SECTION 2

SPECIFIC SIGNALLING SCHEMES AND INTERWORKING BETWEEN SIGNALLING SYSTEMS

Recommendation U.11

TELEX AND GENTEX SIGNALLING ON | fR INTERCONTINENTAL CIRCUITS USED FOR INTERCONTINENTAL AUTOMATIC TRANSIT TRAFFIC

(TYPE C SIGNALLING)

(Geneva, 1964; amended at Mar del Plata, 1968, Geneva, 1972, 1976

Malaga-Torremolinos, 1984 and Melbourne, 1988)

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 bothway working circuits used in the intercontinental transit network, the following action to minimize the incidence of head-on-collision is recommended.

At opposite ends of a group of bothway trunk circuits, either inverse order testing should be adopted or a close approximation to it by testing the route in smaller groups of circuits in a fixed order starting the search from the same initial position.

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 switching equipment should not have facilities for delayed searching.

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

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

a 3-digit destination code

Class-of-traffic

Class-of-traffic

Class-of-traffic check

Class-of-traffic check

D1 D1

D2 D2

N1 D3

?04 start of N1

N2 ?05 forward selection start of

⌡ forward selection

N3 N2

. .

. .

N*n* N*n*

Combination No. 26 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.

Where modern electronic switching equipment is used at both ends of a circuit, the above figures for incoming and outgoing guard delay periods may be reduced to 0.5 and 1 second respectively.

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.

Blanc

H.T. [1T1.11]

TABLE 1/U.11

Signalling between the two intercontinental transit centres

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)
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 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 the 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 (± | 0%) after the end of receipt of the class-of-traffic signal. Combination No. 22 is returned 450 ms (± | 0%) after the inversion to stop polarity on the backward path. }	{	{
Selection signals Class-of-traffic signal Class-of-traffic check signals 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. 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. }			

Tableau 1/U.11 [1T1.11], p.

H.T. [2T1.11]

TABLE 1/U.11 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Rem
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. }			
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. }			

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Tableau 1/U.11 [2T1.11], p.

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H.T. [3T1.11]

TABLE 1/U.11 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Rem
Call redirection signals Teleprinter signals i) RDI: xxxxx←≡ *(see Rec. U.41)* ii) RDI } These signals will always be preceded by a call connected signal. No clearing signal is sent after RDI. The answer-back signals of the number to which the call has been redirected is in accordance with the procedures on answer-back signals shown below. }	{	{	
Answer-back signals Where the destination systems 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. }			

Tableau 1/U.11 [3T1.11], p.

H.T. [4T1.11]

TABLE 1/U.11 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Remark
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 ± | 0%. }	{	{	

Tableau 1/U.11 [4T1.11], p.

H.T. [5T1.11]
TABLE 1/U.11 *(end)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Ren
Backward busy Continuous stop polarity for a maximum of 5 minutes }	{		

{
Receiving equipment congestion
}
Stop polarity for 450 ms followed by the 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.
}
	{
	{		

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. }			

Tableau 1/U.11 [5T1.11], p.

H.T. [T2.11]

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
Selection
Transit proceed-to-select
}
{
Stop polarity for at least 450 ms followed by combination No. 22 (40-ms pulse of A polarity)
Selection signal | ua)
Combination No. 30
Class-of-trafic
2 or 3 digit destination code
Digits of called number
Combination No. 26
Blanc
Transit centre identification code signals
Blanc
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 is adopted [see § 15
f
) of the text]
}
	Call confirmation
	Digits 00
		Proceed-to-select
		{	

Service signals Clear confirmation These are signalled in accordance with the type of signalling used on terminal calls into the national system of the transit Administration. 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. These are signalled in accordance with the type of signalling used on terminal calls into the national system of the transit Administration. 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. }	Call connected As in Table 1/U.11 {	As in Table 1/U.11 Clear	

Tableau 2/U.11 [T2.11], p.

H.T. [T3.11]

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/
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 agent.

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

Tableau 3/U.11 [T3.11], p.

