UIC CODE 753-2

5th edition, June 2004

Original

OR

General technical regulations governing establishment and development of communication capacity over the railway telecommunications network of UIC members

Prescriptions techniques générales pour l'établissement et le développement de la capacité de communication sur le réseau de télécommunications des membres de l'UIC
Allgemeine technische Vorschriften für den Auf- und Ausbau der Kommunikationen im UIC-Bahnentelekommunikationsnetz

UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

Leaflet to be classified in Volume:

VII - Way and Works

Application:

With effect from 1 May 2004
All members of the International Union of Railways

Record of updates

1st edition, January 1959	First issue
2nd edition, January 1961	with Amendment of 1.1.1970
3rd edition, January 1985	
4th edition, January 1997	
5th edition, June 2004	Overhaul of leaflet

The person responsible for this leaflet is named in the UIC Code

Contents

Summary

The UIC Leaflet 753-2 describes the facilities, equipment and organisation required to support international switched-circuit telecom services. These services are offered through the UIC International Railway Telephone Network (IRTN) consisting of the internationally-connected telecommunication networks of the UIC Members. The Leaflet states the railway's responsibilities in support of the implementation of these services, including the obligation to keep the international directory up-to-date.

1 - General

1.1 - Scope of document

This document describes in terms of hardware and software requirements the current UIC Corporate Fixed Telecommunication Network (consisting of the internationally-connected fixed telecommunication networks of the UIC Members). It focuses on the network's technological evolution and deals with the same UIC Corporate Fixed Telecommunication Network using digital PABXs (see List of abbreviations - page 24), to be known in future as the International Railway Telecommunications Network (IRTN).

It also explains the international switched-circuit telecom services with which railway users in Europe will be provided in the digital era. It describes the facilities, equipment and organisation required to support them. It states the UIC Members responsibilities in support of the implementation of these services.

This leaflet does not prescribe any requirement for the switches of the railways' national networks that are operated by Railway Telecommunication Operators (RTOs).

Its provisions are based in principle on those of the International Telecommunications Union - Telecommunication Standardisation Sector (ITU-T) (see List of abbreviations - page 24). However, the type of automatic telephone equipment used by the RTOs has enabled major simplifications to be made in relation to the ITU-T Recommendations.

Matters relating to operating are addressed in UIC Leaflets 750 and 753-3 (see Bibliography - page 25).

Terminology and definitions can be found in ITU-T Volume I, Fascicle I.3.

1.2 - Approval of revised interconnection arrangements

The UIC Way and Works Committee agreed in 1989 that all UIC Members would proceed with digitalisation of the International Railway Telecommunications Network. The agreement was ratified by letter from the Chairman of the UIC to the Chief Executives of the railways to confirm the Board of Management's commitment to ensure that members made adequate financial provision for this operation.

1.3 - Technology migration

With the acceptance of the switch from analogue to digital networking came an agreement at the January 1992 Sub-Committee for Telecommunications whereby all new international transit exchanges ordered in future would use the ITU-T (formerly CCITT (see List of abbreviations - page 24)) N.7 Signalling System. As members upgrade to digital transit exchanges, they shall be responsible for maintaining existing signalling arrangements adjacent to international transit exchanges.

2 - Existing network

2.1 - Structure of the Telecommunications Network of UIC Members

International telephone communications are established semi-automatically[1] or automatically and the latter mode formerly used must be progressively upgraded over the whole network.

The network must be structured to allow migration from analogue to digital operation, and as a consequence the network will evolve into the potential International Railway Telecommunications Network (IRTN).

Initially one or two countries will have digital transit exchanges and progressively, as each RTO upgrades its international connections and transit exchanges, the requirement for retention of analogue interfaces will diminish.

Large RTOs, for national and safety reasons, may operate several international switches distributed over different locations within the country, but these should be seen to operate as a single switch for the adjoining Railways and UIC network users. In this case, the national circuits between these exchanges shall be considered as international circuits, in accordance with UIC Leaflet 753-1 (see Bibliography - page 25). The number of such national circuits, together with those in the telecommunications network of UIC members that are connected in tandem, must be kept to a minimum to limit transit times. The current and proposed IRTN network architecture is given in the UIC Infrastructure Commission's permanent documents. Examples of possible solutions are given in Appendices A - page 20 and B - page 21.

2.2 - User information

The international directory of the existing UIC Corporate Telecommunications Network and IRTN is located on the UIC WWW site (ernst.uic.asso.fr) in the form of a database. The database contains the European Railway Numbering Scheme for Telecommunications (ERNST) and was created under the UIC Project of the same name.

The ERNST Database comprises the following lists:

- Details – Common information on the railway corporate telephone network;
- Routing – Overview of all dialling codes from originating to destination railway in table form;
- Destination Codes – most important town (area) codes. The number of records is limited to 100 of the most important towns (areas);
- Subscribers – most important subscriber numbers or group of numbers, e.g. railway headquarters, controllers, etc.

The UIC Infrastructure Department issues printed versions of the directory at least every two years.

1. With operator intervention.

2.3 - Number of circuits placed end-to-end when making a call in the analogue network sections

Calls are made by connecting end-to-end as many circuits as necessary, depending on the structure of the national telephone networks and the layout of the railway international network, while complying with the provisions of UIC Leaflet 753-1 (see Bibliography - page 25). UIC Members should endeavour to reduce the number of connections whenever the structure of their networks permits.

As a result of the structure of the telephone system of the UIC Members, the number of pulse trains necessary for different destinations varies according to circumstances.

2.4 - Access to the international network

Since calls are normally made without telephone operator intervention, either in the destination network or any network crossed in transit, it follows that there is no check by the destination or transit exchanges.

