectedAnswerback[1] IMPLICIT IA5String OPTIONAL,
attentionInformation[2] IMPLICIT IA5String OPTIONAL,
delayIndication[3] IMPLICIT IA5String OPTIONAL}

The delivery address is the called international telex address in the format of the F.69 country code and national number.

The format of the expected answerback and attention information should remain as provided by the calling subscriber.

The delay indication, when present, describes the type of delivery delay required. The format of this field should be:

a) D if the calling subscriber leaves the period of delay to the discretion of the Administration providing the SFU service,

b) DXY where XY are numeric characters which specify the minimum desired delay in hours from 01-23.

c) LXY where XY are numeric characters (01-24) which specify the maximum time limit for delivering the message to the address.

A.2.7 *SMXU message block*

The data values contained in the octets of both the notification and status report *SMXU* message block and the status request *SMXU* message block should be coded in accordance with the message code indicator described in § A.2.4.

A.2.8 *Notification and status report SMXU message block*

The notifications and status reports provide information about the delivery status of messages to called addresses. The optional data types will be present if and only if the SFU transmitting the SMXU message block has the required information.

NotificationandStatusReportSMXUMessageBlock ::= [APPLICATION 8 IMPLICIT SEQUENCE OF SEQUENCE{
[0] IMPLICIT **Status**,
[1] IMPLICIT **CalledAddress**,
[2] IMPLICIT **Answerback** OPTIONAL,
[3] IMPLICIT **LastAttemptTime** OPTIONAL,
CHOICE [4] IMPLICIT **Reason**,
[5] IMPLICIT **ChargeableDuration** OPTIONAL}

A.2.9 *Last attempt time*

The last attempt time represents a time of day local to the SFU which has the responsiblity for delivering the message. The format of the last attempt time is a string of characters YYMMDDHHNN,

where

YY represents two numeric characters indicating the year

MM represents two numeric characters indicating the month

DD represents two numeric characters indicating the day

HH represents two numeric characters indicating the hour

NN represents two numeric characters indicating the minute

LastAttemptTime ::= [APPLICATION 10] IMPLICIT OCTET STRING

The coding of the octet string should be in accordance with the message code indicator described in § A.2.4.

A.2.10 *Reason*

The reason indicates why a delivery attempt has failed. The reason is a string of characters forming the service code that should be returned to the subscriber.

Reason ::= [APPLICATION 11] IMPLICIT OCTET STRING

The coding of the octet string should be in accordance with message code indicator described in § A.2.4.

A.2.11 *Chargeable duration*

The chargeable duration represents the time in minutes and seconds for which the call should be charged. The chargeable duration is a string of 5 characters in the format MMM.M, where MMM represents the time in minutes (0-999) and N represents the time in tenths of minutes (0-9). The separator is a full stop.

ChargeableDuration ::= [APPLICATION 14] IMPLICIT OCTET STRING

The coding of the octet string should be in accordance with the message code indicator described in § A.2.4.

A.2.12 *Transit identities*

The transit identities format is subject to further studies on transit store and forward, but will consist of a sequence of transit identity information for each transit unit used in the order of call establishment.

A.3 *Format definition of telex SFU MXUs*

MXU ::= CHOICE{[0] IMPLICIT **UMXU**, [1] IMPLICIT **SMXU**}

UMXU ::= SEQUENCE{**UMXUHeader, UMXUMessageBlock**}

UMXUHeader ::= [APPLICATION 0] IMPLICIT SEQUENCE{
TypeIdentity,
MessageIdentity,
DestinationSFUIdentity,
MessageCodeIndicator,
[0] IMPLICIT SEQUENCE OF **DeliveryInformation**

UMXUMessageBlock ::= APPLICATION 1] CHOICE{ **ITA2String,**
[0] IMPLICIT S61String,
[1] IMPLICIT IA5String}

– message text received from subscriber, coded in accordance with message code indicator –

– various header information –

TypeIdentity ::= [APPLICATION 3] IMPLICIT INTEGER{
TT(1),**DN**(17),**ND**(18),**CN**(19),**SRQ**(33),**SRPT**(34)}

MessageIdentity ::= [APPLICATION 4] IMPLICIT SEQUENCE{
origCountryRef NumericString,
origSFURef NumericString,
messageSerialNumber NumericString,
origTime DateandTime}

DestinationSFUIdentity ::= [APPLICATION 5] IMPLICIT SEQUENCE{
destinationCountryRef NumericString,
destinationSFURef NumericString}

MessageCodeIndicator ::= [APPLICATION 6] IMPLICIT INTEGER{
ITA2(0),**IA5**(1),**S'1**(2)}

DeliveryInformation ::= SEQUENCE{
deliveryAddress[0] IMPLICIT NumericString,
expectedAnswerback[1] IMPLICIT IA5String OPTIONAL,
attentionInformation[2] IMPLICIT IA5String OPTIONAL,
delayIndication[3] IMPLICIT IA5String OPTIONAL}

ITA2String ::= [APPLICATION 7] IMPLICIT OCTET STRING

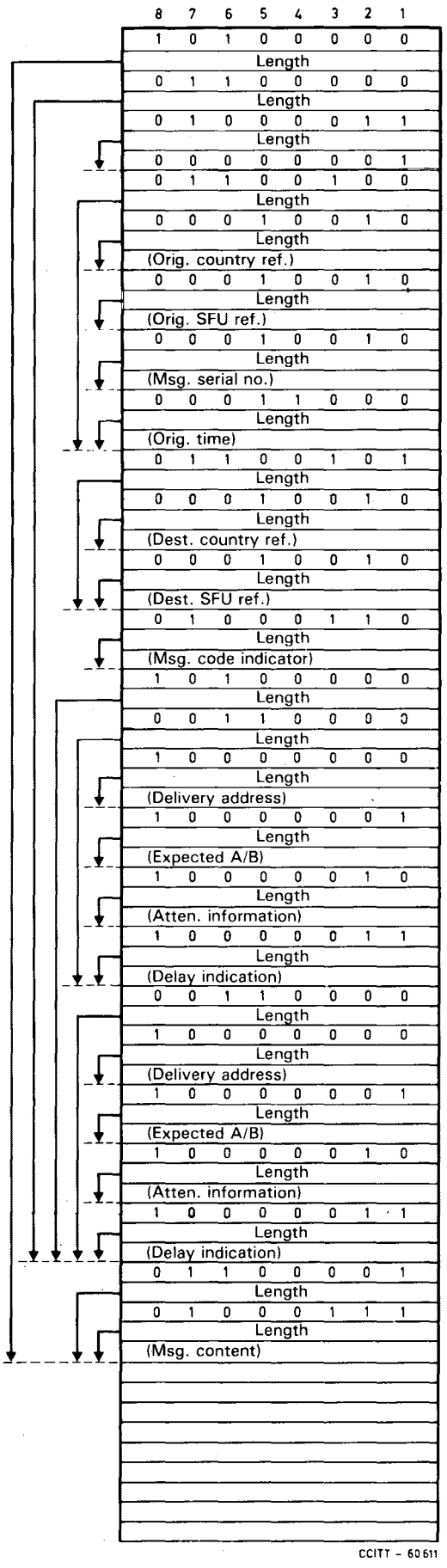
SMXU ::= SEQUENCE{
SMXUHeader, MXUMessageBlock}

SMXUHeader ::= [APPLICATION 2] IMPLICIT SEQUENCE{
TypeIdentity,
MessageIdentity,
DestinationSFUIdentity,
MessageCodeIndicator,
TransitIdentities OPTIONAL}

SMXUMessageBlock ::= CHOICE{
NotificationandStatusReportSMXUMessageBlock,
StatusRequestSMXUMessageBlock}

NotificationandStatusReportSMXUMessageBlock ::= [APPLICATION 8] IMPLICIT SEQUENCE OF SEQUENCE{
[0] IMPLICIT **Status,**
[1] IMPLICIT **CalledAddress,**
[2] IMPLICIT **Answerback** OPTIONAL,
[3] IMPLICIT **LastAttemptTime** OPTIONAL,
CHOICE [4] IMPLICIT **Reason,**
[5] IMPLICIT **ChargeableDuration** OPTIONAL}

```
StatusRequestSMXUMessageBlock ::= [APPLICATION 9] IMPLICIT SEQUENCE{
                                  requestType [0] IMPLICIT INTEGER{
                                  requestAllAddresses (0),
                                  requestNonDeliveryAddresses (1),
                                  requestSpecifiedAddresses (2)},
                                  specifiedAddresses [1] IMPLICIT AddressList OPTIONAL}

                        -- transit identities --

        -- transit identities are for further study --

TransitIdentities       ::= SEQUENCE{
                            firstTrId [0] IMPLICIT NumericString OPTIONAL,
                            secondTrId [1] IMPLICIT NUMERICString OPTIONAL,
                            thirdTrId [2] IMPLICIT NumericString OPTIONAL,
                            fourthTrId [3] IMPLICIT NumericString OPTIONAL,
                            fifthTrId [4] IMPLICIT NumericString OPTIONAL}

                    --SMXU Message Block Information --

    -- all octets are coded in accordance with the message code indicator --

Status                  ::  INTEGER{ delivery (0), nonDelivery (1)}

CalledAddress           ::= OCTET STRING

        -- called address is restricted to numeric characters --

Answerback              ::= OCTET STRING

LastAttemptTime         ::= [APPLICATION 10] IMPLICIT OCTET STRING

Reason                  ::= [APPLICATION 11] IMPLICIT OCTET STRING

ChargeableDuration      ::= [APPLICATION 12] IMPLICIT OCTET STRING

AddressList             ::= SET {specifiedAddress IMPLICIT OCTET STRING}
```



Note 1 – Delivery information is repeated for each address. The example shows two addresses.

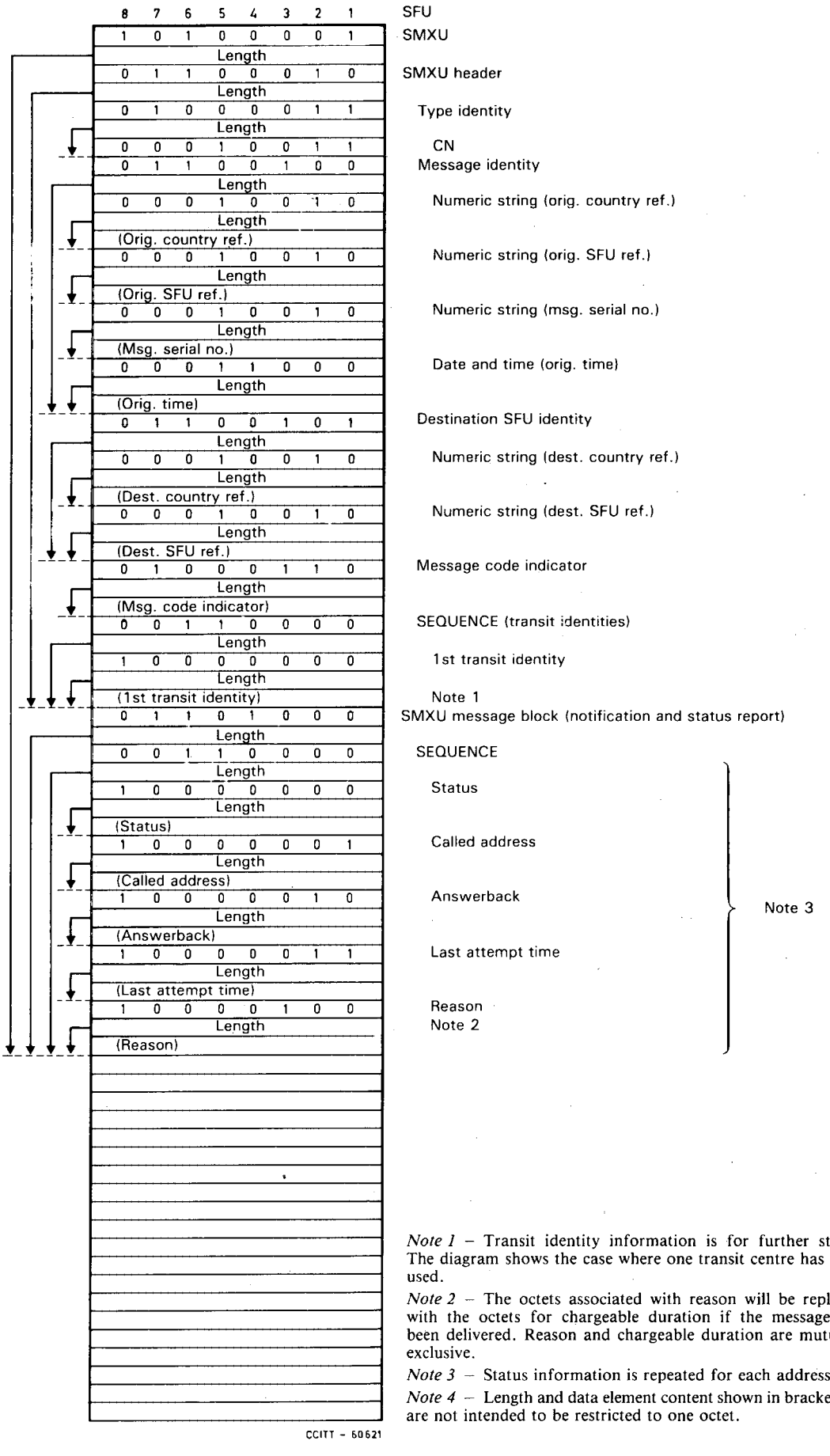
Note 2 – Optional.

Note 3 – Message content is coded according to the message code indicator.

