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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.

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FIGURE 1/U.20, p.46

Reference

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

Recommendation U.21

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).

Recommendation U.22

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 $(137 — 4\ r)/137$. Hence, it is sufficient to count the number of repetition cycles because if, in a period of 20 consecutive seconds, there are 7 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.

This figure is 8 in the case of an 8-character-repetition cycle.
3.5 with an 8-character-repetition cycle.

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.

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 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.

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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.

Recommendation U.24

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 — ± | % 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)

H.T. [T1.24]
TABLE A-1/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.24]
TABLE A-2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.24]
TABLE A-3/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.25]
TABLE 1/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.25]
TABLE 2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.25]
TABLE 3/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Table A-1/U.24 (recup.) [T1.24], p. 47

H.T. [T2.24]
TABLE A-2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.24]
TABLE A-3/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.25]
TABLE 1/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.25]
TABLE 2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.25]
TABLE 3/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Table A-2/U.24 (recup.) [T2.24], p. 48

H.T. [T3.24]
TABLE A-3/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.25]
TABLE 1/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.25]
TABLE 2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.25]
TABLE 3/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Table A-3/U.24 (recup.) [T3.24], p. 49

Reference

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

Blanc

Recommendation U.25

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 $\pm |$ ms tolerance except where otherwise indicated.

H.T. [T1.25]

TABLE 1/U.25

Montage:

Reprendre les originaux du Livre Rouge

(sans corr.)

BLANC

H.T. [T2.25]

TABLE 2/U.24

Montage:

Reprendre les originaux du Livre Rouge

(sans corr.)

BLANC

H.T. [T3.25]

TABLE 3/U.25

Montage:

Reprendre les originaux du Livre Rouge

(sans corr.)

BLANC

H.T. [T1.40]

TABLE 1/U.40

Montage:

Reprendre les originaux du Livre Rouge

(sans corr.)

BLANC

H.T. [T1.45]

TABLE 1/U.45

Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Tableau 1/U.25 [T1.25], p. 5

H.T. [T2.25]
TABLE 2/U.24
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.25]
TABLE 3/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Tableau 2/U.25 [T2.25], p. 6

H.T. [T3.25]
TABLE 3/U.25
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Tableau 3/U.25 [T3.25], p. 7

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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.

Recommendation U.31

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.

Blanc

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;

and at Melbourne, 1988)

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 *NA, NP, NCH or the service code CI*

1.4.3.1 If, after initiating a call, the terminal receives an **NA** , **NCH** or **NP** 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.

1.4.4 *DER, ABS*

1.4.4.1 If after initiating a call, the terminal receives a **DER** or **ABS** service signal followed by a clear, it must wait 30 minutes before repeating the attempt.

1.4.4.2 If the first repeated attempt is unsuccessful, another attempt may be made 30 minutes later. The terminal must then wait two hours before repeating the series of two attempts spaced 30 minutes apart.

1.4.4.3 If the distant terminal is still unavailable after these attempts, further series of attempts can be made after a delay of 15 minutes to 2 hours. A total of 5 such series may be made with two attempts per series.

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.

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.

H.T. [T1.40]
TABLE 1/U.40
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.45]
TABLE 1/U.45
Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Tableau 1/U.40 [T1.40], p. 8

Recommendation U.41

CHANGED ADDRESS INTERCEPTION AND CALL REDIRECTION

IN THE TELEX SERVICE

(Geneva, 1980; amended at Melbourne, 1988)

Definitions

For the purpose of this Recommendation the following definitions shall apply:

— Subscriber A is the calling subscriber;

— Subscriber B is the redirecting subscriber;

— Subscriber C is the subscriber to which the call shall be redirected.

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;

(c) that operation in networks employing signalling systems according to Recommendations U.1, U.11 and U.12 must be considered;

(d) that the described facilities in the called network must be compatible with existing call setup procedures in the originating and transit network(s),

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** . The service signal is not preceded by the call connected signal. It is always followed by the clearing signal in accordance with Recommendation F.60 [1], U.1 (§ 10.1 and Table 1b/U.1) and U.11 (Table 1/U.11).