UIC Members should therefore take adequate measures to make provision, at the calling point, for any check which might appear relevant to them, so that access to international telephone links is restricted to authorised users. For this purpose, UIC Members should select the most suitable methods (monitoring by telephone operator, technical monitoring by equipment or software).

At the moment, to establish communications with a user who can be reached through a UIC international circuit, it is necessary to define a route, the shortest one, and to apply the following directives:

- dial the national prefix to gain access to the international network;

- dial, in accordance with the numbering plans referred to in Point 2.2 - page 3, the code for gaining access to the desired network;

- dial the subscriber number.

NB : Using the ERNST Database, the entire destination number of the desired network to be dialled can be found without requiring a distinct prefix and access code.

To gain access to destination exchanges via the Network of UIC Members, it may be necessary to wait for a tone, a Morse code or verbal announcement from the exchange obtained, or even to observe a short pause before beginning to dial. The necessity of waiting for a tone, Morse code or verbal announcement is reflected in the ERNST Database by marker “W” (wait).

Examples:

1. In the digital network, when calling from the originating digital network to the destination digital network, it shall be possible to:

   a. transmit the digit sequence without pauses for tones, Morse codes or verbal announcements;
   b. apply a single code only, determining the destination network, and leaving optional route selection and control to the international transit exchange;
   c. see Point 4.1.4 - page 12: Procedures for using IRTN, for details.

2. In a mixed analogue and digital network, when calling from an originating analogue to a destination digital network, the new digital transit exchange will not return a verbal announcement. However, all pauses necessary in order to reach the international part of the analogue network must be respected.

3. In a mixed analogue and digital network, when calling from an originating digital to a destination analogue network, all necessary pauses (waiting for a tone, Morse code or verbal announcement) must be taken into consideration and be entered manually by the subscriber or automatically by the digital international transit exchange.

2.5 - Direction, type and characteristics of the signals transmitted over international circuits in analogue network sections

2.5.1 - Direction for making calls on international circuits

Bearing in mind the relatively small number of international circuits on each route, these circuits will only be used to fullest capacity if calls can be made in both directions (so-called “two-way” or “mixed” circuits).

However, for important routes, consideration can be given to whether the circuits should be operated so that some of them are used in one direction. This technique can also be used when additional circuits are available at little extra cost. Unidirectional operation makes it possible to reduce simultaneous connections (“head-on clashes”) and in certain technologies, the equipment to be installed at connecting points.

The number of international circuits is determined by mutual agreement between the two RTOs concerned. The volume of telephone business must be measured periodically for each link; measuring must be carried out at least once a year. Neighbouring RTOs must mutually exchange data on the results of the measurements undertaken.

In principle, a sufficient number of circuits must be provided to ensure that the level of service for automatic operation never exceeds 5 % loss at the busiest period; indeed, every effort must be made to reduce this loss to a maximum of 1 %.

For semi-automatic services, a sufficient number of circuits must in principle be provided to ensure that the waiting period does not exceed 1 minute.

2.5.2 - Type of signalling in analogue networks

2.5.2.1 - The type of signalling to be used for a given circuit is selected by the RTOs concerned when the circuit is being constructed, and in consideration of its transmission medium and terminations.

2.5.2.2 - The signalling procedure on analogue circuits in accordance with Point 2.5.2.3 of this leaflet remains unchanged until digitalisation.

O **2.5.2.3 -** As soon as a circuit between analogue exchanges is digitalised, conversion of the analogue system for signalling into channel 16 of the 2 Mbit/s circuit is to be undertaken. When converting, the conditions of ITU-T G.704, Table 9, are to be respected.

2.5.2.4 - Audible frequency signals used on a national network must be prevented from producing interference on other networks. For this purpose, each RTO must take the necessary measures to avoid reception of all signals emanating from an adjacent network which could produce interference within its own network. In certain specific cases, it is more cost-effective to prevent the transmission of signals likely to cause interference; this solution can then be applied by agreement between the two RTOs concerned.

2.5.3 - Signal definitions and characteristics in analogue networks

A signal is made up of one or more electrical pulses which characterise the various items of routing information. A clear distinction must be made between these and the announcements or audible tones referred to in Point 2.6 - page 8. These signals, a diagram of which is given in Appendix C - page 22 with durations and tolerances, are described in Sub-points 1 to 10 below.

In addition, Appendix C gives details of the time delays which must be provided between receipt of the signals and transmission of the following signal in the opposite direction. These time delays are necessary to enable the apparatus of the remote exchange to prepare for reception.

1. Connect (seize) signal: (emitted in the “forward” direction)

This signal must be emitted at the start of the call to seize the international circuit, at its incoming termination (e.g. register contact, exit blocking).

2. Start dialling (proceed-to-send) signal: (emitted in the return direction)

This signal is only necessary when registers are used either in the transmitting or receiving equipment.

In cases where this signal proves necessary, the RTOs concerned must come to a direct agreement on this subject.

3. Numerical signals: (emitted in the forward direction)

Selective information necessary to switch the call to the desired direction is transmitted by series of decimal pulses, where each series represents a digit; in each series, the number of pulses must be equal to the digit to be transmitted (for example, three pulses for digit 3); this is therefore known as the decadic selector system.

It is recommended that pulse correctors be used in reception equipment.

4. End of dialling signal

This signal is not used in decadic selection.

5. Signal for line free: (emitted in the return direction)

The signal for line free is not generally used, since many RTOs use an audible tone in its place.

As this is sufficient, circuits used in international telephone communications must always allow for the transmission of audible tones at any time.

RTOs which use a "line free" signal on their national networks should come to an agreement with the adjacent RTOs on the choice of equipment for changing this signal into an audible tone and vice versa, with the possibility for this equipment being fitted either to the transmitter or the receiver; it is usually preferable for this particular adjustment to be effected in transmission equipment for the “reverse” transmission direction.

