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SPECIFIC SIGNALLING SCHEMES AND INTERWORKING BETWEEN SIGNALLING SYSTEMS

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

ITU-T Recommendation U.15

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation U.15 was revised by the ITU-T Study Group IX (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

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NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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

(Malaga-Torremolinos, 1984; revised at Helsinki, 1993)

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 (see Recommendation U.11) signalling for transit working;

(i) that types A and B (see 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 (see Recommendation U.11) and NIC (see 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 gives details of each case.

3 Rules for conversion of TCICs and NICs (see Table 1 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 clause 4/U.11 and defined in the ITU publication List of Indicators for the Telegraph Retransmission System and Telex Network Identification Codes, Part A (see 3.4.2.4/F.60).

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.

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 shows the timing diagram of this protocol.

NOTES

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.

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

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, β, γ, δ preceding a Recommendation U.1 type A or B service code (see 10.1.2/U.1)], 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 an 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 3.13/U.12.

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 and 3.

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 signal* on receipt of the call connected signal as per Appendix III/U.12.

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 signal two seconds after receipt of the call connected signal.

Rule 4 – If the incoming circuit uses a non-automatic 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 signal.

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 non-automatic return of answerback trunk signalling standard, then the last type D exchange shall delay any received WRU signal until two seconds from the start of the received call connected signal. Through-connection shall occur following the retransmission of the WRU signal or after two seconds from the start of the received call connected signal if no WRU signal has been received.

TABLE 1/U.15

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

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

TABLE 1/U.15 *(end)*

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

Incoming signalling	Outgoing signalling	Action to be taken by the transit exchange
Type A using a TCIC (trunk route dedicated to originating traffic only)	Type D	Conversion of NICs to TCICs is at the discretion of individual Administrations. Alternative routing can be allowed only if conversion of NICs to TCICs occurs.
	Type C with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted at the discretion of individual Administrations. Alternative routing is allowed only if retransmission of TCICs occurs.
	Type B	No register codes will be received. Alternative routing is not allowed (Note).
	Type A with register codes or TCICs	Any received register codes or TCICs may be absorbed or retransmitted as received at the discretion of individual Administrations. Alternative routing is not allowed (Note).
Type A using register codes (trunk route dedicated to originating traffic only)	Type D	NICs will be absorbed. Alternative routing is not allowed (Note).
	Type B	No register codes will be received. Alternative routing is not allowed (Note).
	Type C with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted, at the discretion of the individual Administrations. Alternative routing is not allowed (Note).
	Type A with register codes or TCICs	The received register codes or TCICs may be absorbed or retransmitted as received, at the discretion of individual Administrations. Alternative routing is not allowed (Note).
Type A with register codes or TCICs	Type D	NICs may be absorbed or converted to TCICs, at the discretion of individual Administrations. Alternative routing is not allowed (Note).
	Type C with register codes or TCICs	Register codes or TCICs may be absorbed or retransmitted as received, at the discretion of individual Administrations. Alternative routing is not allowed (Note).
	Type B	No register codes will be received. Alternative routing is not allowed (Note).
	Type A with register codes or TCICs	Register codes or TCICs may be absorbed or retransmitted as received at the discretion of individual Administrations. Alternative routing is not allowed (Note).
NOTE – Where alternative routing is stated as "not allowed", it applies in this transit exchange and shall also be indicated in the COT signals on outgoing type C and D signalling to prevent alternative routing in distant centres. Alternative routing is not allowed when the outgoing or incoming trunks use type A or B signalling, with the one exception of the case where a type A incoming route accepts TCICs and is dedicated to originating traffic only and where the outgoing signalling is type C or D standard.		