H.T. [T4.11]

TABLE 4/U.11

Class-of-traffic signals

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

Tableau 4/U.11 [T4.11], p.8

H.T. [T5.11]

TABLE 5/U.11

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

Category	Class-of-traffic Combination number	Class-of-traffic Element number 1	2	3	4	5	Class-of-traffic check Combination number	Class-of-traffic check Element number 1	2	3	4
A	11 21	Z Z	Z Z	Z Z	Z A	A A	20 15	A A	A A	A A	A Z
	10 1	Z Z	Z Z	A A	Z A	A A	8 13	A A	A A	Z Z	A Z
	6 19	Z Z	A A	Z Z	Z A	A A	12 7	A A	Z Z	A A	A Z
	4 5	Z Z	A A	A A	Z A	A A	16 22	A A	Z Z	Z Z	A Z
Special category (see Note under § 7.2)	yes no										
B	3 9	A A	Z Z	Z Z	Z A	A A	26 2	Z Z	A A	A A	A Z
	18 28	A A	Z Z	A A	Z A	A A	25 24	Z Z	A A	Z Z	A Z
	14 31	A A	A A	Z Z	Z A	A A	23 30	Z Z	Z Z	A A	A Z
	27 32	A A	A A	A A	Z A	A A	17 29	Z Z	Z Z	Z Z	A Z

Tableau 5/U.11 [T5.11], p.9

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, Division C, No. 8.

[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.

Blanc

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 inter-working 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 ± | 0%. 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.

Blanc

H.T. [1T1.12]

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)	
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 the 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. }	{	{	

Tableau 1/U.12 [1T1.12], p.

H.T. [2T1.12]

TABLE 1/U.12 *(continued)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Re
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 this 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/X.12) followed by the idle circuit condition
}
Service signals consist of CSC No. 11 followed by two characters from Table 7b/U.12.
}
	{	{	

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-connect 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) blanc 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) }			

Tableau 1/U.12 [2T1.12], p.

H.T. [3T1.12]
TABLE 1/U.12 *(end)*

Signal or function	Forward path (X towards Y)	Backward path (Y towards X)	Re
WRU *(Who are you?)* WRU characters (combinations Nos. 30 and 4) of ITA No. 2 } 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	
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 it 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 re-test 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 }		{ 	

Tableau 1/U.12 [3T1.12], p.

H.T. [T2.12]

TABLE 2/U.12

First CSC

| ua) **character on the forward and backward paths**

Combination				Condition signalled
b 4	b 3	b 2	b 1	
A No further network selection signal follows | ub) }	A	{		
A Second class-of-traffic character follows | ub) (see Table 4/U.12) }	Z	{		
Z User-class character follows | ub) (see Table 3/U.12) }	A	{		
A Alternative routing not allowed | ub) }	{			
Z Alternative routing allowed | ub) }	{			
A	Transit traffic | ub)			
Z	Terminal traffic | ub)			
Z Z Z Z	Z Z Z Z	A A Z Z	A Z A Z	Re-test signal | ub) Reception-confirmation Not allocated

a) CSC = control signalling code.

b) First class-of-traffic character.

Tableau 2/U.12 [T2.12], p.13

H.T. [T3.12]

TABLE 3/U.12

First user-class character

Combination Condition signalled from X to Y | ua) } 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 3/U.12) }	{			
A A A A Z Z Z Z A second user-class character follows | ub) }	A A Z Z A A Z Z	A Z A Z A Z A Z	Reserve Service Telex Gentex Reserve {	

a) The user class character may be omitted, if, for example, the information can be derived from the incoming line.

b) Reserved for future needs.

Tableau 3/U.12 [T3.12], p.14

H.T. [T4.12]

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 | ua) }	{			
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 | ub) }	{			

a) Reserved 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.

Tableau 4/U.12 [T4.12], p.15

H.T. [T5.12]

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 | ua) }	{			
A Z	Reserved | ub)			
A Z	Reserved | ub)			
A No delay of forward selection is required | uc) }	{			
Z Delay of forward selection is required | uc) }	{			

a) Reserved for future needs.

b) See Table 4a/X.70.

c) See Recommendation U.15.

Tableau 4a/U.12 [T5.12], p.16

H.T. [T6.12]

TABLE 5/U.12

Start of closed user group character

| ua), | ub)

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	uc)			
Z DNIC follows	uc)		ud) }	{		
Number of hexadecimal closed user group characters that follow }		A A Z Z	A Z A Z	1 2 3 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.