6. Signal for line engaged: (emitted in the return direction)

For “line engaged” signals, the same remarks apply as for the “line free” signal.

Similar arrangements should therefore be made.

However, the equipment used by some RTOs causes compulsory reverse clearance when the receiver for the requested call is found to be engaged. This clearance, which occurs at the latest 2 seconds after dialling the number, is then transformed into the engaged tone (or an engaged signal) on one of the exchanges of the international circuit, in accordance with agreements to be made directly between the RTOs concerned.

7. Busy, re-order (congestion)

Congested circuit connections are dealt with in the same way as when the user required is found to be engaged.

8. Answer signal: (emitted in the “return” direction)

The transmission channel in the “forward” direction for a number of automatic networks is only activated for conversation after receipt of the answer signal; for other networks, calls obtained through the telephone operator are automatically cut after 30 to 40 seconds if no answer signal is received. For such networks, an answer signal is essential to establish a call.

In cases where the equipment of the automatic switches of a destination or transit network would not normally give an answer signal, this signal must be artificially produced by the last preceding exchange.

RTOs must reach direct agreement between themselves concerning the construction details.

9. Clear signals: (at end of call)

   a. Calls between two users through automatic switches.
   The "line free" signal is produced by the first user to replace his receiver.
   RTOs must reach direct agreement between themselves concerning the type of "line free" signal.
   The arrangements made must ensure that the line is free through all the exchanges and equipment for all cases of operation.Circuits must not be available for further calls until the "line free" sequence (clear down) is completed.

b. Communications established between a user connected to an automatic switch and a user depending on a manually operated installation.
The connection between the manual switchboard and the main exchange of the international line is always established through the intervention of automatic telephone equipment. Release of the international connection reverts to the previous situation.
Release of an international line must not depend on the intervention of a telephone operator, but take place as soon as the user connected to the automatic network replaces his or her receiver (through clearing).

10. Blocking signal

This signal is emitted from either end of the circuit and is intended to show that the international connection at the other end is engaged. It can be used by direct agreement between the RTOs concerned.

Blocking consists either of permanent transmission of signal current over the line, or permanent transmission of a series of pulses.

Observations:

1. No signal or specific code is used to obtain the intervention of a telephone operator for assistance. If necessary, a call can be made to an extension number where there is a telephone operator speaking a given language.
2. In addition to the arrangement relating to clear forward and clear down signals (see above under 9.a.), it is desirable for any fault in the terminal equipment to make the failed section inaccessible to subsequent callers, and to activate an alarm for the maintenance service.

2.6 - Verbal announcements and audible tones transmitted over the international circuits in analogue network sections

1. Advice of invitation to transmit

At international transit exchanges on the Telecommunications Network of UIC Members, it is recommended that a verbal announcement supplied by a voice recorder should be used for the purpose of announcing the transit exchange already contacted in the course of establishing the communication.

The following rules should be adopted when composing this verbal announcement:

- the name of the town will only be mentioned if the subsequent numbering is specific to that town. In other cases, only the initials of the railway will be given;
- the above information will be followed by the word “transit”[1].

Where applicable, the same exchange can announce the initials of the railway on the circuits crossing over frontiers, and the name of the town on the national circuits forming part of the international chain.

Reception of the subsequent dialling at the exchange takes place after the beginning of the verbal announcement.

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1. This word should be pronounced as it is, without being translated into the language of the respective country.

2. Busy Tone (Engaged subscriber or link)

To facilitate interconnection of automatic networks with different technical characteristics, the busy tone transmitted over international circuits should preferably be standardised. For this purpose, a tone has been chosen with a single frequency of 400 to 600 Hz; the rate will be 1 to 2.5 transmissions per second, the length of the silent interval being between one third and one half of each cycle.

3. Ringing tone (Confirmation of call)

In the same way as for the busy tone, an audible tone with a single frequency of 400 to 600 Hz will be used, emitted every 3 to 5 seconds, for about 1 second.

At any time while the call is being made, or at least in the interval between successive series of pulses, it must be possible for the verbal announcements and audible tones to be freely transmitted in the “return” direction.

3 - Transient phase: international circuits with analogue and digital sections

3.1 - General description

The digital IRTN shall comprise digital transit exchanges capable of supporting ISDN (see List of abbreviations - page 24) services which will be connected together in a network by means of digital links with a transmission capacity of at least 2 Mbit/s.

In addition to user information (voice, picture, data, and text), all necessary signalling information for circuit and network control are transmitted over the IRTN. In the transitional period it must be assumed that analogue and digital sections exist in one circuit. If analogue sections are used in an international circuit, the performance (services and performance characteristics) only corresponds to that of the analogue section. See Point 2.3 - page 4 for use of mixed analogue and digital links. Not until all analogue sections are replaced by digital sections can the new services and performance characteristics be fully utilised.

In the transitional period, international transit exchanges must co-exist compatibly and reliably in both analogue and digital environments. During the changeover from analogue to digital technology, conversion of characters and signalling may only be carried out in the new digital transit exchanges. Changes to the old analogue installations are to be avoided.

Appendix C - page 22 - shows a typical section of the network with the analogue and digital configurations possible in the transitional period.

3.2 - Number of circuits placed end-to-end when making a call

For an international call, the route of the call should be designed so as to allow few transitions, significantly below the ITU-T recommendations, between analogue and digital in the international route. Where originating and destination exchanges are digital, no analogue circuit should be included in the route.

The network connections should be constructed so that the delay between originating to called extension is contained within limits appropriate to ITU-T recommendations.

3.3 - Verbal announcements and audible tones in a mixed analogue and digital network

O **3.3.1 -** There will be a progressive withdrawal of verbal announcement and intermediate tones with implementation of the IRTN.