Note 4 – Length and data element content shown in brackets ( ) are not intended to be restricted to one octet.

FIGURE A-1/U.82

Telex SFU interworking: text transfer (TT) UMXU



Note 1 – Transit identity information is for further study. The diagram shows the case where one transit centre has been used.

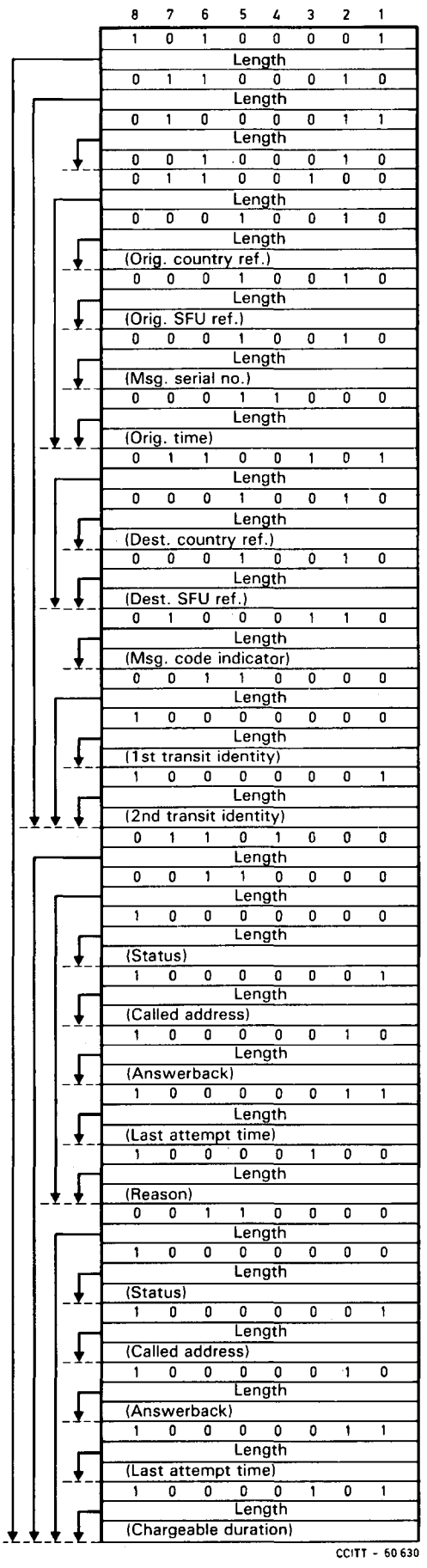
Note 2 – The octets associated with reason will be replaced with the octets for chargeable duration if the message has been delivered. Reason and chargeable duration are mutually exclusive.

Note 3 – Status information is repeated for each address.

Note 4 – Length and data element content shown in brackets ( ) are not intended to be restricted to one octet.

FIGURE A-2/U.82

Telex SFU interworking: combined delivery/non-delivery notification (CN) SMXU



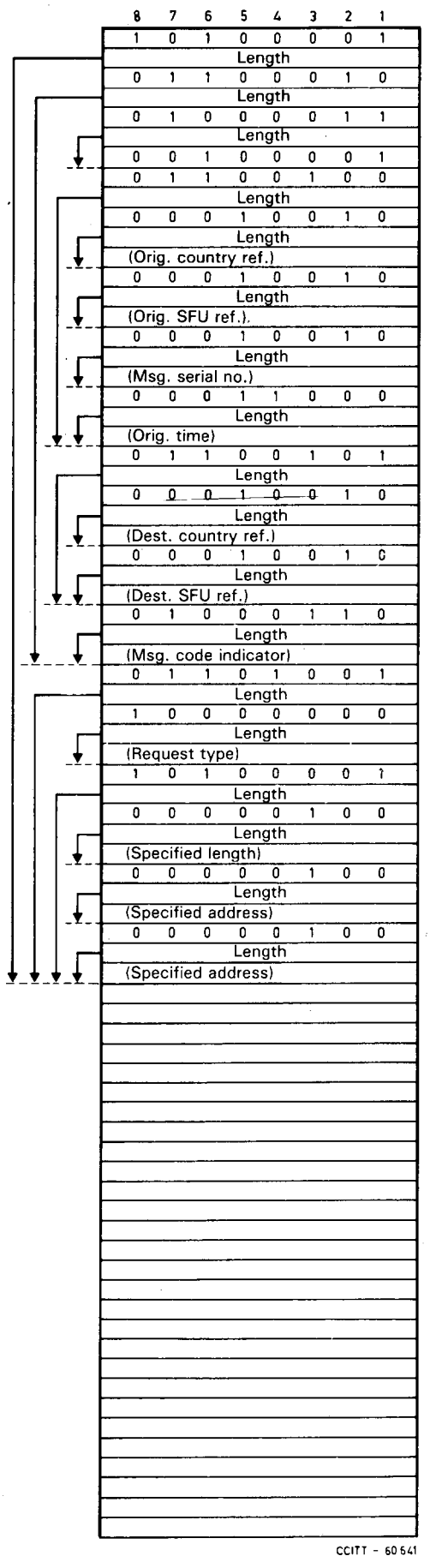
Note 1 – Example shows report of message passed through 2 transit SFUs.

Note 2 – Use of transit store and forward and the format of the transit identities is for further study.

Note 3 – Example shows report for two addresses where one has been delivered and the other has not been delivered at the time of this report.

FIGURE A-3/U.82

Telex SFU interworking: status report (SRPT) SMXU



SFU
SMXU
SMXU Header
Type identity
SRQ
Message identity
Numeric string (orig. country ref.)
Numeric string (orig. SFU ref.)
Numeric string (msg. serial no.)
Date and time (orig. time)
Destination SFU identity
Numeric string (dest. country ref.)
Numeric string (dest. SFU ref.)
Message code indicator
SMXU message block (status request)
Integer (request type)
Address list
OCTET STRING (address)
OCTET STRING (address)
OCTET STRING (address)

Note 1 – Example shows request for 3 specific addresses.
Note 2 – Length and data element content shown in brackets ( ) are not intended to be restricted to one octet.

FIGURE A-4/U.82

Telex SFU interworking: status request (SRQ) SMXU

APPENDIX I

(to Recommendation U.82)

Examples of field coding and content of MXUs for interconnection of telex SFUs when using the telex network, direct circuits and circuit switched data networks using asynchronous transmission

Example of UMXU – TT

Field description	Content
Type identity	01 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0 +
Delivery address expected answerback	41994531 + / 994531 FUG D (Attention line), D
Delivery address expected answerback	41662724 + / 662724 SPEER D (Attention line)
Delivery address expected answerback	41246178 + / 246178 ADAC D (Attention line)
Delivery address expected answerback	41823590 + / 823590 SEB D (Attention line)
End of address line	BT
Message text	Message text
End of MXU indicator	+ + + +

Note 1 – Delay indicator
D Delay at discretion of Administration
DXY XY specifies minimum delay in hours
LXY XY specifies maximum time limit

Note 2 – Message code indicator
0 ITA2
1 IA5
2 S.61

Note 3 – The expected answerback, attention line information and delay indicator may be optional fields. Each address line is delimited by CRLF.

Note 4 – The message text is the customer text and should not include the input end of message or end of transaction signals.

Example of SMUX – DN

Field description	Content
Type identity	11 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0+
Transit identities	+
Delivery status	0+
Address	41994531 +
Received answerback	994531 FUG D +
Delivery date/time	82-12-12 + 13-24 +
Chargeable duration	006.3 +
Delivery status	0+
Address	41246178 +
Received answerback	246178 ADAC D +
Delivery date/time	82-12-12 + 12-58 +
Chargeable duration	006.3 +
End of MXU indicator	+ + + +

Note 1 – Transit identity field is for future use.
Note 2 – Chargeable duration is in minutes and tenths of minutes.

Example of SMUX – NDN

Field description	Content
Type identity	12 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0+
Transit identities	+
Delivery status	1+
Address	41662724 +
Received answerback	662724 SPDDR D +
Date/time of last attempt	82-12-12 + 13-20 +
Reason	A/B +
Delivery status	1+
Address	41823590 +
Received answerback	+
Date/time of last attempt	82-12-12 + 12-49 +
Reason	DER +
End of MXU indicator	+ + + +

Note 1 – Wrong answerback received for first address.
Note 2 – No answerback received for second address.

Example of SMXU – CN

Field description	Content
Type identity	13 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0 +
Transit identities	+
Delivery status	0 +
Address	41994531 +
Received answerback	994531 FUG D +
Delivery date/time	82-12-12 + 13-24 +
Chargeable duration	006.3 +
Delivery status	1 +
Address	41662724 +
Received answerback	662724 SPDDR D +
Date/time of last attempt	82-12-12 + 13-20 +
Reason	A/B +
Delivery status	1 +
Address	41823590 +
Received answerback	+
Date/time of last attempt	82-12-12 + 12-49 +
Reason	DER +
Delivery status	0 +
Address	41246178 +
Received answerback	246178 ADAC D +
Delivery date/time	82-12-12 + 12-58 +
Chargeable duration	006.3 +
End of MXU indicator	+ + + +

Example of SMXU – SRQ

Field description	Content
Type identity	21 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0 +
Transit identities	+
Request type: 0	0 +
(see Note)	+ + + +
or 1	1 +
	+ + + +
or 2	2 +
Specified address	41994531 +
End of MXU indicator	+ + + +

Note – Request type indicators:
0 – Request all
1 – Request non-delivery reports only
2 – Request report on specified address(es)

Example of SMXU – SRPT

Field description	Content
Type identity	22 +
Message identity	51 + 0001 + MSG NO. + 82-12-12 + 12-22 +
Destination SFU identity	41 + 0002 +
Message code indicator	0+
Transit identities	+
Delivery status	0+
Address	41994531 +
Received answerback	994531 FUG D +
Date/time of delivery or last attempt	82-12-12 + 13-24 +
Chargeable duration	006.3 +
End of MXU indicator	+ + + +

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SECTION 9

(Reserved)

SECTION 10

(Reserved)

SECTION 11

(Reserved)

SECTION 12

(Reserved)

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SECTION 13

DEFINITIONS

Recommendation U.140

DEFINITIONS OF ESSENTIAL TECHNICAL TERMS RELATING TO TELEGRAPH SWITCHING AND SIGNALLING

The definitions given below have been identified as necessary for studies in the field of telegraph switching and signalling.

Sub-numbers in the range 37.ZZ signify definitions derived from definitions with number 37.ZZ in the ITU List of Definitions of Essential Telecommunications Terms.

Sub-numbers in the 721.52.YY range signify correspondence with definitions in the International Electrotechnical Vocabulary (IEV) of the International Electrotechnical Commission (IEC).

1 connection

F: chaîne de connexion

S: conexión

A temporary association of channels or circuits, switching and other functional units set up to provide for the transfer of information between two or more points in a telecommunication network.

721.52.01
37.18

2 (complete) connection

F: chaîne de connexion complète; (chemin de) communication

S: conexión (completa)

A temporary association of channels or circuits, switching and other functional units set up to provide for the transfer of information between terminals in a telecommunication network.

721.52.02

3 (telex) call

F: communication (télex)

S: llamada (télex); comunicación (télex)

The establishment and possible use of a complete connection by connected telex terminals.

721.52.03

4 subscriber serving exchange

F: commutateur de rattachement

S: central de servicio de abonados

A public switching exchange which connects subscribers in a same area to one another, or which establishes connection between them and the other exchanges.

721.52.04

5 transit exchange

F: commutateur nodal télégraphique

S: centro de tránsito

A telegraph exchange which enables connections between other telegraph exchanges to be established.

721.52.05

6 telegraph switching exchange

F: centre de commutation télégraphique

S: centro de conmutación telegráfica

The set of equipments installed at a single location to switch telegraph traffic.

721.52.06

7 sub-centre

F: sous-centre

S: subcentro

A switching centre which serves a group of terminals and concentrates the traffic from this group towards a larger parent switching centre in which it is dependent for the routing of the whole of its traffic.

721.52.08
35.02

8 line concentrator

F: concentrateur de lignes

S: concentrador de líneas

A switching equipment remotely located in a local line network and enabling the traffic between the subscriber serving exchange and a number of subscribers to be carried by a smaller number of lines.

Note – A compatible equipment must normally be provided at the subscriber serving exchange.

721.52.09
35.09

9 telegraph trunk circuit

F: circuit télégraphique de jonction

S: circuito telegráfico intercentrales

A permanent telegraph circuit between two telegraph exchanges permitting intercommunication.

721.52.10
35.12(b)

10 telegraph junction circuit

F: jonction de sous-centre

S: circuito telegráfico de enlace

A telegraph circuit connecting a sub-centre with its parent switching centre.

721.52.11
35.12(a)

11 overline service

F: groupement de lignes

S: servicio de líneas agrupadas

Several subscriber line circuits grouped under the same address in such a way that a call to that address may reach any of the free lines of the group.

721.52.12

12 overflow (in telegraphy)

F: débordement (en télégraphie)

S: desbordamiento (en telegrafía)

Redirection by the network of calls or messages to a designated position, when a connection to the called position cannot be established, with a view to a later retransmission.

721.52.13
35.10

13 circuit switching

F: commutation de circuits

S: conmutación de circuitos

The temporary connection of two or more terminals upon request providing the exclusive use of a complete connection until it is released.

721.52.14

14 message switching; store and forward switching

F: commutation de messages; messagerie

S: conmutación de mensajes; conmutación en el servicio de almacenamiento y retransmisión

The process of routing messages comprising, in certain nodes of the network, a receiving, storing as necessary, and forwarding of messages within a telecommunication network.

