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THE INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE

CCITT

# SIXTH PLENARY ASSEMBLY

GENEVA, 27 SEPTEMBER - 8 OCTOBER 1976

ORANGE BOOK

VOLUME II.2

## TELEPHONE OPERATION QUALITY OF SERVICE AND TARIFFS

Published by the  
INTERNATIONAL TELECOMMUNICATION UNION  
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**CONTENTS OF THE CCITT BOOK**  
**APPLICABLE AFTER THE SIXTH PLENARY ASSEMBLY (1976)**

**ORANGE BOOK**

- Volume I** — Minutes and reports of the VIth Plenary Assembly of the CCITT.  
— Resolutions and Opinions issued by the CCITT.  
— General table of Study Groups and Working Parties for the period 1977-1980.  
— Summary table of abridged titles of Questions under study in the period 1977-1980.  
— Recommendations (Series A) on the organization of the work of the CCITT.  
— Recommendations (Series B) relating to means of expression.  
— Recommendations (Series C) relating to general telecommunication statistics.
- Volume II.1** — General tariff principles — Lease of circuits for private service: Series D Recommendations and Questions (Study Group III).
- Volume II.2** — Telephone operation, quality of service and tariffs: Series E Recommendations and Questions (Study Group II).
- Volume II.3** — Telegraph operations and tariffs: Series F Recommendations and Questions (Study Group I).
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- Volume IV.1** — Line maintenance and measurement: Series M and N Recommendations and Questions (Study Group IV).
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- Volume VI.4** — Programming languages for stored-programme control exchanges: Series Z Recommendations.
- Volume VII** — Telegraph technique: Series R, S, T and U Recommendations and Questions (Study Groups VIII, IX, X, XIV).
- Volume VIII.1** — Data transmission over the telephone network: Series V Recommendations and Questions (Study Group XVII).
- Volume VIII.2** — Public data networks: Series X Recommendations and Questions (Study Group VII).
- Volume IX** — Protection: Series K and L Recommendations and Questions (Study Groups V, VI).

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- definitions of specific terms used;
- supplements for information and documentary purposes.



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**MODIFICATIONS TO THE SERIES E RECOMMENDATIONS**

The following Recommendations did not appear in the *Green Book* and are, for the most part, new:

E.130	E.261
E.165	E.275
E.252	E.276
E.260	E.523

The following Recommendations, which were already included in Volume II-A of the *Green Book*, have been extensively rewritten:

E.113	E.422(Q.61)
E.420(Q.60)	E.425(Q.64)
E.421(Q.60 <i>bis</i> )	E.521(Q.88)

Owing to the decision of the VIth Plenary Assembly of the CCITT to discontinue Study Group XIII and to transfer some of its duties to Study Group II, most of the Recommendations which formerly fell within the competence of Study Group XIII are no longer given double numbering and are included in this Volume only (Series E Recommendations).

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**PRELIMINARY NOTE**

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

## **PART I**

### **Series E Recommendations (E.100 to E.181)**

#### **TELEPHONE OPERATION**

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## SECTION 1

### DEFINITIONS

Recommendation E.100 <sup>1)</sup>

#### DEFINITIONS OF TERMS USED IN INTERNATIONAL TELEPHONE OPERATION

1. **telephone call**

The interconnection of two telephone stations.

2. **call request**

The first application made by the caller for a telephone call is called the call request.

In automatic service, the operation of the dial (or key-set) by the caller to obtain a call with his correspondent is comparable to the call request.

3. **telephone message**

An effective call over a connection established between the calling and the called stations.

4. **telephone circuit (international or trunk circuits)**

1. The whole of the facilities whereby a direct connection is made between two exchanges (manual or automatic) is called a telephone circuit.

2. A circuit is called an international circuit when it directly connects two international exchanges in two different countries.

3. The term *trunk circuit* is reserved for the designation of exclusively national circuits.

*Note.* — The above definitions relate solely to the use of the terms in operational procedures, no matter how the circuits are actually made up.

5. **international exchange**

The exchange (at the end of an international telephone circuit) which switches a call destined to or originating from another country.

---

<sup>1)</sup> The word "international" is applied to any relation between countries whether those countries are in the same continent or not.

**6. international transit exchange**

An international exchange chosen to establish telephone calls between two countries other than its own is called an international transit exchange.

**7. preparation operating**

In preparation operating, after the request is recorded by an operator in the outgoing international exchange another operator in the exchange sets up the call. After the requests have been put in order at the exchange, the controlling operator sees to it that the calling station is connected on the international circuit without loss of time.

A distinction is made between:

**A. advance preparation operating**

Advance preparation operating requires preparation at both the outgoing and incoming international exchanges.

**B. outgoing preparation operating**

Outgoing preparation operating requires preparation at the outgoing international exchange only.

**8. demand operating**

In demand operating (manual or semi-automatic), after the request has been recorded in the outgoing international exchange, an immediate attempt to set up the call is made by the operator at this exchange who took the request.

A distinction is made between:

**A. manual demand operating**

There are two operating methods:

**a) indirect manual demand operating**

In this method of operating, the operator at the incoming international exchange always acts as an interpreter between the operator in the outgoing international exchange and the called party.

**b) direct manual demand operating**

In this method of operating, the operator in the outgoing international exchange speaks with the called party direct.