3.3.2 - The speed of operation of digital routes and reduction in call set-up times in a digital environment does not allow time for network routing messages to be generated/received, and paths will attempt to go to “set up” on such answer-type messages. Tones may be experienced where analogue routes remain.

3.3.3 - In digital networks, the subscriber-busy tone will be returned from the user by the calling parties' exchange. On analogue routes the busy tone is returned from the called parties' or end users' exchange. In a mixed analogue and digital network, users will continue to hear a variety of types of busy tone. Advice on changes of tones can be provided by calling the RTO.

4 - Digital era

4.1 - IRTN description

4.1.1 - IRTN structure

The IRTN shall be a circuit-switched network configured to support ISDN services, primarily voice traffic. It can exist as an international connection of national networks (internationally-connected networks) managed in a distributed way and consisting of a number of international switches (PABX's) or an independently-managed international network.

Large RTOs that already have switches compliant with the IRTN standards may nominate part of these switches, and the links connecting them, to be incorporated into the international network or into the internationally-connected network. In the first case, IRTN management will be responsible for ensuring that the use of such elements provides a suitable level of service (e.g. performance) for IRTN users. In the second case, every participating network management will be responsible for ensuring that the use of such elements provides a suitable level of service.

There will be a transmission network linking the international switches (PABX's). The transmission network need not be dedicated to the IRTN services but could be shared with other international services or with elements of national railway telecommunications networks.

The IRTN will be resilient against any single point of failure. To achieve this resilience, switch processing elements will be duplicated; the transmission network will be based on ring rather than tree architectures and access links to national networks will be duplicated, diversely routed and connected to two separate switches. Rings of greater than "1000 km" length should be supported by cross links.

Note:
The approach of an international network is different from that of an internationally-connected network that consists of bilateral links only. Appendices A - page 20 and B - page 21 show the current network structure and indicate possible architectures for the IRTN switching network.

4.1.2 - IRTN services

4.1.2.1 - The IRTN shall, in accordance with the definition given in ITU-T recommendations and ETSI standards (see List of abbreviations - page 24), support:

- bearer services;
- teleservices;
- supplementary services.

O **4.1.2.2 -** In order to achieve this, the protocol between IRTN switches will be ITU-T SS7 ETSI ISUP Version 2 or Q-sig (see List of abbreviations - page 24). Using Q-sig, the set of supported services will be reduced accordingly.

O **4.1.2.3 -** The IRTN will also support the railways' emerging GSM-conformant mobile network (GSM-R). It will achieve this through the connection of IRTN to the GSM-R mobile switching centre (MSC), using SS7 MAP (see List of abbreviations - page 24) or DSS1 (see List of abbreviations - page 24) protocols.

4.1.2.4 - The IRTN will be capable of supporting third-party users, subject to a suitable regulatory regime, and subject to the RTOs choosing to permit it.

4.1.2.5 - A small number of different service profiles will be identified for the switches. This will enable a basic range of services to be implemented initially, with the potential to upgrade later.

4.1.2.6 - Provision will be made for incorporating telephone operator services into the network.

4.1.3 - Access to IRTN services

The access links from a national railway telephone network to the IRTN will normally use the national RTO's internal signalling system. These links will clearly vary from RTO to RTO, and range from Q-sig through DSS1 and DPNSS (see List of abbreviations - page 24) to analogue (electromechanical) systems.

Access to the IRTN will be transparent to users. The aim is that they will be able to treat the system as an extension of their own national network.

The services available to any given user depend on three factors:

- the protocol of the network to which he/she is connected;
- the services offered by the IRTN;
- the protocol of the destination national network. Where protocols change, interworking is necessary. ISDN services will only therefore be available where the national networks support them. Conversely RTOs that use analogue systems will not be able to exploit the features of the IRTN.

Where third parties are directly connected to an IRTN switch, specific connection agreements and connections will need to be configured. As with railway users, the services available will depend on the nature of their connections.

4.1.4 - Procedure for using the IRTN

An IRTN user wishing to dial an IRTN user in another country will proceed as follows:

- dial the IRTN access code ("international prefix"),
- dial the IRTN destination code (country code according to ITU-T E.164),
- dial the destination national number according to the numbering of the destination network.

Connection will be fully automatic. There will be no call progress announcements. The ERNST Database reflects this situation, presenting dialling codes without marker ("W").

For connections routed via the IRTN, and for destinations which are not on the IRTN, the originating IRTN switch must simulate the manual dialling requirements to transit the analogue section.

During the transition period, the procedure will be more complex than this, depending on whether the calling party's national network and/or the called party's national network are connected to the IRTN. The general procedure will be as follows:

- dial to the local international switch;
- dial successively to other international switches through the existing UIC Corporate Telecommunication Network, aiming towards the IRTN switch;
- dial the IRTN destination code of the country nearest to the destination;
- dial successively to other switches of the existing UIC Corporate Telecommunication Network, aiming at the destination country;
- dial the destination national number according to the numbering of the destination network.

Connection across the IRTN will be fully automatic and there will be no call progress announcements. Hops across the existing system will be associated with call progress announcements.

4.1.5 - PSTN connection

The IRTN will seek to connect to the PSTN (see List of abbreviations - page 24) using SS7 (see List of abbreviations - page 24), subject to national and international regulations. The IRTN will seek to arrange a suitable access code with regulators and national PTOs (see List of abbreviations - page 24), to enable easy interworking of railway users connected to the IRTN and PSTN users.

PSTN break-in and break-out actions, where allowed, will proceed as follows:

- from the national PSTN, dial the access (break-in) code of the IRTN switch (note: this switch may be in another country);
- dial the IRTN destination code of the country nearest to the destination;
- dial a PSTN line access (break-out) code;
- dial the destination PSTN number that again can be in another country.