721.52.15

15 reperforator switching

F: commutation avec retransmission par bande perforée

S: conmutación con retransmisión por cinta perforada

A tape relay system in which the tape from a reperforator feeds directly into a permanently associated automatic transmitter which can be switched to an outgoing channel.

Note – This switching may be manual, automatic or semi-automatic.

721.52.17
35.03

16 **character switching**

F: commutation de caractères

S: conmutación de caracteres

The temporary connection of two or more terminals upon request using a process of storing and transferring character by character from one line to another.

721.52.18

17 **circuit switching exchange; switch** (circuit)

F: commutateur de circuits

S: centro de conmutación de circuitos; conmutador (de circuitos)

A set of devices associated with a set of circuits intended to interconnect temporarily on request such circuits to constitute connections.

721.52.19

18 **message switching exchange; switch** (message)

F: commutateur de messages

S: centro de conmutación de mensajes; conmutador (de mensajes)

A set of devices associated with a set of circuits intended to receive, store as necessary, and forward messages without providing any exclusive connection between circuits.

721.52.20

19 **national subscriber's telex number**

F: numéro télex national d'abonné

S: número télex nacional de abonado

A sequence of digits that a caller must normally select to connect to a called subscriber situated in the same country.

721.52.21

20 **local telex number**

F: numéro télex local

S: número de télex local

A sequence of digits shorter than the national subscriber's telex number used to connect a called subscriber situated in a restricted geographical area.

721.52.22

21 **alternative selection signals**

F: pluralité des codes de signaux de sélection

S: pluralidad de señales de selección

The acceptance by the network of several different codes for selection signals, e.g. International Telegraph Alphabet No. 2 and International Alphabet No. 5, the choice of code being either fixed for a given subscriber, or variable at the subscriber's choice, for each call attempt.

721.52.28

22 prefix giving access to the long distance telex network

F: préfixe d'accès à grande distance

S: prefijo de acceso a la red télex de larga distancia

A digit or sequence of digits giving access to the remainder of the national telex network from an area inside which local telex numbers are used.

721.52.29

23 prefix giving access to the international telex network

F: préfixe d'accès à l'international

S: prefijo de acceso a la red télex internacional

A digit or a sequence of digits that must be selected by a subscriber, possibly after the prefix giving access to the long distance telex network, to connect with the international network.

721.52.30

24 prefix giving access to the intercontinental telex network

F: préfixe d'accès à l'intercontinental

S: prefijo de acceso a la red télex intercontinental

A digit or a sequence of digits that must be selected by a subscriber, possibly after the prefix giving access to the long distance telex network, to connect with the intercontinental network.

721.52.31

25 destination code

F: code télex de destination

S: código de destino

A sequence of digits identifying the country in which the called subscriber is located or a specified network in that country.

Note – The telex destination codes have been fixed by Recommendation F.69.

721.52.32

26 international selection sequence

F: numéro de batterie

S: secuencia de selección internacional

First sequence of digits in an international two-stage selection.

721.52.33

27 international two-stage selection

F: numérotation internationale en deux temps

S: selección internacional de dos etapas

The process of establishing international calls using two sequences of digits, the first sequence characterizing the called country or network, and the second sequence characterizing the called subscriber in that country or network.

721.52.34

28 traffic routing (in circuit switching)

F: acheminement (en commutation de circuits)

S: encaminamiento de tráfico (en conmutación de circuitos)

Designating in accordance with given rules the set of circuits to be used for setting up a connection from a given exchange for a given call attempt.

721.52.36

29 normal (traffic) **routing**

F: acheminement normal

S: encaminamiento normal (de tráfico)

Designating in accordance with given rules the set of circuits on a first priority basis from which a circuit is to be selected, provided that a free circuit exists in that set for a given call attempt.

721.52.37

30 alternative traffic routing

F: acheminement détourné; détournement

S: encaminamiento alternativo (de tráfico)

Designating in accordance with given rules the set of circuits to be taken in the case where no circuit is available in the set of normal traffic routing circuits for a given call attempt.

721.52.38

31 first choice set of circuits

F: faisceau de premier choix

S: haz de circuitos de primera elección

A set of circuits to be used on a first priority basis if a free circuit from this set is available.

721.52.39

32 emergency routing

F: acheminement de secours

S: encaminamiento de emergencia

The routing to be chosen exceptionally if neither the normal traffic routing nor any alternative traffic routing set of circuits is available.

721.52.40

33 re-routing

F: réacheminement

S: reencaminamiento

In case of congestion in a transit exchange, the re-direction of the call backwards to a preceding exchange in the already partly established connection with a view to finding an alternative traffic routing from that exchange.

721.52.41

34 switching signal

F: signal de commutation

S: señal de conmutación

A signal transmitted between two exchanges or between one exchange and a terminal for establishing and clearing a call.

721.52.42

35 **forward switching signal**

F: signal (de commutation) vers l'avant

S: señal de conmutación hacia adelante

A switching signal transmitted in the direction from the caller to the called party.

721.52.43

36 **return switching signal**

F: signal (de commutation) vers l'arrière

S: señal de conmutación hacia atrás

A switching signal transmitted in the direction from the called party to the caller.

721.52.44

37 **free circuit condition**

F: état de disponibilité

S: estado de circuito libre

The characteristic state of a circuit available for the setting up of a call.

721.52.45
35.13

38 **calling signal**

F: signal d'appel

S: señal de llamada

A forward switching signal retransmitted on a circuit or a subscriber's line to indicate that the setting up of a call is requested.

721.52.50
35.15

39 **call control procedure**

F: procédure de commande d'appel

S: procedimiento de control de la llamada

The entire set of interactive signals necessary to establish, maintain and release a call.

721.52.51

40 **call-confirmation signal**

F: signal de confirmation d'appel

S: señal de confirmación de llamada

A return switching signal, in response to a calling signal, to acknowledge the receipt of the calling signal.

721.52.52
35.16

41 **call accepted signal**

F: signal d'acceptation d'appel

S: señal de llamada aceptada; señal de aceptación de la llamada

A signal sent over the return channel, indicating that the call can be accepted by a terminal.

721.52.53

42 **selection signals**

F: séquence de sélection

S: señales de selección

A sequence of forward signals giving to an exchange information necessary to the setting up of a call.

721.52.54

43 **address** (in circuit switching)

F: adresse (en commutation de circuits)

S: dirección (en conmutación de circuitos)

The part of the selection signals which indicates the destination of a call.

721.52.55

44 **address** (in information processing)

F: adresse (en traitement de l'information)

S: dirección (en tratamiento de la información)

A character or group of characters that identifies a storage or a device without the use of any intermediate reference.

721.52.56

45 **processed-to-select signal**

F: signal d'invitation à numéroter

S: señal de invitación a marcar

A return switching signal transmitted by an exchange in response to a calling signal or after a call-confirmation signal to indicate that the exchange is ready to receive the selection signals.

721.52.57
35.17

46 (user) **class of service signal**

F: signal de catégorie

S: señal de clase de servicio (de usario)

A character or group of characters among the selection signals identifying the user's class of service of the calling party.

721.52.58

47 **pre-signal**

F: présignal

S: preseñal

A class of service signal transmitted at the beginning of the selection signals.

721.52.59

48 **post-signal**

F: postsignal

S: postseñal

A class of service signal transmitted after the sequence of digits characterizing the called terminal.

721.52.60

49 end of selection signal

F: signal de fin de sélection

S: señal de fin de selección

A switching signal transmitted among the selection signals after the digits of the called subscriber's number to indicate that there is no further digit belonging to this number.

721.52.61

50 keyboard selection

F: numérotation au clavier (en télégraphie)

S: selección por teclado (marcación por teclado)

In automatic telegraph switching, the use of telegraph alphabet signals sent from the teleprinter's keyboard or from an automatic equipment to form the selection sequence.

721.52.62

51 dial selection (in telegraph)

F: numérotation au cadran (en télégraphie)

S: selección por disco (marcación por disco) (en telegrafía)

In automatic telegraph switching, the use of dial pulse trains from a dial or an automatic equipment to form the selection sequence.

721.52.63

52 call-connected signal

F: signal de communication établie

S: señal de comunicación establecida

The switching signal returned over the backward signalling path to indicate that the call is extended to the called station.

721.52.64
35.19

53 clearing signal

F: signal de libération

S: señal de liberación

The switching signal transmitted over a circuit to release a switched connection.

721.52.65
35.20

54 confirmation of clearing signal

F: signal de confirmation de libération

S: señal de confirmación de liberación

Return switching signal which indicates that the clearing signal has been executed.

721.52.66

55 service signal

F: signal de service

S: señal de servicio

Signal transmitted automatically by the network to the calling terminal indicating the progress of a call or the cause of failure of the call attempt.

721.52.67

56 engaged; busy signal

F: signal d'occupation

S: señal de ocupado; señal de ocupación

A busy signal which indicates that the called station is busy or not available.

721.52.68

57 barred signal

F: signal d'interdiction

S: señal de acceso prohibido

A service signal which indicates that a call cannot be established because access is barred.

721.52.69

58 call set-up time

F: temps d'établissement d'une communication

S: tiempo de establecimiento de la llamada

The interval of time between the sending of the calling signal by the calling party and the reception of the call-connect signal.

721.52.70

59 pre-selection delay

F: temps de présélection

S: tiempo de preselección

The interval of time between the sending of the calling signal by the calling party and the reception of the proceed-to-select signal.

721.52.71

60 selection time

F: temps de numérotation

S: tiempo de selección (tiempo de marcación)

The interval of time between the reception by the calling party of the proceed-to-select signal and the end of reception by the exchange of the selection sequence.

721.52.72

61 post-selection time

F: temps de sélection

S: periodo de espera después de marcar

The interval of time between the end of the sending of the selection sequence by the calling party and the reception of the call-connect signal.

721.52.73

62 effective duration of a call

F: durée d'une communication

S: duración efectiva de una llamada

The interval of time between the reception by the calling party of the call-connect signal and the sending of the clearing signal.

721.52.74

63 stored program control (SPC)

F: commande par programme enregistré

S: control por programa almacenado (CPA)

The control of an exchange by means of a set of instructions which are stored and can be modified.

721.52.75

64 common channel signalling

F: signalisation par canal sémaphore; signalisation sur voie commune

S: señalización por canal común

A signalling method in which signalling information relating to a multiplicity of circuits is conveyed over a single channel by labelled messages.

721.52.76

65 channel associated signalling

F: signalisation voie par voie

S: señalización asociada al canal

A signalling method in which the signals for the traffic carried by a single transmission channel are transmitted over that channel itself or over a signalling channel permanently associated with it.

Note – This term may also apply when the signals for a circuit are transmitted over the channel carrying the traffic.

721.52.77

66 call clearing delay

F: temps de libération

S: tiempo de liberación de la llamada

The interval of time between the beginning of the sending of the clearing signal by a terminal and the appearance of the free circuit condition on the return line.

721.52.78

67 unsuccessful call

F: appel infructueux

S: llamada infructuosa

A call attempt which does not result in the establishment of a complete connection.

721.52.79

68 call not accepted signal

F: signal de refus d'appel

S: señal de rechazo de la llamada

A call control signal sent by the called terminal to indicate that it does not accept the incoming call.

721.52.80

69 lost call

F: appel perdu

S: llamada perdida

A request for a connection which is rejected due to network congestion.

721.52.81

70 **head on collision**

F: double prise (sur circuit mixte); collision frontale

S: colisión frontal

The condition which exists when, on a transmission path capable of being used to set up calls in both directions, the path is seized from both ends simultaneously or nearly so. The seizure of the path by the distant end is not apparent, due to propagation delays.

721.52.82

71 **terminal connection method** (in telex)

F: mode de raccordement (en télex)

S: método de conexión del terminal (en télex)

The characteristics of the interface between a telex subscriber's line and a subscriber-serving exchange.

721.52.83

72 **speed converter concentrator**

F: concentrateur-diffuseur

S: concentrador convertidor de velocidad

The temporary storing of data arriving from slow channels and their retransmission on high speed channels and vice versa.

721.52.84

73 **system control station**

F: centre directeur

S: estación de control del sistema

Station which is responsible for maintenance and clearance of faults on a transmission system.

721.52.86

PART II

SUPPLEMENTS TO THE SERIES U RECOMMENDATIONS

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Supplement No. 1

SIGNALLING CHARACTERISTICS AND TIMING OF THE MARISAT TELEX SERVICE

(*Source:* COMSAT)

1 Introduction

In response to Recommendation U.4, this Supplement describes the characteristics and time sequences of the international telex service operated over the MARISAT maritime satellite communication system.

2 Ship terminal originated telex call

Figure 1 shows the signalling sequence for a telex call originated from a ship terminal in the MARISAT system. Figure 2 illustrates the telex signalling and timing sequence. The following is a general description of the sequence of events in establishing a telex call from a ship terminal to a gateway switch.

2.1 To initiate a call, the ship terminal sends a telex request message in the *out of band* request channel. The coast earth station receiving the valid request message will send back an *out-of-band* assignment message instructing the ship terminal equipment to tune to the assigned channel.

2.2 On the receipt of a valid *out-of-band* assignment message from the coast earth station, the ship terminal can then access its assigned channel. The terminal will normally achieve carrier and bit timing synchronization within 0.58 seconds after receipt of the assignment message. This time includes assignment message decoding, carrier recovery and clock recovery. Transmission will normally start upon frame synchronization, which occurs in less than 5.25 seconds. Therefore, the normal ship terminal response time will be less than 5.8 seconds as seen at the ship or 6.6 seconds as seen at the coast earth sation. The time that the assignment message remains active in the coast earth station is in addition to this 6.6 seconds, allowing enough time for the ship terminal to start transmitting.