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 must be preceded by the call-connected signal. A pause of at least two seconds must be provided between the beginning of the call connected signal and the beginning of the NCH service sequence defined above. 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, and the sequence ‘‘RDI’’ as specified under § 2.1 below shall then apply. Under no circumstances shall the NCH sequence be preceded by the RDI service sequence. 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 expression **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 expression **RDI** , as specified in Recommendations U.1 and F.60, without any further indication, should be returned.

2.2 The call redirection sequences specified in § 2.1 above must always follow the call connected signal. A period of two seconds must elapse between the beginning of the call connected signal and the beginning of the RDI sequence. The answerback of the Subscriber C will then be returned to the Subscriber A in accordance with the procedures outlined in Recommendation U.1, § 7. (It should be noted that there are networks which return the RDI-sequence after the answerback sequence and in addition to the NCH and new call number.)

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 With regard to the call redirection facility, redirection should not take place to addresses outside the jurisdiction of the Administration performing the redirection function, therefore the new address shall consist only of the national number.

2.5 Interworking between automatic terminals, Teletex to telex conversion facility and other services in the originating network and a redirected subscriber station in a terminating network is for further study.

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; amended at Melbourne, 1988)

The CCITT,

considering

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 four combinations No. 12 (**LLLL**); usage of a fifth or more Ls is a national matter. This combination should be recognized in letter shift mode only;

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; amended at Melbourne, 1988)

The CCITT,

considering

(a) the definitions of multi-address and broadcast calls ; (Supplement No. 2 to F-Series Recommendations)

(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] relating to the chargeable duration;

(e) the provisions of Recommendation D.61 for charging and accounting purposes;

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

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

(h) 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 call will not be extended to a redirected subscriber.

3 The standard text **BCT MOM** , in accordance with Recommendation F.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 the transmission by forwarding his own answerback sequence to all called parties using the Here Is key on his terminal.

c) Alternatively, the originating exchange, if it 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 Clearing of a broadcast call, in response to the clear signal from the originating subscriber, shall comply with the relevant U-Series Recommendations.

For new systems, and as far as possible for existing ones, should the originating subscriber wish to know those parties who cleared prematurely (and, by implication, those who received the complete message) then this should be signalled by terminating the transmitted text with the letter shift **MMMM** . The originating exchange will then clear forward in the normal way, list those subscriber, if any, who cleared early to the originating subscriber and clear backwards.

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.

Recommendation U.45

RESPONSE TO THE NOT-READY CONDITION OF THE TELEX TERMINAL

(Melbourne, 1988)

The CCITT,

considering

(a) the increasing use of modern electronic terminals, telex automatic emitting devices (TAEDs) and stored-program-controlled exchanges in the international telegraph, telex and gentex networks;

(b) the desirability of standardizing the network and terminal responses to the various not-ready conditions of the terminal;

and recognizing

the need to keep the response as short as possible in order to avoid unnecessary charging;

unanimously recommends

the adoption of the following procedures in response to the not-ready condition of the telex terminal in new equipments and as far as possible in existing equipments.

1 Definition

1.1 The following term used in this Recommendation is defined as follows:

the not-ready condition of the telex terminal

The status of a terminal which prevents the return of the call connect signal or answerback sequence in response to a valid incoming call signal or WRU respectively.

Alternatively, the status which develops within a terminal during an established connection as a result of the exhaustion of the printing paper, or equivalent recording medium, and which results in premature clearing of the connection.

2 Scope

The provisions of this Recommendation apply only to printed service signals.

3 Call attempts to terminals already in the not-ready condition

3.1 For networks which do not utilize the additional information characters allowed by Recommendation U.1, § 10.1.2, then a call attempt to a terminal in the not-ready condition and connected to that network shall receive the standard service signal DER, constructe in accordance with Recommendation U.1, Table 1/U.1 and § 10.1.2.

It should be noted, however, that some Administrations use the standard service signal ABS to signal the not-ready condition as a result of loss of power at the called terminal.