The security aspects of this need to be carefully considered.

4.1.6 - Numbering plans

The IRTN numbering scheme will comply with the relevant ITU-T recommendations. It is planned that the IRTN will seek to use a numbering scheme as close to the PSTN scheme as possible. In particular:

- the IRTN access code ("international prefix") should be 900 from any given railway;
- IRTN destination codes should match the public country codes (e.g. 44 for the UK);
- the IRTN will handle and correctly route national destination and subscriber numbers.

It may be the case that several networks within a given country are separately addressed by the IRTN. The approach to this is not yet decided, but is likely to be to retain the country code and to add a connected network code. For instance 44-1 might be the code for access to the BRT fixed network, 44-2 to the NIR fixed network, 44-3 to the UK EIRENE (see List of abbreviations - page 24) network, and 44-4 to the UK PSTN.

4.2 - Technical architecture

4.2.1 - Signalling

The switches shall support transit services and should not support direct connections to subscribers. Note that in the case of third parties, direct connections to PABXs may be supported. The traffic on the network shall be from railway business subscribers, and EIRENE traffic. Signalling between international switches shall be ETSI ISUP Version 2 (see List of abbreviations - page 24). This is the signalling system that will be used in European public networks and supports a wide range of ISDN services. The switches shall also support some or all of the following signalling systems for connection to the national railway telephone networks:

- DSS1;
- Q-sig;
- DPNSS
- analogue E&M;
- other SS7 user parts (TUP, TUP+ (see List of abbreviations - page 24), ISUP Version 1)

It should be noted that interworking between signalling systems reduces the functionality that can be provided. Interworking with national networks using DPNSS and Q-Sig is likely to be realised using DSS1 interfaces. The provision of end-to-end services via the international network is limited by the national signalling systems in use at either end of the link. If analogue signalling systems are implemented in the destination railway telephone network, only basic telephony services are possible.

4.2.2 - Transmission

RTOs will be required to install synchronous transmission equipment based on SDH (see List of abbreviations - page 24) rings. The architecture of these rings will be determined by bilateral or multilateral agreements or by the IRTN Management Organisation, if this exists. RTOs will have the freedom to route the rings as they wish, providing the routing supports the necessary connectivity.

The SDH rings will be based primarily on optical fibre meeting appropriate standards, installed at the trackside. When this is not feasible, or would entail unnecessary expenditure - such as crossing large bodies of water - microwave hops will be necessary.

The IRTN Management Organisation may need to lease capacity from non-railway bodies temporarily in order to provide services while transmission infrastructure is being installed.

4.2.3 - Synchronisation

o **4.2.3.1 -** ITU-T Recommendation G.811 is to be observed in respect of clocking and synchronisation equipment.

o **4.2.3.2 -** The clocking equipment of the transit exchanges is synchronised using the network clock pulse supplied by the IRTN.

4.2.3.3 - Network synchronisation shall be achieved from two accurate clock sources, a main and standby located at two different switches within the network. Each international switch shall have main and standby routes nominated to receive timing information. In the event of failure, the switch shall automatically select the next link from a list with a preset order of priority. In the event of failure of the main network clock, all timing to the network shall be derived from the standby network clock. Links to national railway telephone networks shall operate plesiochronously.

o **4.2.3.4 -** Jitter compatibility must correspond to ITU Recommendation G.823. In the case of framing, the slippery-frame identification code must not be lost.

o 4.2.4 - International circuits

2 Mbit/s circuits in accordance with ITU-T Recommendations G.703 and G.732 are to be used exclusively for the digital circuit of transit exchanges. 32 channels, each with 64 Kbit/s, are available in one 2 Mbit/s circuit. Channel 0 serves synchronisation and is reserved for the frame identification and answering codes. Channel 16 is used for signalling between exchanges.

4.3 - Connection to the IRTN

4.3.1 - Network access

International network access points will be provided at convenient locations throughout Europe, typically in capital cities. It will be the responsibility of individual RTOs to provide connections from the IRTN access point to their own gateway switches. The number and location of switches within the national network nominated to host connections to the international network is left to the discretion of the UIC members. However, the use of a minimum of two is recommended for resilience. Timescales for connection to the IRTN will be negotiated bilaterally or with the IRTN Management Organisation.

National RTOs will be required to set up their networks such that all traffic dialled with an international prefix is routed to the international network. Ultimately, the objective is to use a common international prefix throughout Europe. However, initially this may be allocated by the national RTO. All digits dialled after the international prefix should be passed transparently to the IRTN. The IRTN will also be connected to the GSM-R network (EIRENE) and will transport traffic to and from mobile phones.

When initial connection is made to the IRTN, a period of interworking testing will take place. This will follow a set sequence of tests specified by the IRTN Management Organisation, or bilaterally. Upon successful completion of these tests and on starting live operation, the RTOs concerned will update the international directory (ERNST Database) according to the implemented numbering schemes.

4.3.2 - Telephone operator services

It is important that users are able to obtain the assistance of a telephone operator when making international calls. It is considered preferable that a single RTO site within each national railway network is nominated as the international telephone operator for users on that national network. This offers the benefits that:

- the telephone operators will have knowledge of the operation of the IRTN and be able to offer a high level of service to subscribers;

- the telephone operators will be able to act as a focal point for receiving calls from telephone operators in other railway telephone networks;

- linguistic capabilities can be developed to improve the quality of service offered to incoming callers.

In terms of linguistic capabilities, it is preferable that the international telephone operators have capabilities in the languages most likely to be used by incoming callers. Typically, this will be those of the neighbouring countries.

Access to the international telephone operators should be via a common access code. This should be different from the number usually used to access telephone operator services.