2.3 The coast earth station, which is continually transmitting a spacing signal, makes the transition space to mark indicating call confirmation within one character (150 milliseconds not counting framing delays) after the assignement message is formatted. In cases of heavy traffic, the assignment message may be delayed in queue until after the transition has occurred, i.e., it is possible for the space to mark transition to be received by the ship terminal before the assignment message.

2.4 The initial ship terminal transmission is in the spacing state. When a mark is received from the coast earth station, the terminal changes its transmission from space to mark. In the case when the space to mark transition on the coast earth station to ship terminal link reaches the terminal before the assignement message, the terminal inserts no more than two space characters in the initial burst.

2.5 Once the coast earth station has received the terminal's space to mark transition, it sends a WRU (figure case D) to the ship terminal. The coast earth station must receive a 20 character answerback within 7 seconds from the end of the WRU character sequence or it will clear the call. In addition, the coast earth station sends a *request not acceptable* assignment message (out-of-band) back to the terminal. The coast earth station does not check if the answerback code corresponds to the ship terminal's destination code (ID).

2.6 The received answerback is stored by the coast earth station. Call processing is now started between the coast earth station and the gateway switch. The coast earth station presents a mark to the gateway switch and the gateway responds with a *call confirmation* within 1 second. Within 3 seconds after the *call confirmation*, the gateway returns a *call connect*. The coast earth station then connects the gateway switch to the ship terminal. The gateway then sends its header (if any) and a WRU to the ship terminal. After transmission of these signals, the coast earth station disconnects the circuit and sends the ship's answerback in storage to the gateway switch within 850 milliseconds. The ship terminal will send an answerback in response to the WRU from the gateway switch. However, this second answerback is blocked by the coast earth station. The coast earth station will connect the circuit after the 19th character of the ship's answerback is received, and the ship terminal can then send selection digits to the gateway switch.

2.7 After this second connection, the coast earth station does not respond to any data on the line until it detects clearing.

2.8 The gateway switch, upon receipt of the selection sequence from the ship terminal, proceeds to process the call to the desired terrestrial subscriber. As the MARISAT system interfaces with various gateway switches, the signalling sequences proceed according to the protocol between the particular gateway switch and the terrestrial network.

Note – The signalling sequences shown between the gateway switch and terrestrial network in Figure 1 illustrates one method of signalling which can be employed.

3 Telex call originated by a coast earth station

3.1 Figures 3 and 4 illustrate the telex signalling and timing sequences for a telex call originated in a terrestrial network to a ship terminal via the MARISAT system. As the signalling sequences between the terrestrial networks and each gateway switch are not identical, that portion of the signalling sequences in Figure 3 are for illustrative purposes only and no attempt is made to describe all the possible sequences.

3.2 The following paragraphs provide a description of the sequence of events which occur between a gateway switch and a ship terminal for a telex call originated by a coast earth station.

3.2.1 Upon receit of the selection digits from the terrestrial network, the gateway switch starts the signalling sequence by sending a *call request* signal on an idle circuit to the coast earth station. Upon receipt, the coast earth station returns both a *call confirmation* and *proceed-to-select* signal within the proper intervals as shown in Figure 4. The gateway switch can then proceed to send the selection digits to the coast earth station.

3.2.2 The coast earth station checks the validity of the selection digits and if correct, sends an *out-of-band* assignment message to the ship terminal requested. When the assignment message has been transmitted, the signalling proceeds in the same manner as a call from a ship terminal to a coast earth station described in § 2. Once the ship has accessed its assigned channel, the coast earth station sends a WRU to the ship terminal. The terminal responds with its answerback which is stored by the coast earth station.

3.2.3 When the answerback is stored, the coast earth station sends a *call connect* signal to the gateway switch. The gateway then sends a WRU and its header toward the coast earth station. These signals are blocked at the coast earth station and prevented from going to the ship terminal. The coast earth station responds to the gateway's WRU with the ship terminal answerback it had previously stored. The coast earth station then interconnects the circuit between the gateway switch and the ship terminal. From this point, the coast earth station is essentially transparent to all data on the line until it detects a *clearing* signal.

4 Telex clearing sequence

4.1 The coast earth station recognizes a *clearing* signal as a spacing condition of 400 to 1000 milliseconds from either the gateway switch or a ship terminal. After recognition of the *clearing* signal, the coast earth station will disconnect the circuit and send a *clear confirmation* signal in both directions.

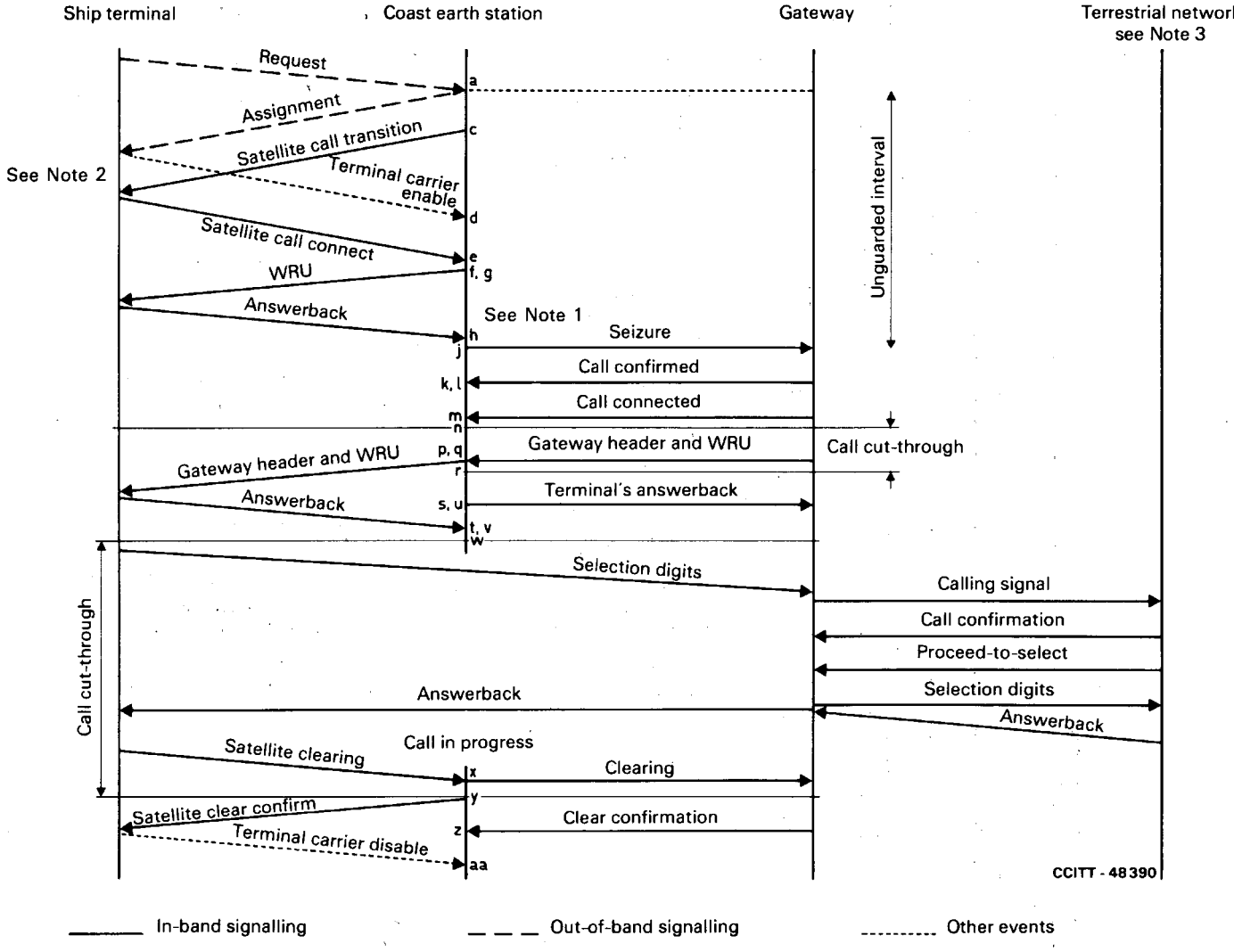
4.2 Release of the satellite circuit section is under the control of the coast earth station. The ship terminal does not stop transmission of its RF carrier until;

a) it has returned a *clear confirmation* signal following the receipt of a *clearing* signal from the coast earth station; or

b) a *clear confirmation* signal is received from the coast earth station.

In either case, the ship terminal maintains a spacing signal for a maximum of 3.09 seconds before transmission is terminated.

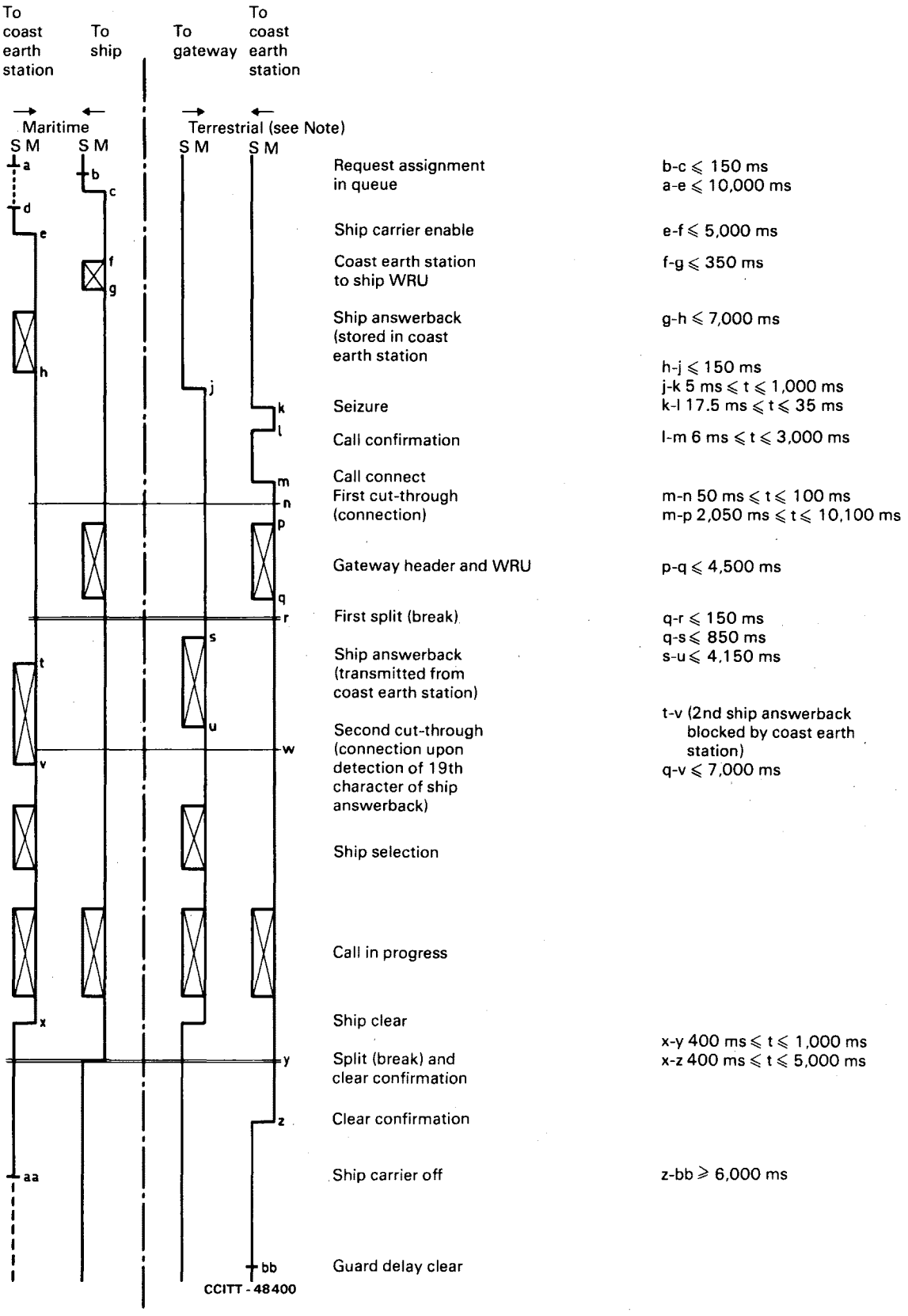
4.3 For 6 seconds after the successful receipt of the *clearing* and *clear confirmation* signals over a circuit section between the coast earth station and a gateway switch, the coast earth station will not process any calls on that circuit section. The ship terminal is also considered busy during this 6-second interval. This 6-second guard time is necessary to allow for proper clearing of the ship terminal over the satellite circuit section. If another telex call is received for that ship terminal during the 6-second guard time, the coast earth station will send back an **OCC** service signal.



Note 1 — Answerback stored by coast earth station.
Note 2 — The assignment message and satellite call transition may arrive in either order.
Note 3 — Sequence between gateway and terrestrial network is for illustration only, as sequence can vary depending on the gateway involved.