TABLE 2/U.15

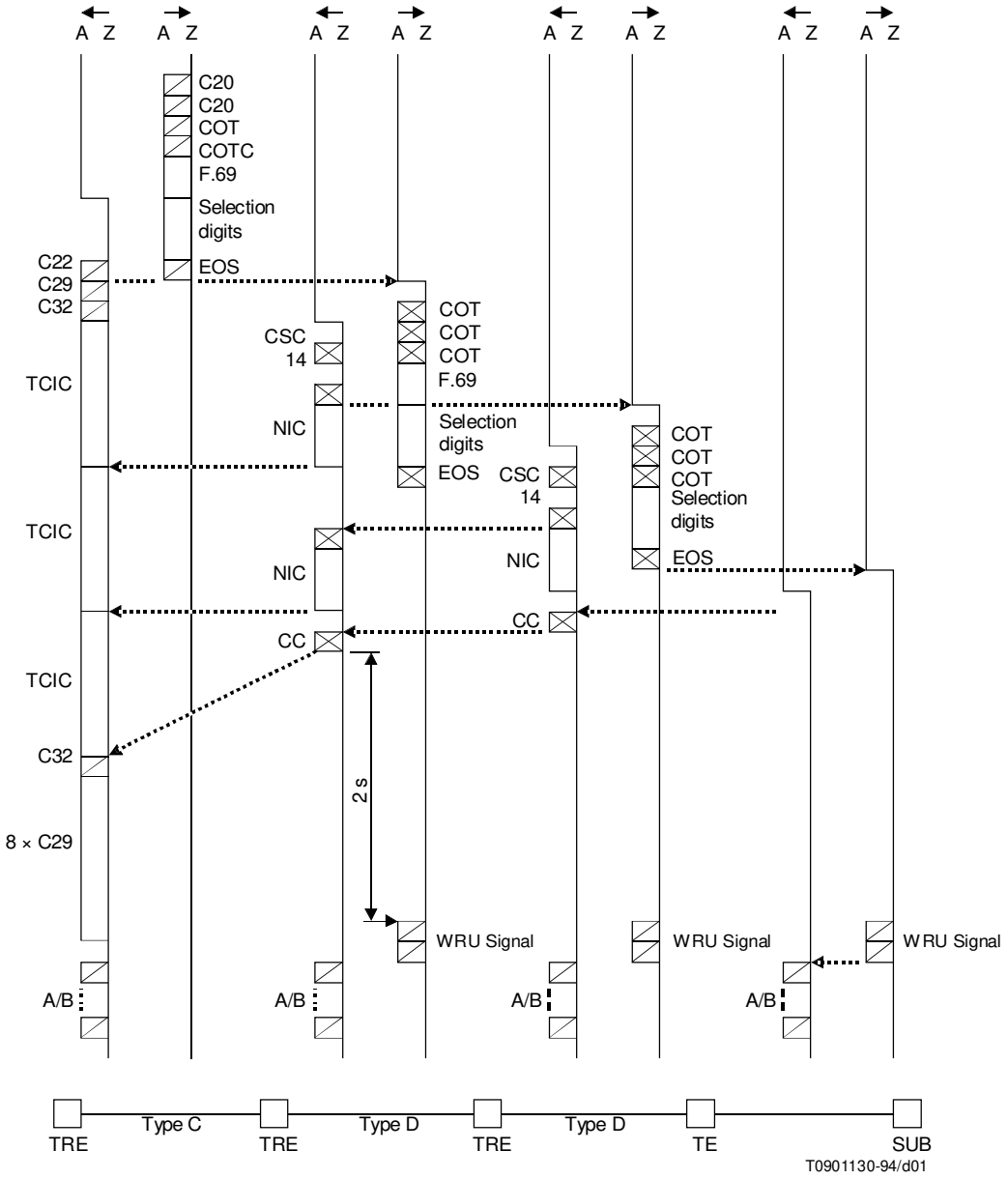
Rules for obtaining the called subscriber's answer-back (first type D exchange)

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

TABLE 3/U.15

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

Incoming signalling type	Action to be taken by the first type D exchange	Outgoing signalling type
Type D	1. Absorb WRU signal 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. (Clause 8, Rule 6)	Type A, Type B (automatic return of answer-back), Type C
Type D	1. Delay any received WRU signal 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 signal, or in the absence of a received WRU signal, two seconds after the start of the received call-connected signal. (Clause 8, Rule 7)	Type B (non-automatic return of answer-back)
Type D	1. No action on WRU signal. 2. Connect-through backward path after sending call-connected signal. 3. Connect-through forward path after sending call-connected signal. (Clause 8, Rule 5)	Subscriber



TCIC	Transit centre identification code
NIC	Network identification code
EOS	End of selection signal
COT	Class of traffic
COTC	Class of traffic check
CC	Call connected signal

C20	ITA2 combination No. 20
CSC	Control signalling code
A/B	Answerback
TRE	Transit exchange
SUB	Subscriber
TE	Terminating exchange
WRU Signal	Who are you?

FIGURE 1/U.15

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