5 - Directory administration

Every UIC Member Railway using the UIC Corporate Telephone Network must keep the international directory up-to-date. The international directory is hosted in electronic form (ERNST Database) on the UIC Web site (ernst.uic.asso.fr). Directory administration is performed in two independent ways, keeping the ERNST Database and Web server operational on one site, and providing ERNST Database content management on the other.

The ERNST Database server and the UIC Web server are administered by UIC IT staff regarding technical and operational questions. This part of administration is described in the "UIC Web Server Administrator's Guide".

The content of the ERNST Database can be administered in several ways. It can be managed in a centralised manner (one database administrator only), in a distributed manner (one or several database administrators for every RTO) or a mixture of these. However, the primary activity must emanate from the contact person who wishes to inform the other users of the UIC Corporate Network of changes in the home railway telephone network. The ERNST Database is merely a tool that can help save important numbering scheme values and enable the users to make international telephone calls through the UIC Corporate Network more easily.

5.1 - Contact persons

Every UIC Member Railway (including the UIC itself) connected to the UIC Corporate Telephone Network or IRTN nominates one or several contact person(s). These contact persons will act as remote ERNST Database administrators. The members of the Panel of Telecommunication Experts PETER are considered automatically to be contact persons. It must be underlined that no special information technology skills are required from remote database administrators; the most important qualification is knowledge of the railway telephone network structure and numbering scheme.

A contact person's duties will be as follows:

- To define the range of values (basic information, destination codes, subscribers) that are to be entered in the ERNST Database;

- To update the content of the database (via Internet browser) according to the latest modification of the numbering scheme of the home railway telephone network under the contact person's responsibility;

- To disseminate information concerning changes on other railways among users (subscribers) of a home railway telephone network.

In order to obtain administrator access to the ERNST Database, the contact persons will address the UIC Infrastructure Commission (this step is not necessary for PETER Members). The message sent to the UIC Infrastructure Commission must contain the name and e-mail address of the contact person, the country and abbreviation of the railway or RTO that the contact person will be responsible for. On receipt of these values, the main ERNST Database administrator will create the basic ERNST Database records enabling remote administration. Taking over the ERNST Database administration, the contact person will receive by e-mail the complete "Remote ERNST Database Administrator's Guide" in electronic form.

The personal computer (PC) of the contact person must be equipped with an Internet browser. The contact person must have access to public Internet. The Internet browser will serve to make changes in the ERNST Database values. The PC of the contact person must also be equipped with e-mail client software, allowing e-mail messages to be submitted and retrieved from outside. The contact person must know his/her e-mail address. E-mail is necessary because information about changes in the ERNST database will be distributed through it.

Note:
The contact persons can also be nominated for UIC Members that are not connected to the UIC Corporate Telephone Network (IRTN). These contact persons will be informed of the latest changes to the UIC Corporate Telephone Network (IRTN) by e-mail.

5.2 - Centralised administration

In this case, the UIC Infrastructure Commission acts simultaneously as main and remote ERNST Database administrator. However, the origin of the information that is to be entered in the ERNST Database must still be based on national railway telephone network resources.

The obligations of a centralised ERNST Database administrator are as follows:

- To collect messages informing of any change in the numbering scheme of the UIC Member Telephone Network by letter or e-mail;

- To update the ERNST Database values according to the information obtained.

The centralised ERNST Database administrator must dispose of the same equipment as the contact person. However, knowledge of the UIC Telephone Network and its numbering scheme is not necessary in this case due to the largely administrative work involved. The centralised administrator will perform his/her tasks according to the "Main ERNST Database Administrator's Guide" and the "Remote ERNST Database Administrator's Guide".

Centralised administration is acceptable for a transient period only, until ultimately 1 January 2004. In future, it will be accepted for RTOs not disposing of access to public Internet only.

5.3 - Distributed Administrations

Content administration of the ERNST Database is split up between the contact persons responsible for remote administration of the ERNST Database and the main ERNST Database administrator. The UIC Infrastructure Commission performs the tasks of main ERNST Database administrator.

The duties of the contact persons are those mentioned in Point 5.1 - page 17.

The duties of the main ERNST Database administrator are as follows:

- To approve the right of access to the ERNST Database;

- To define the appropriate administrator's access rights to the contact persons;

- To export the ERNST Database from the internal format into another format using the ERNST Database tools; this export must be done after every change in ERNST Database values in order to keep the content consistent;