FIGURE 1

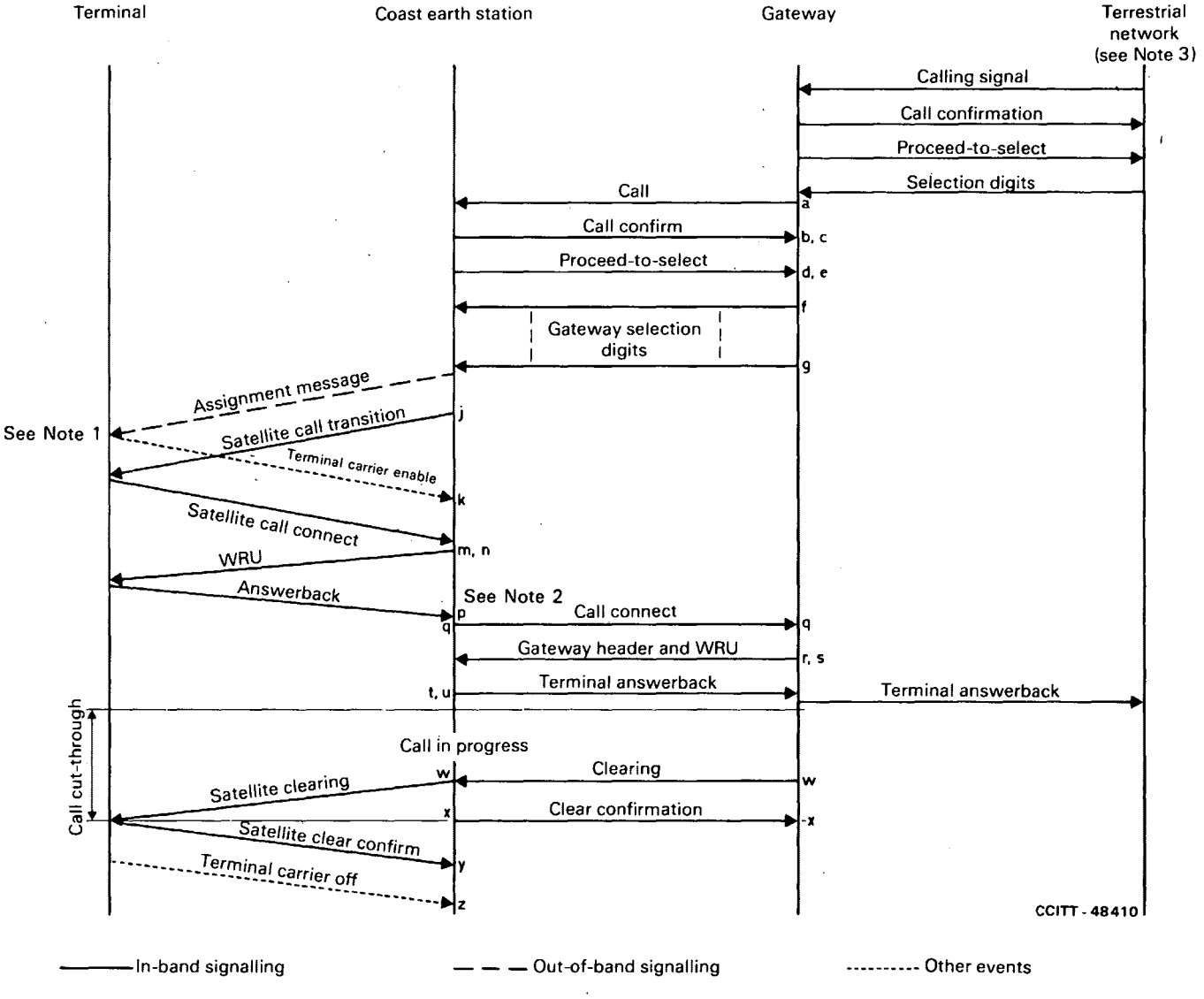
Signalling sequence for MARISAT telex calls (ship terminal-to-shore)



Note — U.S. coast earth station/gateway interface shown.

FIGURE 2

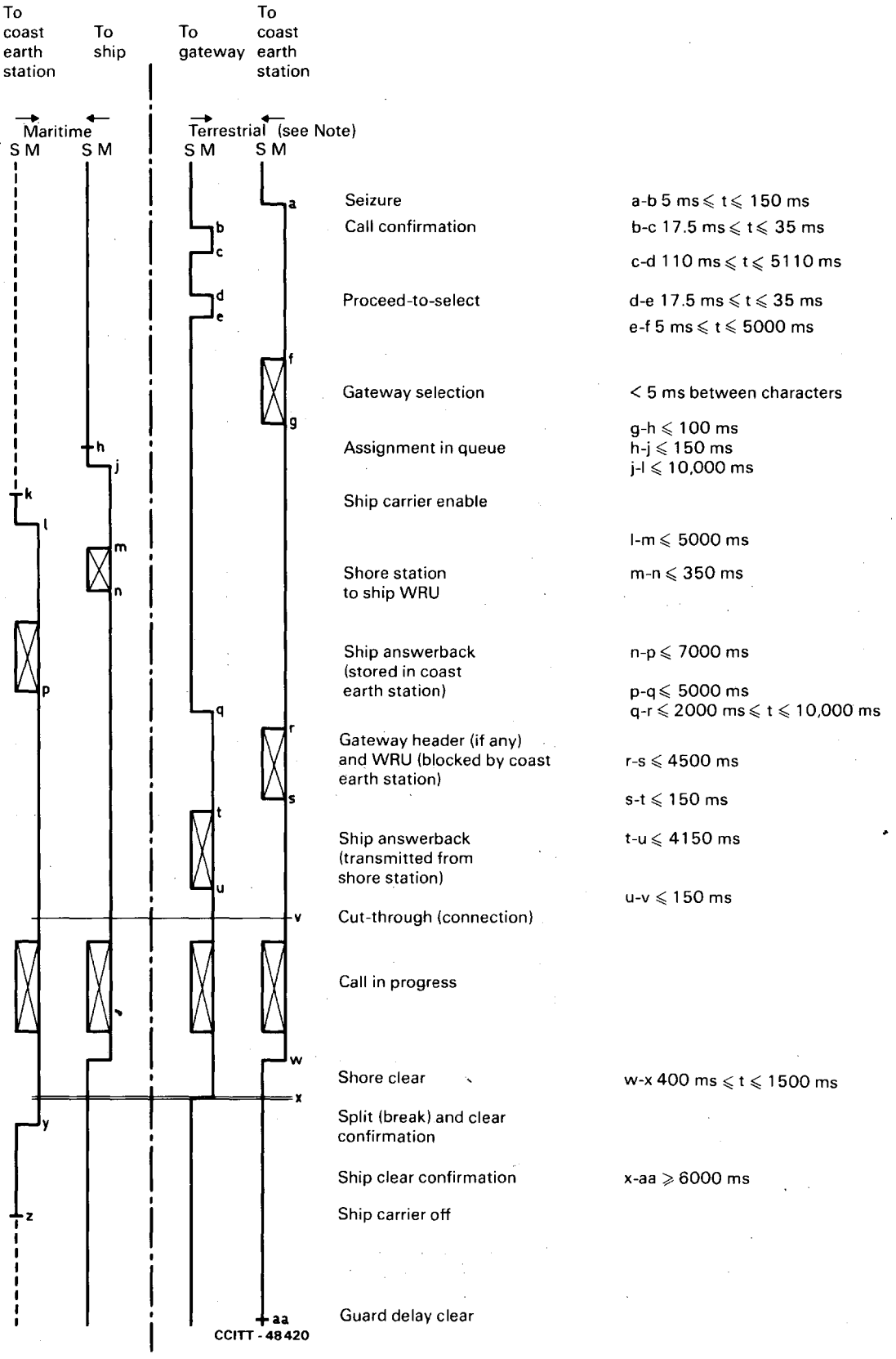
Timing sequence for a ship terminal originated MARISAT telex call



Note 1 — The assignment message and satellite call transition may arrive in either order.
Note 2 — Answerback stored by coast earth station.
Note 3 — Sequence between gateway and terrestrial network is for illustration only, as sequence can vary depending on the gateway involved.

FIGURE 3

Signalling sequence for MARISAT telex calls (shore-to-ship terminal)



Note — U.S. coast earth station/gateway interface shown.

FIGURE 4

Timing sequence for a shore originated MARISAT telex call

Supplement No. 2

SIGNALLING ARRANGEMENTS IN THE MARITIME SATELLITE TELEX SERVICE VIA THE MARISAT SYSTEM

[*Source:* Kokusai Denshin Denwa Co., Ltd. (KDD)]

1 Introduction

In response to Recommendation U.4, this supplement describes the characteristics and signalling conditions of the Maritime Satellite Service being provided by KDD in Japan. The coast earth station at Yamaguchi was built by KDD to access the Indian Ocean MARISAT satellite.

Coast earth stations can be grouped into two types. As shown in Figure 1 *a)*, a coast earth station can be viewed as a gateway to accommodate international circuits directly by giving it routing, charging and other functions. On the other hand [Figure 1 *b)*] to simplify its functions the coast earth station can be regarded as a line concentrator, or local switch.

The Yamaguchi station is regarded as a local switch in the KDD telex network and uses domestic signalling, conforming to Recommendation U.1 (type B), between the station and a Tokyo gateway (CT10). Figure 1 shows the network configuration.

2 Numbering and routing

Ship stations are accessed by 3-digit destination codes of Recommendation F.69 [1] assigned to each maritime satellite (583 is assigned to the Indian Ocean satellite) and 7-digit ship numbers. Ship stations gain access by means of 2- or 3-digit destination codes of Recommendation F.69 [1] and subscriber numbers. When a ship station accesses a KDD operator for number inquiry, etc., the coast earth station converts the 2-digit number before sending it to the gateway.

Generally, maritime telex calls are connected automatically, while distress, urgent and safety calls have come to be operated manually.

3 Charging and accounting

At present, information, based on conversation time, about both subscribers' charging and international accounting is recorded onto the same toll ticket by transferring the originating subscriber's number to the gateway in the KDD network where it is recorded.

One of the tariff parameters in maritime satellite communications is space segment utilization. In order to base the accounting on holding times (including the time required for setting-up calls), recording at coast earth stations will be necessary. Fortunately, the MARISAT system has the same accounting structure as telex networks (i.e. based on conversation time). It is, therefore, possible to get charging and accounting information (including the space segment) from only one record, by transferring ship station numbers to gateways, and by utilizing the charging and accounting function of gateways.

Items recorded for ship originated calls are:

a) ship station number,

b) address number,

c) outgoing route information,

d) date and time at start of charging and accounting,

e) time at release of the connection.

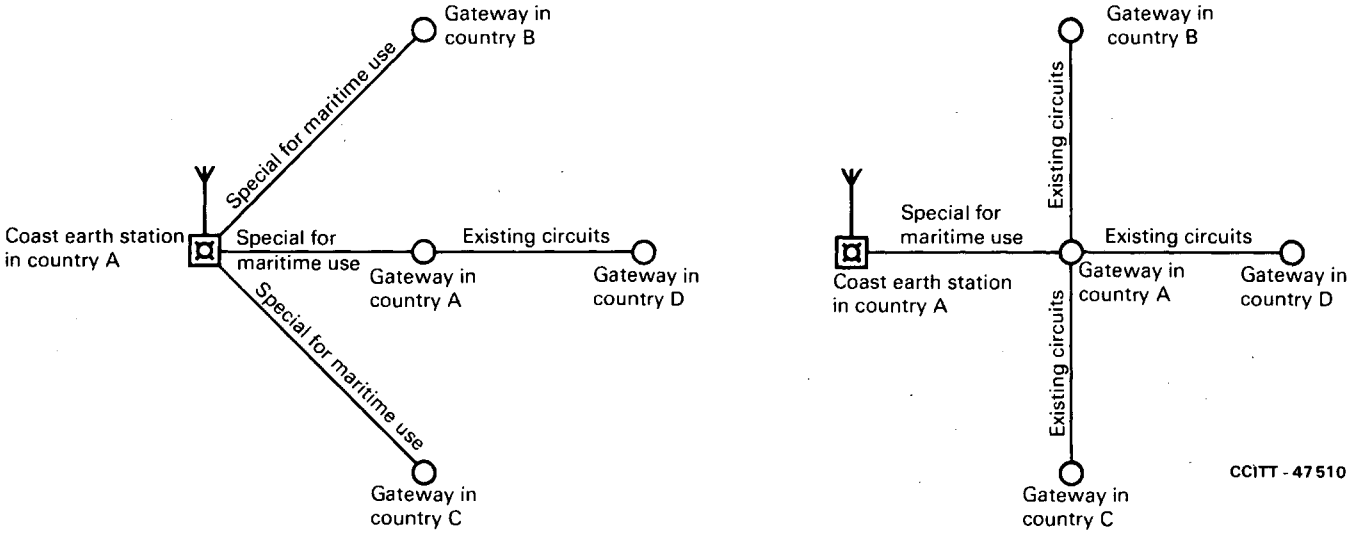
Items recorded for calls originated by domestic subscribers are:

a) domestic subscriber number,

b) ship station number,

c) date and time at start of charging and accounting,

d) time at release of the connection.



a) A coast earth station with *routing and charging functions*

b) A coast earth station without *routing and charging functions*

FIGURE 1

Connection between coast earth station and telex network

Items recorded for calls originated by foreign subscribers are:

a) incoming route information,

b) ship station number,

c) date and time at start of accounting,

d) time at release of the connection.

Ship station number up to nine digits can be handled. Time information is recorded in units of seconds.

The above information is recorded at the outgoing gateway, or at gateways which have operator positions. For ship originated calls, a reference number consisting of the date, time in Japanese Standard Time (JST), and circuit number is sent by the charging gateway to the ship station when calls are accepted. The chargeable duration of communications is sent when signals indicating the end of call are received.

4 Signalling

When introducing a new service, the first consideration must be to minimize the impact on the existing network. For example, a call setting-up procedure from a ship station meeting this objective must be like the one shown in Figure 2. However, considering that shipboard operators are already familiar with the procedure at the U.S. coast earth stations, the procedure shown in Figure 3 has been adopted to unify the call setting-up procedure.