Tableau 5/U.12 [T6.12], p.

H.T. [T7.12]

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			
A			
A			
A			
A			
Z			
Z			
Z			
Z			
Z			
Z			
Z			
Z			
}	{		
A			
A			
A			
A			
Z			
Z			
Z			
Z			
A			
A			
A			
A			
Z			
Z			
Z			
Z			
}	{		
A			
A			
Z			
Z			
A			
A			
Z			
Z			
A			
A			
Z			
Z			
A			
A			
Z			
Z			
}	{		
A			
Z			
A			
Z			
A			
Z			

A Z A Z A Z A Z A Z }	{				
0 1 2 3 4 5 6 7 8 9 A B C D E F }	{				
Hexadecimal closed user group character }					

Tableau 5a/U.12 [T7.12], p.

H.T. [T8.12]

TABLE 6/U.12

Miscellaneous forward path signals

Combination	b 4	b 3	b 2	b 1
{				
A				
A				
A				
A				
A				
A				
A				
A				
Z				
Z				
}	{			
A				
A				
A				
A				
Z				
Z				
Z				
Z				
A				
A				
}	{			
A				
A				
Z				
Z				
A				
A				
Z				
Z				
A				
A				
}	{			
A				
Z				
A				
Z				
A				
Z				
A				
Z				
A				
Z				
}	{			
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
}	{			
Digits for:				
—				

telex destination code, — called subscriber's number, — calling line identification, — DNIC. }				
Z End-of-selection signal and transit centres through-connected signal (TTD) }	A	Z	A	{
Z End-of-calling-line-identification signal | ua) }	A	Z	Z	{
Z Z Z Z Not allocated }	Z Z Z Z	A A Z Z	A Z A Z	{

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

Tableau 6/U.12 [T8.12], p.

H.T. [T9.12]

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				
A				
A				
A				
A				
Z				
Z				
}	{			
A				
A				
A				
A				
Z				
Z				
Z				
Z				
A				
A				
}	{			
A				
A				
Z				
Z				
A				
A				
Z				
Z				
A				
A				
}	{			
A				
Z				
A				
Z				
A				
Z				
A				
Z				
A				
Z				
}	{			
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
}	{			
Digits for:				
—				

network identification signal (Recommendation F.69 | 3]), — called line identification, — service signals. }				
Z Start-of-service signal (see Table 7a/U.12) }	A	Z	A	{
Z End-of-called-line identification | ua) Start-of-network identification signal }	A	Z	Z	{
Z	Z	A		Call-connected signal
			A	Call metering
			Z	No call metering
Z Start of transit through-connect signal (STTC) }	Z	Z	A	{
Z Further backward path signal follows | ub) }	Z	Z	Z	{

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.

Tableau 7/U.12 [T9.12], p.

H.T. [T10.12]

TABLE 7a/U.12

Transit through-connect signals

| ua)

Combination				Condition signalled from Y to X
b 4	b 3	b 2	b 1	
A	A	A	A	Calling line identification not required
A	A	A	Z	Calling line identification required
A	A	Z	A	Originating half echo control device not included
A	A	Z	Z	Originating half echo control device included
A	Z	A	A	Originating half echo control device not included
A	Z	A	Z	Originating half echo control device included
A	Z	Z	A	Originating half echo control device not included
A	Z	Z	Z	Originating half echo control device included
Z	A	A	A	Terminating half echo control device not included
Z	A	A	Z	Terminating half echo control device included
Z	A	Z	A	Terminating half echo control device not included
Z	A	Z	Z	Terminating half echo control device included
Z	Z	A	A	Terminating half echo control device not included
Z	Z	A	Z	Terminating half echo control device included
Z	Z	Z	A	Terminating half echo control device not included
Z	Z	Z	Z	Terminating half echo control device included
A	A	A	A	Continuity check not required
A	A	A	Z	Continuity check required on this circuit
A	A	Z	A	Continuity check required on previous circuit
A	A	Z	Z	Continuity check required on this circuit and on previous circuit
A	Z	A	A	Continuity check not required
A	Z	A	Z	Continuity check required on this circuit
A	Z	Z	A	Continuity check required on previous circuit
A	Z	Z	Z	Continuity check required on this circuit and on previous circuit
Z	A	A	A	Continuity check not required
Z	A	A	Z	Continuity check required on this circuit
Z	A	Z	A	Continuity check required on previous circuit
Z	A	Z	Z	Continuity check required on this circuit and on previous circuit
Z	Z	A	A	Continuity check not required
Z	Z	A	Z	Continuity check required on this circuit
Z	Z	Z	A	Continuity check required on previous circuit
Z	Z	Z	Z	Continuity check required on this circuit and on previous circuit
A	A	A	A	Not allocated
A	A	A	Z	Not allocated
A	A	Z	A	Not allocated
A	A	Z	Z	Not allocated
A	Z	A	A	Not allocated
A	Z	A	Z	Not allocated
A	Z	Z	A	Not allocated
A	Z	Z	Z	Not allocated
Z	A	A	A	Not allocated
Z	A	A	Z	Not allocated
Z	A	Z	A	Not allocated
Z	A	Z	Z	Not allocated
Z	Z	A	A	Not allocated
Z	Z	A	Z	Not allocated
Z	Z	Z	A	Not allocated
Z	Z	Z	Z	Transit through-connect signal (TTC)
A	Not allocated			