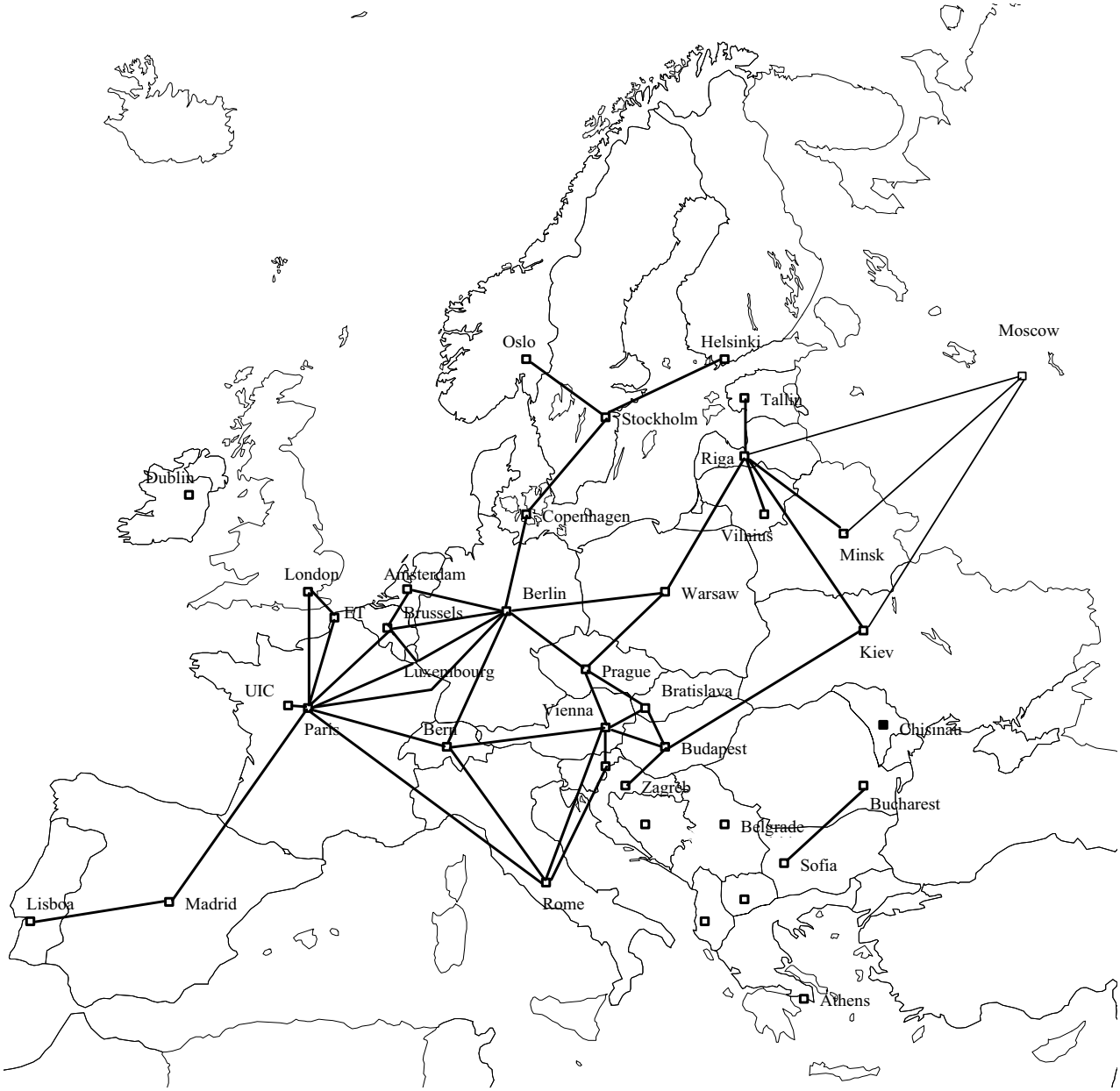
- To prepare a printed version of the ERNST Database;

- To delete railways or RTOs from the ERNST Database.

5.4 - Directory Distribution

The UIC Infrastructure Commission distributes the complete directory, based on the content of the ERNST Database in written form, at least once every two years.

Appendix A - Presentation of existing IRTN



UIC Members

Other Railways

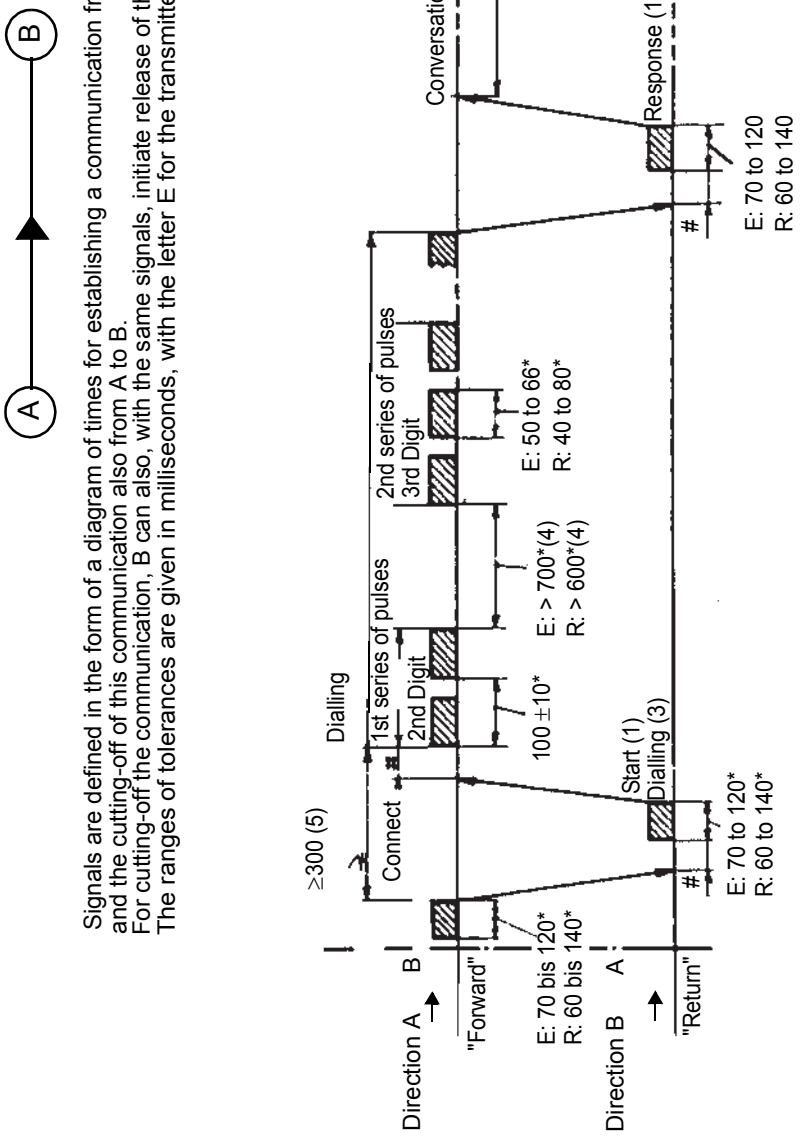
Appendix B - IRTN: possible switching connectivity