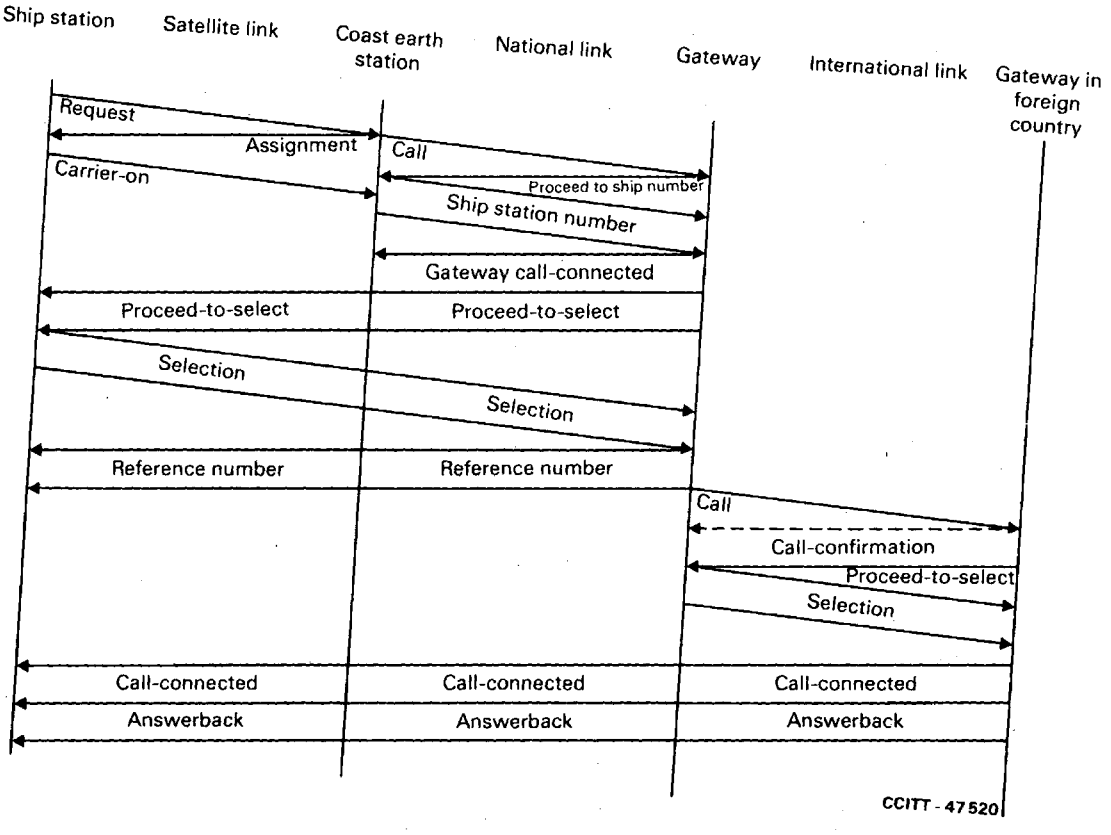


FIGURE 2

One example of a call setting-up procedure

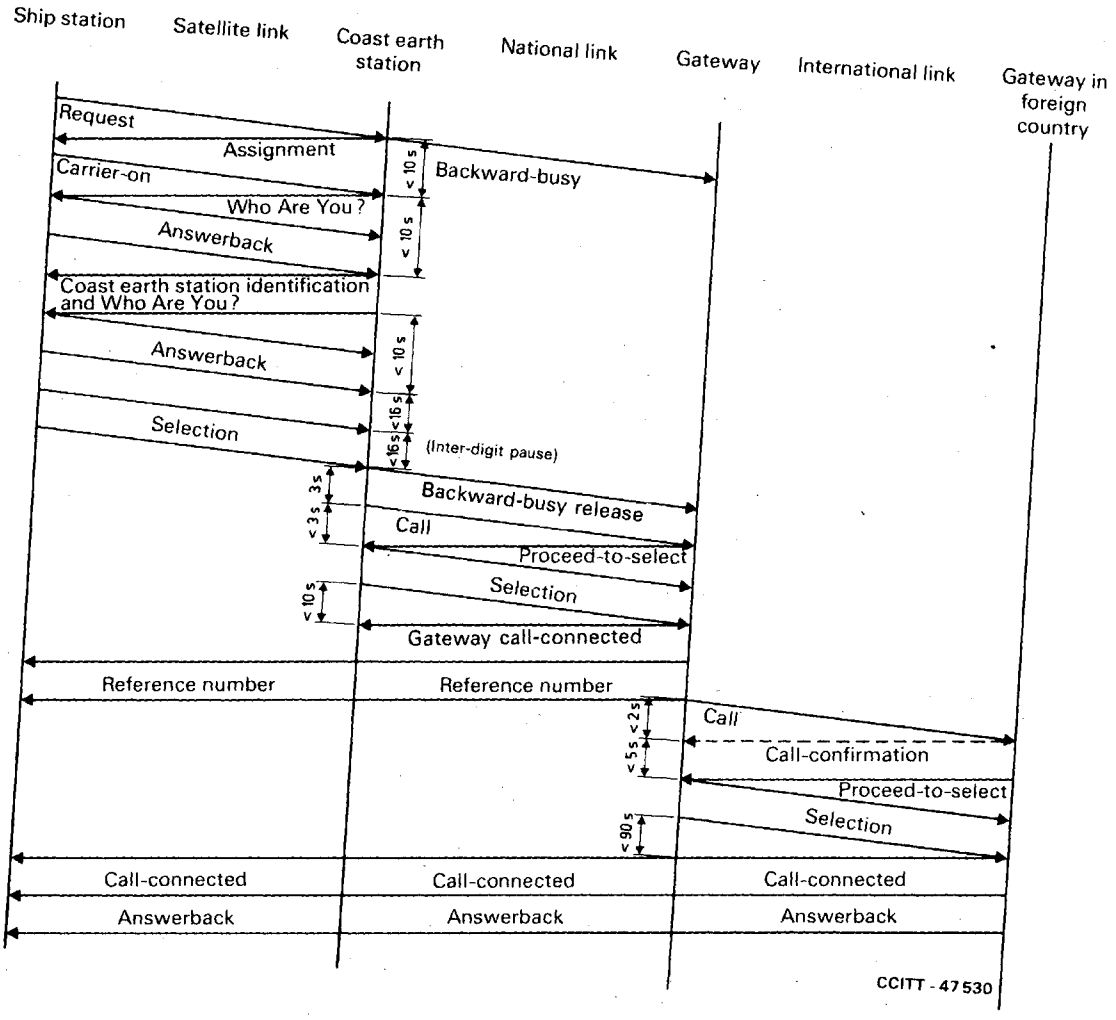


FIGURE 3

Ship originated call

4.1 *Ship originated call* (see Figure 2)

4.1.1 *Acceptance of requests*

Ship stations sending request signals are checked to determine whether or not they are authorized in the MARISAT system. Requests from ship stations that are not authorized are neglected. However, requests for distress calls are unconditionally accepted.

Request signals are of two types – release requests and assignment requests. On reception of a release request, a *channel release* is sent if a channel has already been assigned to that station; if an assignment request is waiting in a queue, it is deleted from that queue.

In the case of assignment requests, a *request not acceptable* is sent if assignment requests have already been accepted. Requests from ships to which the coast earth station is broadcasting are accepted. *Request not acceptable* is sent when request signals contain errors.

For routine requests, a circuit is assigned to the ship if there is an idle circuit. If there is no idle circuit, the request signal is put into the queue, and *acknowledged message (queue)* is sent. The length of a queue can vary up to a maximum size of 10.

In the case of distress requests, the request is handled in the same manner as for routine calls if there is an idle circuit. If there is no idle circuit, one circuit is pre-empted automatically. The priority order for this is as follows:

a) a circuit in setting-up procedure;

b) a circuit in progress.

For urgent or safety requests, the same procedure that is applied to routine calls is taken.

A circuit is selected from the higher order channel numbers.

After the request is accepted, the polarity of the transmission line on the gateway side is immediately inverted from an A polarity to Z polarity (backward busy). This backward busy signal is released on reception of the end-of-selection signal (+) from the ship station. However, in the case of distress, urgent, or safety requests, this signal is released after the second answerback is received from the ship.

During this time, the receive channel from the gateway is not monitored.

4.1.2 *Response to assignment*

If the carrier does not arrive at the coast earth station within ten seconds of sending the assignment signal, a second identical *assignment* signal is sent. The call is released if carrier is not received within a further ten seconds.

4.1.3 *Response to coast earth station identification*

The "Who are you?" signal is sent out after receiving a carrier, but the call is released unless a group of 20 characters (ship's answerback) is received within ten seconds. After receiving the answerback, the coast earth station identification (**<≡↓KDD↑→ xx→ xxxx↓Z→** where **xx** and **xxxx** are the date and time in UTC) and "Who are you?" are sent. Unless a further answerback is received within ten seconds, the call is released. Any characters received from ship stations while sending *Who are you*? or coast earth station identification signals are neglected, and character groups received are not checked as to whether answerbacks are those of eligible ship stations, or not.

4.1.4 *Processing of selection signals* (except distress, urgent and safety)

The numerical information received from the ship station between the end of the ship's answerback and the end-of-selection signal is stored. It is checked to see that the inter-digit pause does not exceed 16 seconds. The call is also released should the numerical information exceed 15 digits.

In cases where the first-digit numerical information is "1", the following conversion is performed:

a) Numbers 10 and 19 are converted to a number for the information position at the Tokyo gateway.

b) Number 18, to a number for the telephone booking position at the Tokyo international telephone office.

c) Numbers 17 and 16 are also accepted for the connection to the technical operator's position at the shore station and automatic test code sender respectively.

d) Any characters received from ships between the end-of-selection signal and connect-through are ignored.

4.1.5 *Transmission of a calling signal*

After releasing the backward-busy signal, reception of the clear-confirmation signal (A polarity for 450-600 ms) is confirmed. Three seconds later, a calling signal (inversion from A to Z polarity) is sent to the gateway. Unless the clear-confirmation signal is received within five seconds, the circuit is released after returning the service signal **NC** to ship station.

4.1.6 *Response to a calling signal*

Unless proceed-to-select (a Z polarity pulse for 20-40 ms followed by A polarity for 20 ms) is received from the gateway within three seconds of it sending a calling signal, the calling signal is repeated after sending an A polarity for three seconds. If no proceed-to-select signal is received in this time, the circuit is released after returning **NC** to the ship. The gateway side is cleared after detecting the clear confirmation signal and *carrier off* (three sequential TDMA bursts missing) from the ship. Three seconds thereafter, a retest signal (a Z polarity pulse for two seconds) is periodically sent to the gateway. If the proceed-to-select signal is received while sending the

Z polarity, the retest is stopped, and the circuit status is made idle three seconds after receiving a clear-confirmation signal from the gateway. If a calling signal is detected while sending the A polarity, retest is stopped and the call is accepted.

Failure to receive a proceed-to-select signal after making five retests at one-minute intervals and, thereafter, an additional five at 30-minute intervals, causes the circuit status to be changed to a fault condition.

A head-on collision is registered and the gateway side is released if Z polarity is received continuously for more than 40 ms against a calling signal. Three seconds after receiving a clear-confirmation signal, a calling signal is again sent out. Failure to receive a clear-confirmation signal within five seconds causes the ship station to be released after returning **NC**, and the gateway is released after detecting the clear-confirmation signal and *carrier off* condition from the ship station.

4.1.7 *Sending of selection signals*

After receiving a proceed-to-select signal from the gateway, the coast earth station sends a selection signal in one of the formats shown in Table 1. The numerical information is coded using a 2-out-of-5 code.

Priority calls are connected to a special operator position at the Tokyo gateway.

The class of calling party is used for barring and other uses in the KDD network. Number 02 is assigned to MARISAT ship stations, and number 21, to priority calls.

TABLE 1

Routine	↓ Start of selection	02 Class of calling party	xxxxxxx Ship station number in the out-of-band request signal	V Delimiter	xxx---x Numerical information from ship	E End of selection
Distress, urgent and safety	↓ Start of selection	21 Class of calling party	xxxxxxx Ship station number	V Delimiter	xxx Position's number	E End of selection

4.1.8 *Response to selection*

After sending the end-of-selection signal to the gateway, the coast earth station inspects the return channel for 10 seconds to detect the gateway call-connected signal (Z polarity for 100-150 ms). The circuit is connected through if this is successfully detected.

Failure to detect the call-connected signal results in the release of the ship station after returning **NC**, the channel to the gateway being released after receiving the clear-confirmation signal, and *carrier off* from the ship station.

4.1.9 *Monitoring after through-connection* (see Figure 4)

The circuit is monitored at the coast earth station. When a clearing signal (an A polarity for 450-600 ms) is detected, either from the ship station or the gateway, the circuit is split at this point.

When clearing from the ship station, the clear confirmation signal is returned to the ship station after splitting the circuits without waiting for a clear-confirmation signal from the gateway or a *carrier off* from the ship station.

The ship status is changed to the idle condition when *carrier off* has been detected, and the circuit's status is changed to the idle condition three seconds after a clear-confirmation signal has been received from the gateway and the conditions for the detection of *carrier off* have been fulfilled.

In the case of clearing from the gateway, the circuits are split when the clearing signal is detected. Then, the ship station status is changed to the idle condition when *carrier off* is detected after the arrival of a clear confirmation signal from the ship station. At the same time, the clear confirmation signal is returned to the gateway, and the circuits status changed to the idle condition after three seconds.