3.2 An an exception to the above, the service codes listed in Recommendation F.131 shall be used when a call attempt is made from the international telex network to a ship-earth station participating in the maritime mobile service or the maritime mobile-satellite service and which is not capable of accepting the call.

3.3 For networks which can utilize these additional information characters, then a call attempt to a terminal in the not-ready condition and connected to that network shall receive the expanded version of the standard service signal DER, constructed in accordance with Recommendation U.1, Table 1/U.1 and § 10.1.2.

3.4 The additional information characters shall be in accordance with Table 1/U.45 for the not-ready conditions listed, where the caracter strings PFL, EXM and NAB have meanings as listed in § 4.1.1 of Recommendation F.60.

3.5 For call re-attempts in accordance with Recommendation U.40, it is important that there is no confusion between the basic and expanded form of the service signal. For this reason, the format of the service signal train specified in Recommendation U.1, § 10.1.2 shall be rigidly applied, where the standard service signal is delimited by a carriage-return and line-feed sequence at beginning and end.

The standardization of a specific response to the PFL, EXM and NAB conditions is for further study.

3.6 It should be noted that where an expanded form of a U.1 service signal transits networks which apply signalling conversion rules in accordance with Recommendation U.15, then the additional information characters will be discarded by the conversion process and only the standard service text (i.e. ← ≡ ↓ DER ← ≡) will be translated by the Type D transit centre.

4 Activation of the not-ready condition during an established connection

4.1 During an established connection, the transition to the not-ready condition in the receiving terminal will generally be indicated by an escalation from a PAPER LOW to a PAPER OUT situation. For terminals which use electronic memory as the recording medium, this will be equivalent to STORE LOW and STORE FULL conditions.

The procedures to be applied during this transition are a national matter.

4.2 On reaching a PAPER OUT (or equivalent) condition, one of the following procedures should be applied:

4.2.1 The receiving terminal shall send a clearing signal to initiate immediate clearing of the connection.

4.2.2 Preferably, in new terminals and as far as possible in existing terminals, the following sequence of events will be activated.

4.2.2.1 Interrupt the incoming text as per Recommendation S.4.

4.2.2.2 Send the following character sequence at automatic speed

← ≡ ↓ EXM ← ≡

to indicate exhaustion of the recording medium.

4.2.2.3 Send the clearing signal to initiate clearing of the connection. (See Table 1/U.45.)

4.2.2.4 The reaction of automatic calling devices (terminals, CF, SFU) to the receipt of EXM and clearing during forward transmission is for further study.

4.2.3 If the transmitting terminal fails to respond to the request to stop transmission, then the receiving terminal shall initiate clearing in accordance with § 4.2.1 above.

4.3 Further incoming calls to this terminal will be handled in accordance with § 3 above.

4.4 In the situation where a transmitting terminal is about to reach a PAPER OUT condition , then it is recommended that the procedures of §§ 4.2.2.2 and 4.2.2.3 be applied.

H.T. [T1.45]

TABLE 1/U.45

Response to the not-ready condition in the telex terminal

{ Not-ready condition of terminal }	Effect at exchange	Response of terminal	Signal sent by exchange
{ During established connection: imminent exhaustion of printing paper (or equivalent recording medium) } a) Initiate clearing as per national requirements, or b) Interrupt i/c text as per Rec. S.4; Transmit the sequence ←≡↓EXN←≡; Initiate clearing as per national requirements. (Note 3) }	None None	{	
{ During call set-up: (Note 1) } — Power failure ↓PFL←≡↓DER←≡ (Note 4) } { — Lack of text recording medium } Non-receipt of call connect } ↓EXM←≡↓DER←≡ } — Failure of answerback Non-receipt of valid answerback sequence }	No current { {	{ ↓NAB←≡↓DER←≡	(Note 2) {

Note 1 — Or technical failure presenting the same conditions at the exchange.

Note 2 — Service signal constructed in accordance with Recommendation U.1, § 10.1.2.

Note 3 — Should the incoming text fail to stop, then clear as per a).

Note 4 — See also § 3.1.

Tableau 1/U.45 [T1.45], p. 9

Blanc

MONTAGE: PAGE = PAGE BLANCHE