UIC Members

Other UIC Railways

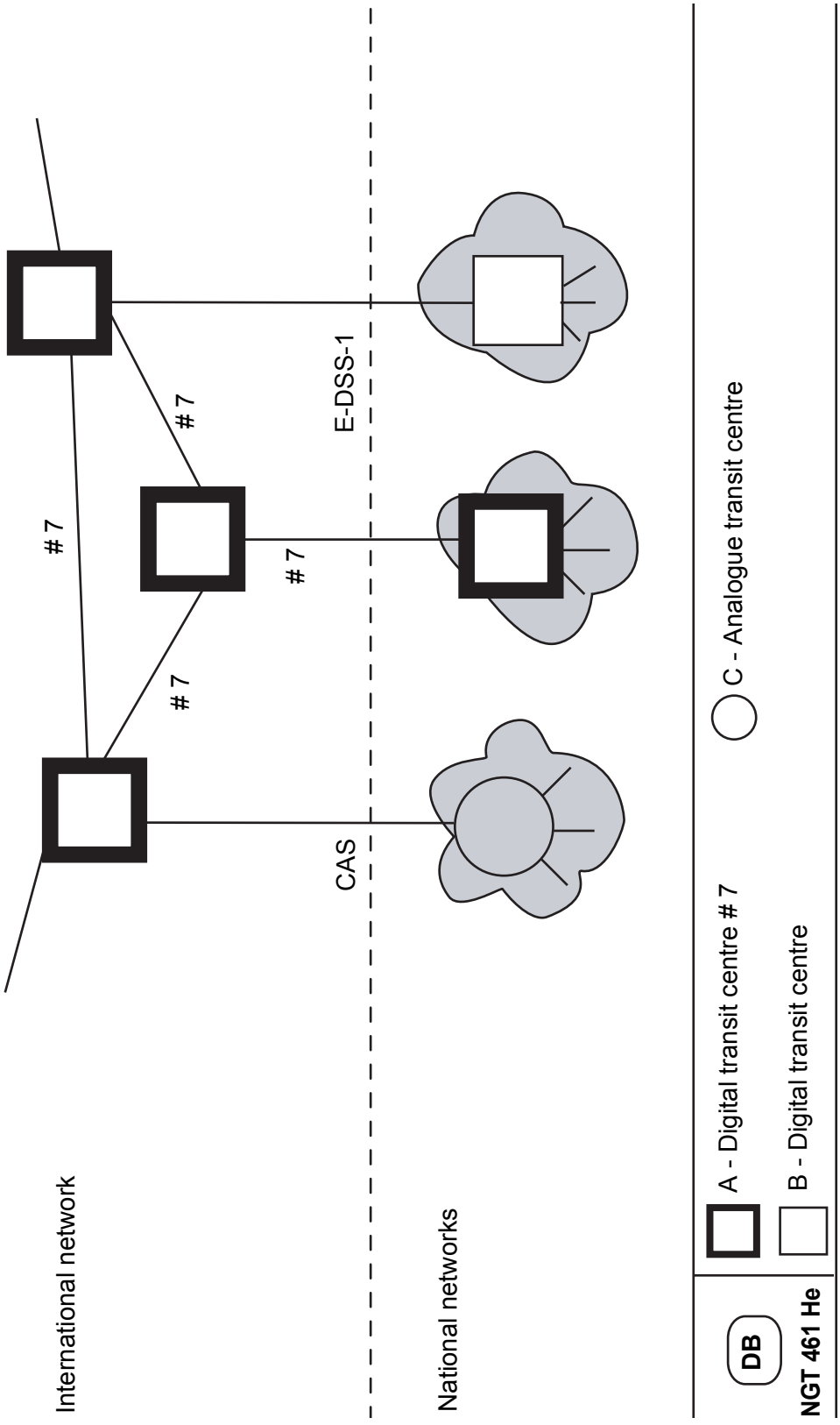
Appendix C - Signalling systems (existing UIC Telecommunications Network)

Durations and tolerances for signals exchanged over the international telephone network



Appendix D - IRTN Network

Transitional interfaces



List of abbreviations

ATM	Asynchronous Transfer Mode
CCITT	Consultative Committee for International Telegraph and Telephone
DPNSS	Digital Private Network Signalling System
DSS1	Digital Subscriber Signalling System n. 1
EIRENE	European Integrated Railway Radio Enhanced Network
ERNST	European Railway Numbering Scheme for Telecommunications
ETSI	European Telecommunications Standards Institute
GSM	Global Standard for Mobile Telecommunications
IMO	IRTN Management Organisation
IRTN	International Railway Telecommunications Network
ISDN	Integrated Services Digital Network
ISUP v.2	Integrated Service User Part Version. 2
ITU	International Telecommunication Union
ITU-T	International Telecommunication Union - Telecommunication Standardisation Sector
MAP	Mobile Application Part
PABX	Private Automatic Branch Exchange
PSTN	Public Switched Telephone Network
PTO	Public Telecommunication Operator
RTO	Railway Telecommunication Operator
Q-Sig	Signalling at Q reference point
SDH	Synchronous Digital Hierarchy
SS 7	Signalling System n. 7
TUP	Telephony User Part
TUP +	A modification of TUP to support ISDN services included in phase 1 of the ISDN MoU (Memorandum of Understanding)
WWW	World Wide Web

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Warning

Printed by the International Union of Railways (UIC)
16, rue Jean Rey 75015 Paris - France, June 2004
Dépôt Légal June 2004

ISBN 2-7461-0781-3 (French version)
ISBN 2-7461-0782-1 (German version)
ISBN 2-7461-0783-X (English version)