Unless a clear-confirmation signal and *carrier off* are received from the ship within 60 seconds of sending a clearing signal to the ship, or unless *carrier off* is received from the ship within 60 seconds of sending a clear-confirmation signal to the ship, a backward busy signal is sent to the gateway, and *channel release* command is sent to the ship, five times at intervals of one minute. *Carrier off* is then expected. Failure to detect *carrier off* causes the circuits and ship stations to be regarded as having failure status.

If *carrier off* is detected when release is not detected in both directions, the circuits are split, and clearing signals are sent to both the ship station and the gateway. A backward busy signal is sent to the gateway after receiving a clear-confirmation signal from the gateway. When *carrier off* is detected prior to a clear-confirmation signal after sending a clearing signal to the ship, an A polarity is sent for three seconds to the gateway, following which a backward busy signal is sent. In either case, a backward busy signal is sent for 50 seconds after receiving *carrier off*, and the circuits are made idle three seconds thereafter. The ship station is made idle when *carrier off* is detected.

If five continuous *full stops* (ITA 2 combination No. 13) or *commas* (ITA 2 combination No. 14) are received from the ship station together with release and *carrier-off*, the circuits are split for 600 ms. During this time, an A polarity is continuously sent to the gateway, and a Z polarity, to the ship stations.

For *carrier off* with less than three sequential TDMA bursts, the circuits are maintained in a condition of through-connection, and characters stored are sent to the ship station when the carrier recovers.

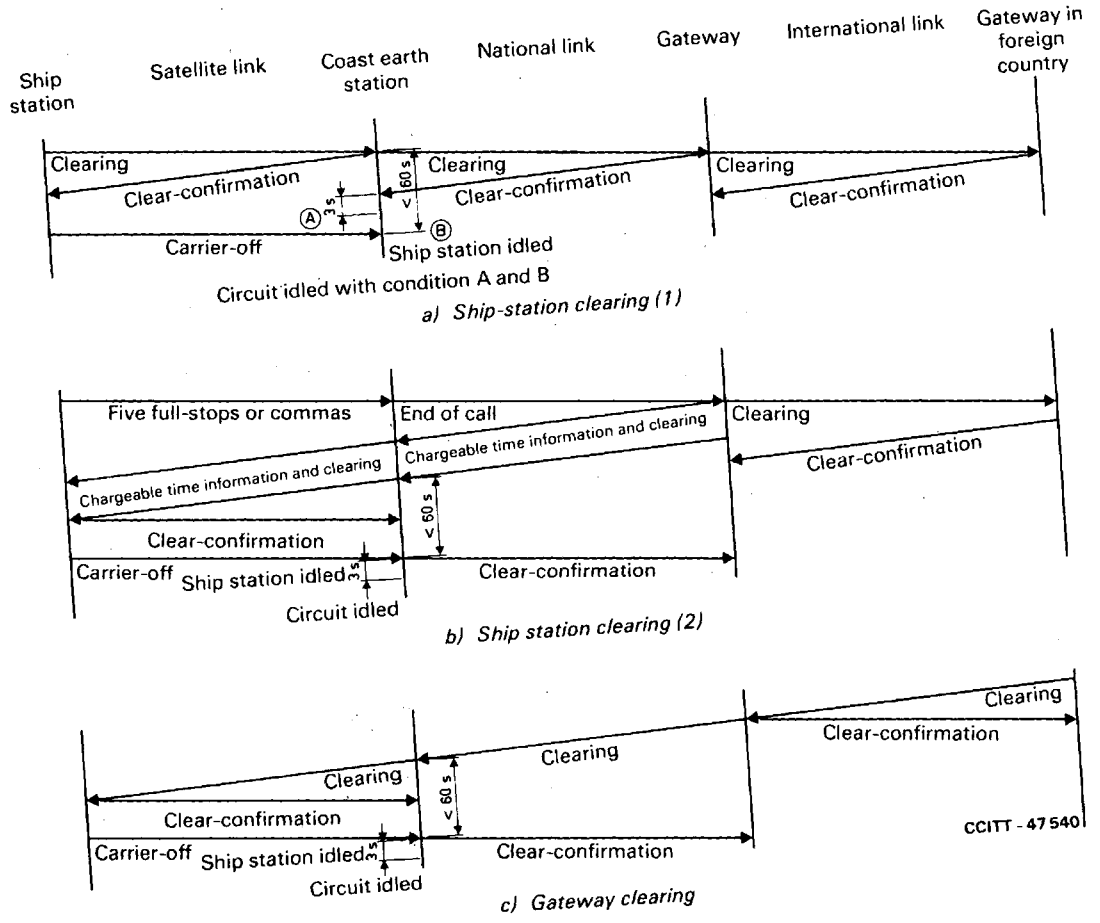
4.2 *Shore originated call* (See Figure 5)

4.2.1 *Sending of proceed-to-select signal*

When a calling signal from the gateway is detected (Z polarity for 100 ms), a proceed-to-select signal (Z polarity for 25 ms) is sent in response to it.

4.2.2 *Processing of selection signal*

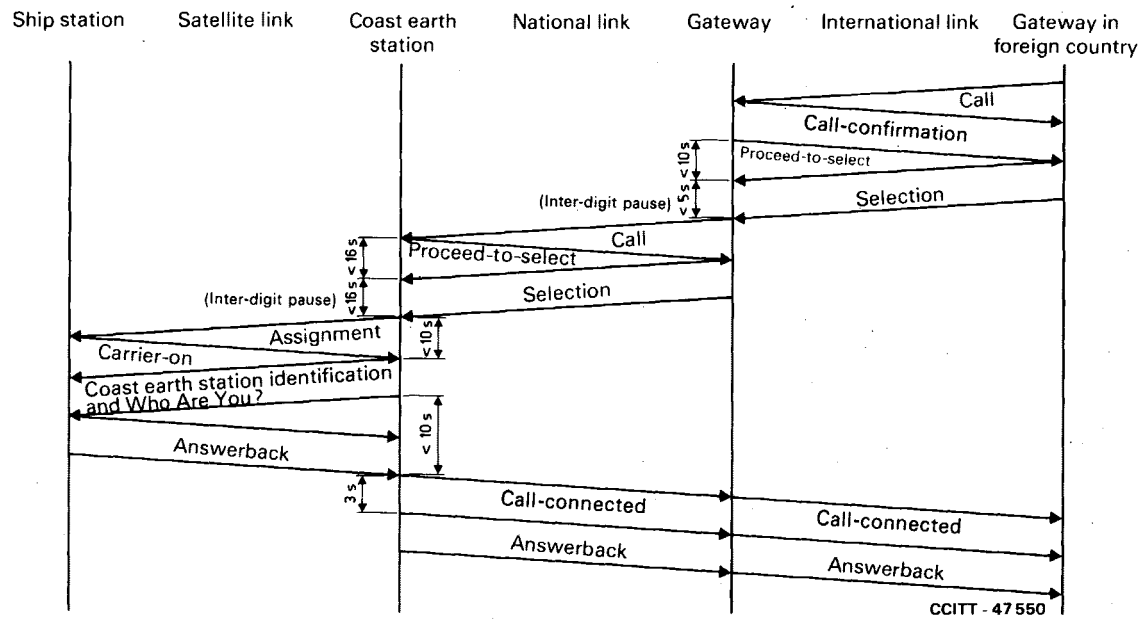
After sending a proceed-to-select signal to the gateway, the coast earth station monitors the channel for 16 seconds to detect the start-of-selection signal (ITA 2 combination No. 29). If it fails to receive it, the circuit status is changed to a hold condition until the receiving line from the gateway is cleared. The characters received after receiving the start-of-selection signal are stored while performing inter-digit pause monitoring for 16 seconds, until an end-of-selection (ITA 2 combination No. 5) is received. Should a failure be detected the gateway is released after returning the service signal NC.



Note — A detail interface between gateways is mentioned in Figures 2 and 4 of Supplement No. 1, CCITT Orange Book Volume VII.

FIGURE 4

Clearing



Note: A detail interface between gateways is mentioned in Figures 2 and 4 of Supplement No. 1, CCITT Orange Book Volume VII.

FIGURE 5

Shore originated call

The formats of selection signal received are as follows. Numerical information is coded using the 2-out-of-5 code.

↓	xx	V	xxxxxxx	E
Start of selection	Class of calling party	Delimiter	Ship station number	End of selection

Checks made to the ship station number and to the service signals returned to the gateway are given in Table 2.

TABLE 2

Checks	Service signal
Ship station is engaged	**OCC**
Ship station is not authorized	**NA**
Ship station is out of service (failure to stop carrier)	**DER**
Ship station number is other than seven digits	**NP**

Checks made to selection signals and service signals are given in Table 3.

TABLE 3

Checks	Service signal
Checking of 2-out-of-5 codes	**NC**
Checking of class of calling party for broadcast	**NA**

The kinds of class of calling party are: 1) foreign subscribers, 2) domestic subscribers and 3) service. At present, only service calls are accepted for broadcast calls.

4.2.3 *Response to assignment*

If a carrier is not received in the assigned channel within 10 seconds of sending an assignment, the call to the ship station is repeated by sending an assignment of the same content. If a carrier is not received within a further 10 seconds, the ship station is released, and the gateway is released by returning the service signal **ABS**.

4.2.4 *Response to coast earth station identification*

After receiving a carrier from the ship station, the coast earth station identification and "Who are you?" signal are sent. If the answerback sequence (group of 20 characters) is not received from the ship station within 10 seconds of the completion of the coast earth station identification, the gateway is released by returning **DER**. Characters from the ship other than the 20-character group are ignored until the sending of the station identification has been completed. Characters received between the end of the 20-character group and connect-through are returned to the ship station as they are received.

4.2.5 *Through-connection*

After receiving the answerback sequence from the ship station, a call-connected signal (a polarity inversion to a Z polarity) is sent to the gateway. Three seconds thereafter, the stored answerback sequence from the ship station is sent.

4.2.6 *Monitoring after through-connection*

This is the same as the procedure for a ship originated call.

4.3 *Broadcast* (See Figure 6)

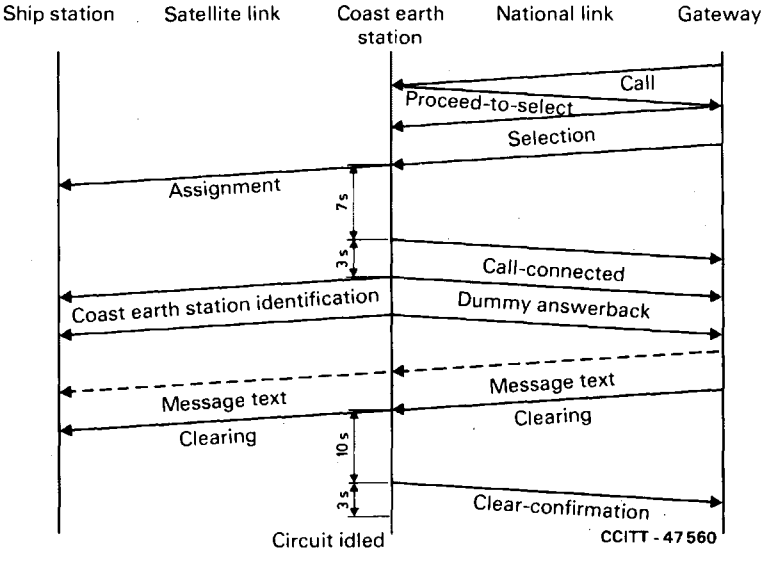


FIGURE 6

Broadcast call

4.3.1 *Call-connected signal*

Seven seconds after sending an assignment, a call-connected signal is returned to the gateway.

4.3.2 *Coast earth station identification and dummy answerback*

Three seconds after returning a call-connected signal, a dummy answerback in the following format is returned to the gateway, and coast earth station identification is returned to the ship:

↓<≡↓↓GA→ ↑xxxxxxx↓<≡↓

Where xxxxxxx is the ship station number in the selection signals from the gateway.

The circuit is connected through after completing the return of the dummy answerback.

Reference

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

Supplement No. 3

TELEX SIGNALLING ARRANGEMENTS IN THE NORDIC MARITIME SATELLITE COAST EARTH STATION

(*Source:* Norway)

1 Introduction

1.1 In response to Recommendation U.4, this supplement describes the signalling conditions of the Nordic maritime satellite coast earth station.

1.2 The coast earth station is planned to commence operation in the autumn of 1981. The station will be located at Eik in the south western part of Norway.

1.3 The station will provide fully automatic telex service to ships in the Maritime Satellite Service operating in the Indian Ocean region. The station will operate as an international gateway exchange connected to the international exchange in Oslo which for this purpose will act as a transit exchange.

Since the station has full switching capabilities for telex, it may also be connected to other international gateway exchanges but the traffic is expected to be too small at the outset to merit such a solution.

1.4 It should be noted that some of the timings required in order to interwork properly with the maritime satellite system will be different from those otherwise encountered towards the gateway exchange in Oslo.

2 Numbering and routing

2.1 At the outset the station will accept ship identities in accordance with the MARISAT numbering plan, i.e. seven digit octal numbers. The station is prepared for accepting six digit decimal numbers in accordance with Recommendation F.120/E.210 [1] and will furthermore be capable of operating with a mixed numbering plan during the period of transition from MARISAT numbers to CCITT numbers.

2.2 The F.69 [2] code to be used towards the coast earth station will be 583.

2.3 Provisions for group calls to ships will be made available. However, only calls to all ships in the ocean region will be provided at the outset (i.e. using MARISAT numbers 1 000 000 or CCITT numbers 000 000).