}				
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.

Tableau 7a/U.12 [T10.12], p.21

H.T. [T11.12]

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 | ub)	**RDI**
03		Connect when free | uc)	**MOM**
20 With clearing, due to subscriber — short term | ud)	{		
}	Network failure	**NC**	
21		Number busy	**OCC**
22		a)	—
23		a)	—
41 With clearing, due to subscriber — long term | ud)	{		
}	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 | ud)	{		
}	Network congestion	**NC**	
71 With clearing, due to network — long term | ud)	{		
}	a)	—	
72		a)	—
81 With clearing, due to subscriber — network procedure	{		
}	a)	—	
82		a)	—
83		a)	—

a) Used only 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.

Tableau 7b/U.12 [T11.12], p.22

H.T. [T12.12]

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	Z	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%.

Tableau 8/U.12 [T12.12], p.23

Figure 1/U.12, (M), (a l'italienne), p.24

APPENDIX I

(to Recommendation U.12)

Possible sequences of network selection signals

Figure CCITT-27993, (M), p.

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.)

Figure, App. II.1, (M), p.

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

Figure 2, App. II.2, (M), p.

APPENDIX IIIa

(to Recommendation U.12)

Through-connection procedure

Called and calling line identification not required

Figure, App. IIIa, (M), p.

APPENDIX IIIb

(to Recommendation U.12)

Through-connection procedure

Called line identification not required,

calling line identification required

Figure, App. IIIb, (M), p.

APPENDIX IIIc

(to Recommendation U.12)

Through-connection procedure

Called line identification required,

calling line identification not required

Figure, App. IIIc, (M), p.30

APPENDIX IIId

(to Recommendation U.12)

Through-connection procedure

Called and calling line identification required

Figure, App. IIId, (M), p.

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.

H.T. [1T1.15]

TABLE 1/U.15

Rules for conversion of network identification codes (NICs) and

transit centre identification codes (TCICs)
and alternative routing

Incoming signalling Action to be taken by the transit exchange }	Outgoing signalling	{
Type D	Type D	{
	Type C	{
	Type B	{
	Type A with register codes	{
	Type A with TCICs	{
Type C	Type D	{
	{	
	{	
	Type B	{
	Type A with register codes	{
	Type A with TCICs	{
Type B	Type D	{
	{	
	{	
	Type B	{
	{	
	{	

Tableau 1/U.15 [1T1.15], p.32

Type B

H.T. [2T1.15]

TABLE 1/U.15 *(continued)*

Incoming signalling Action to be taken by the transit exchange }	Outgoing signalling	{
	Type D	{
	{	
	{	
{		
	Type B	{
	{	
	{	

	Type D	{
	Type B	{
	{	
{	{	
	{	
	{	

	Type D	{
	{	

	{	
	Type B	{
	{	
	{	

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.

Tableau 1/U.15 [2T1.15], p.33

{

H.T. [T2.15]

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.

Tableau 2/U.15 [T2.15], p.34

H.T. [T3.15]

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 first 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-through 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	

Tableau 3/U.15 [T3.15], p.

Figure 1/U.15, (M), p.

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