When the new numbering plan of Recommendation F.120/E.210 [1] is introduced, group calls to other groups of ships will also be provided for.

The procedure used for authorization of the calling subscriber is that defined in Recommendation U.61. At the outset a group call facility may be offered to 100 subscribers.

3 Operator facilities

No operator facilities will be provided at the coast earth station. However, such facilities will be offered at the gateway exchange in Oslo for traffic from other countries.

4 Telegram service

Telegrams to ships from telegram positions may be sent automatically using telex procedures.

5 Signalling

5.1 The timing diagrams for incoming traffic which is routed in transit via Oslo are shown in Figure 1. For completeness Figure 2 shows diagrams for traffic routed directly to the coast earth station. In both cases fully automatic working using type A signalling is provided for.

5.2 *Traffic via Oslo* (Figure 1)

5.2.1 The first selection signal (combination No. 30) should be received within 15 s after sending the proceed-to-select signal. All selection signals including the F.69 [2] code, 583, of the Maritime Satellite Service must be sent en bloc at machine speed. The selection signals must always include the end-of-selection signal, combination No. 26 (+).

The class-of-traffic signal must be one of the combinations, No. 1, 11 or 21.

Note – Since the gateway exchange in Oslo now will offer transit routing to the coast earth station, the selection signals for calls terminating in Norway must include the F.69 [2] code (56) allocated to Norway.

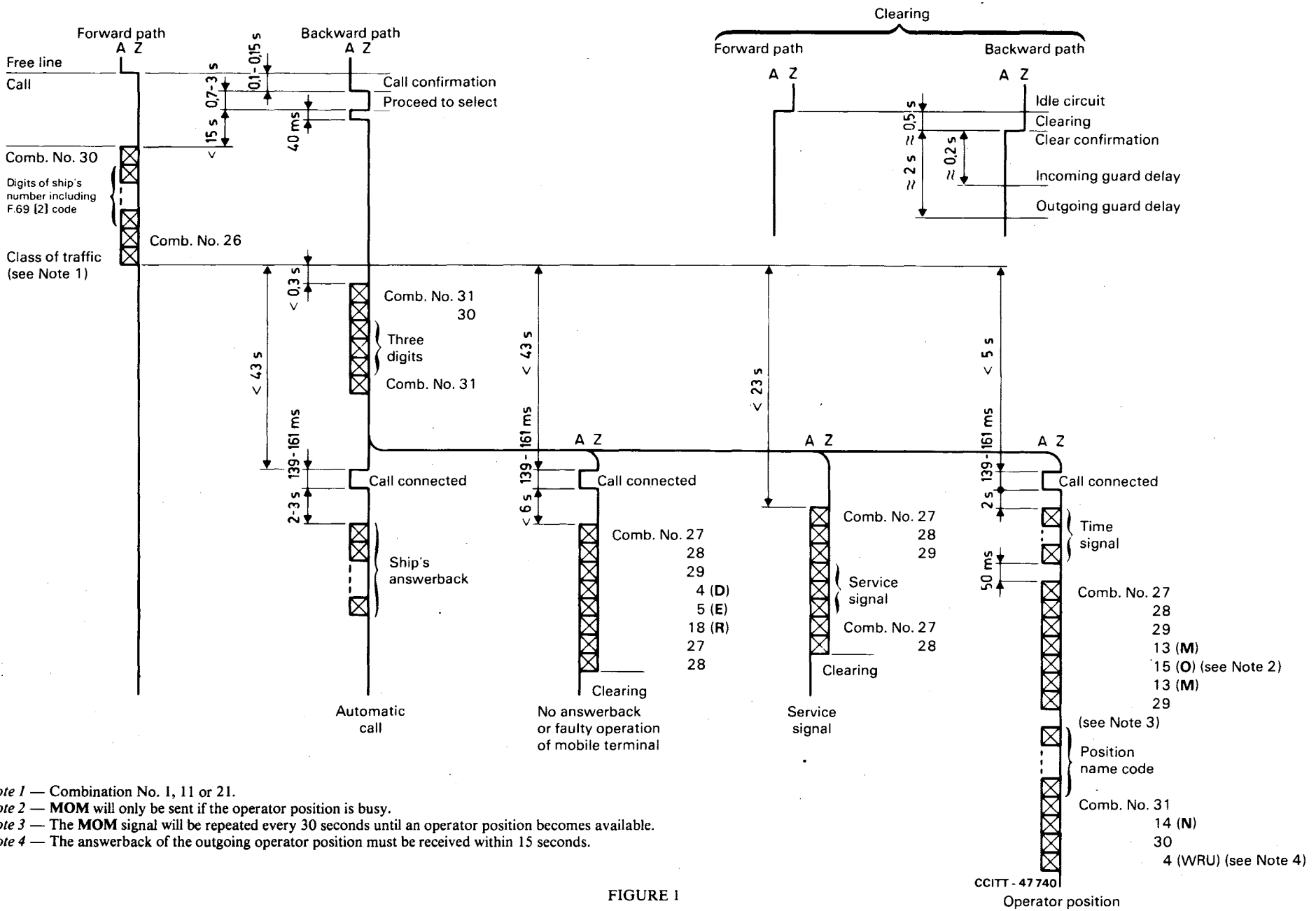
5.2.2 The selection signals are acknowledged by a group of three digits.

5.2.3 The call-connected signal is sent by the coast earth station when the first character of the ship's answerback has been received at the coast earth station. The call connected signal may in exceptional cases be delayed by as much as 43 seconds relative to the last selection signal. This delay takes into account maximum delays encountered in the various stages of connecting the maritime terminal, i.e.

- through-connection delay at the gateway exchange in Oslo,
- transmission delays,
- queuing delays at the coast earth station (number analysis, access to the assignment channel),
- framing delays of the satellite telex channels,
- delays in repeating the assignment message at the Network Coordinating Station (NCS),
- response time of the ship station to return the answerback.

5.2.4 The outgoing exchange must not send the WRU signal in order to obtain the ship's answerback because the answerback will be sent automatically by the coast earth station, 2 to 3 seconds after the call connected signal.

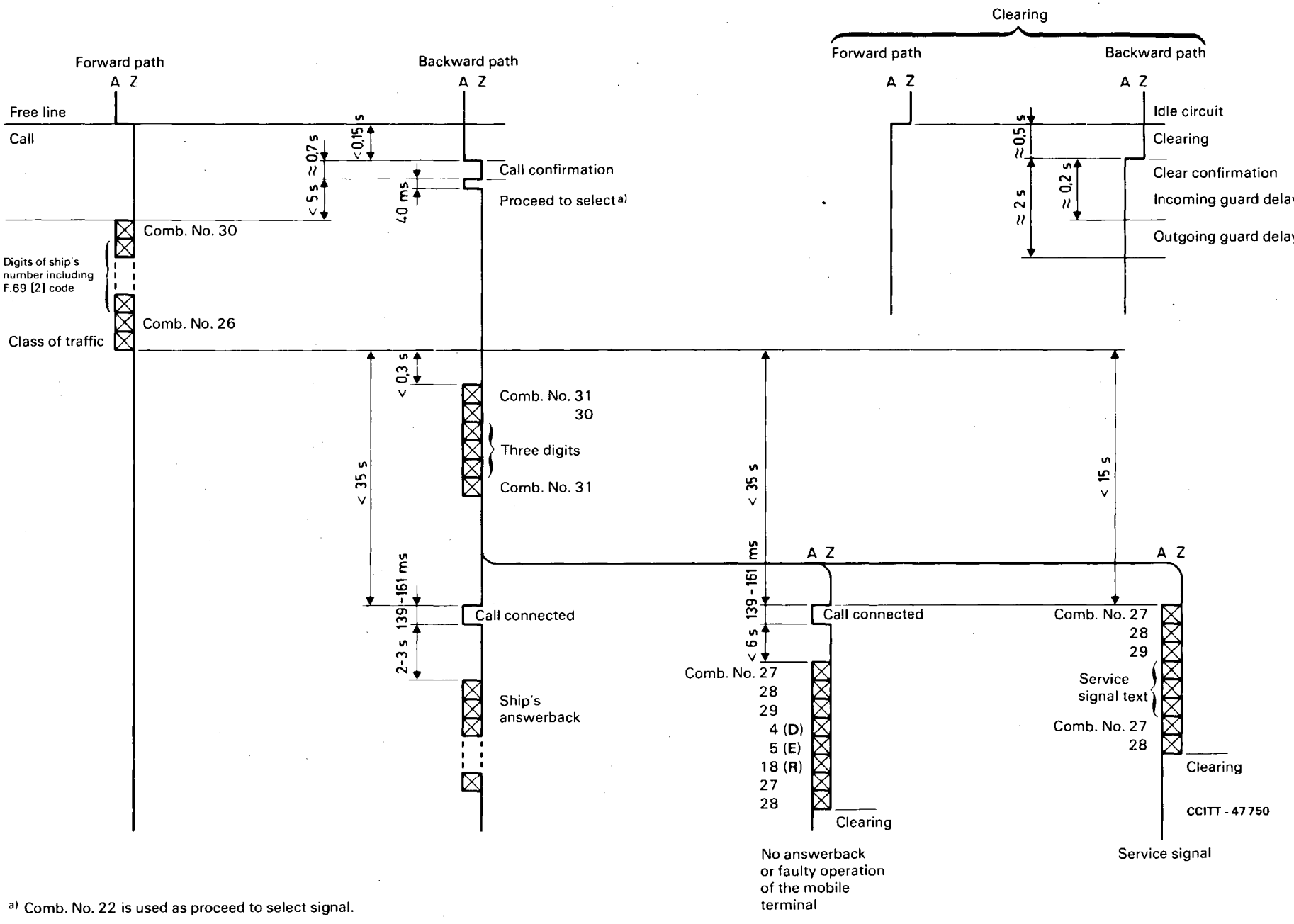
Note – The ship's answerback will be stored at the coast earth station so that it may be returned at the machine speed whenever a WRU signal is detected on the forward path during conversation. This has been done because the 20 characters of the answerback as received from the ship may contain intervals of Z polarity of one character duration due to speed differences between the synchronous satellite channel and the on-board teleprinter. This would avoid misoperation of automatic sending equipment at the outgoing end such as store-and-forward facilities. However, the WRU signal thus received will be sent to the ship so that the continuity the connection is verified before the answerback is returned.



Note 1 — Combination No. 1, 11 or 21.
Note 2 — **MOM** will only be sent if the operator position is busy.
Note 3 — The **MOM** signal will be repeated every 30 seconds until an operator position becomes available.
Note 4 — The answerback of the outgoing operator position must be received within 15 seconds.

FIGURE 1

Telex calls to Nordic maritime satellite coast earth station via Oslo



a) Comb. No. 22 is used as proceed to select signal.

FIGURE 2

Telex calls to Nordic maritime satellite coast earth station

5.2.5 The coast earth station is capable of returning the service signals **OCC, NA, NP, NC, DER** and **ABS**.

The service signals are sent subject to the following conditions:

- **NA**: access barred (e.g. group call from nonauthorized subscriber or ordinary call to nonauthorized ship);
- **OCC**: ship terminal busy (in most cases this will imply that the ship is busy with either another telex call or a telephone call);
- **NC**: congestion at the coast earth station or at the network coordinating station;
- **NP**: nonallocated ship number (e.g. incomplete selection information);
- **ABS**: ship is unavailable (e.g. ship is not within the coverage area of the satellite or ship terminal is out of service);
- **DER**: ship terminal equipment out of order (e.g. call set-up failure or no response to WRU).

Service signals **OCC, NA, NP** or **NC** will in the worst case not be delayed by more than a few seconds. However, **ABS**, will always be delayed by at least 10 seconds.

5.3 *Calls to operator position* (Figure 1)

5.3.1 The selection signals must in this case be composed of the F.69 [2] code to Norway (56) followed by the three digits 000, the end-of-selection signal (combination No. 26) and a class of traffic signal which may be any of the combinations No. 1, 11 or 21. The selection signals must be sent en bloc at machine speed.

5.3.2 The call connected signal will be sent within 5 seconds after receipt of the last selection signal.

5.3.3 The call connected signal will be followed by a time signal within 2 seconds.

If the operator position is free, the position's name code followed by WRU will be sent immediately after the time signal.

5.3.4 If the position is busy, the call connected signal will be followed by a time signal and the **MOM** service signal. The **MOM** signal will be repeated every 30 seconds until an operator position becomes available. When the operator position is connected, the position's name code followed by Who Are You? will be sent.

5.3.5 The answerback of the outgoing operator position must be received within 15 seconds. Otherwise the call will be cleared without a service signal. (See Note 4 to Figure 1.)

5.4 *Direct connections to the coast earth station* (Figure 2)

The same signalling procedures apply as for calls transitted through Oslo. However, the following should be noted:

5.4.1 The selection signals must in this case also be composed of the F.69 [2] code 583 followed by the ship's number, the end-of-selection signal combination No. 26 and a class of traffic signal which may be any of the combinations No. 1, 11 or 21. The selection signals must be sent en bloc at machine speed.

5.4.2 The proceed-to-select signal will be returned approximately 0.7 seconds after receipt of the call confirmation signal.

5.4.3 The first character of the selection signal must be received within 5 seconds relative to the proceed-to-select signal.

5.4.4. The time delay between the last character of the selection signal and the call connected signal will not exceed 35 seconds.

References

[1] CCITT Recommendation *Ship station identification for VHF/UHF and maritime mobile-satellite services*, Rec. F.120.

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

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