**B. semi-automatic demand operating**

In this method of operating, the operator in the outgoing international exchange controls the automatic switching operations to obtain either the called station, or an operator in the incoming or transit international exchange (or an operator in a manual exchange in the country of destination).

**9. automatic service**

In the automatic service, the calling subscriber himself dials (or operates the key-set) the number necessary for connection with the called station.

## 10. routes

The routes followed by international telephone traffic are designated by agreement between Administrations. A distinction is made between:

- primary routes,
- secondary routes,
- emergency routes.

**primary routes:** The circuits normally used in a given relation.

**secondary routes:** The circuits to be used when the primary routes are congested, or when the transmission on the primary routes is not sufficiently good, or it is outside the normal hours of service on the primary routes.

The secondary route(s) may pass through the same countries as the primary routes or through different countries.

**emergency routes:** The circuit or circuits to be used in case of complete interruption or major breakdown of the primary and secondary routes. The emergency routes may pass through any country.

## 11. controlling exchange

1. The exchange which is responsible for setting up calls and decides the order in which they are to be connected is called the controlling exchange.

2. The Administrations concerned shall agree among themselves to designate the controlling exchange.

3. As a general rule, they shall select for this purpose:

3.1 when a single international circuit is used, the international exchange operating that circuit on the calling party side;

3.2 when two or more international circuits are used:

- a) either the international exchange which has access to the first international circuit on the calling party side, or
- b) the international transit exchange designated by joint agreement of the Administrations concerned.

*Note.* – It may be that the international circuits are not operated exclusively by operators at the international exchange where they end; operators at other international or national exchanges may also have access to them by means of an automatic transit device. In such circumstances these international or national exchanges must be treated as though they were a controlling exchange, as far as setting up calls is concerned.

## 12. controlling operator

The controlling operator is the outgoing operator in the controlling exchange who operates the international circuit. The controlling position is the position used by the controlling operator.

*Note.* – However, it may happen that the outgoing international circuit is also operated by an operator in an international or even a national exchange. If this is so, the latter operator is considered as controlling operator.

## 13. successive phases of a call

The characteristic instants in the successive phases of the setting up of an international telephone call in the manual or semi-automatic service are distinguished as follows:

- $t_0$  the caller has placed his request;
- $t_1$  the controlling operator has received all of the call details;
- $t_2$  the controlling operator has made the first attempt to set up the call;
- $t_3$  the called number has replied or the caller has been informed why the call cannot be connected;

- $t_4$  the called person (or called extension) has been obtained or the caller has been informed why the call cannot be connected (the instant is only significant for personal calls);
- $t_5$  the end of the conversation, generally when the caller replaces the receiver;
- $t_6$  disconnection, normally when the international circuit is released by the operator.

*Note.* — In automatic service it is in general difficult to define all the characteristic instants specified above, either because it is impossible to distinguish between them with accuracy or because of differences between the switching systems used. It is, however, possible to define the *total setting-up time* (see definition 17).

#### 14. duration of a call (conversation time)

The interval between the instant the call is actually established between the calling and the called stations and the instant the calling station gives the clearing signal (or the instant when, although the caller has not replaced his receiver, the call is:

- in manual or semi-automatic service, officially cleared down by an operator,
- in fully automatic service, cleared down after some slight delay by the action of the called subscriber's clear-back signal).

The time interval between:

- a)  $t_5 - t_3$  is the duration of a station call;
- b)  $t_5 - t_4$  is the duration of a personal call.

#### 15. chargeable duration — charged duration

1. The time interval on which the charge for a call is based is called the chargeable duration.
2. The chargeable duration is equal to the duration of the call reduced in manual or semi-automatic service, if necessary, to make allowance for any interruptions or other difficulties which might have occurred during the call.
3. The duration of a call for which the charge is paid by the calling subscriber (or the called subscriber in the case of a collect call) is the chargeable duration rounded upwards;

In the case of manual or semi-automatic operation:

- a) either to a 3-minute charge, if the chargeable duration of the conversation is less than 3 minutes; or
- b) to the whole number of minutes if the chargeable duration is greater than 3 minutes.

#### 16. holding time of an international circuit

The time interval  $t_6 - t_2$  during which the circuit is used is the holding time of the international circuit.

This interval includes in particular the call duration, the operating time and the time taken to exchange service information.

*Note.* — The term "operating time" is meant to cover the time taken both by operators and switching equipment.

#### 17. answering time of operators; request transmission time; delay time; setting-up times of an international call

1. At the outgoing international exchange, the *answering time of operators* is the interval between the end of the transmission of the calling signal and its answer by an operator at the distant international exchange.

At the incoming international exchange, the *answering time of operators* is the interval between the appearance of a calling signal on a position or group of positions at that exchange and its answer by an operator.

2. The request transmission time is the time interval  $t_1-t_0$  taken in passing the call request to the controlling operator.

3. The time interval  $t_2-t_1$  is the delay to which the call is subject at the controlling exchange.

The caller is generally informed of this delay.

4. The setting-up time of a station is the time interval  $t_3-t_1$ . The total setting-up time of a personal call is the time interval  $t_4-t_1$ . These times include any delay at the outgoing international exchange.

## 18. traffic carried (by a group of circuits or a group of switches)

### 18.1 amount of traffic carried

The amount of traffic carried (by a group of circuits or a group of switches) during any period is the sum of the holding times expressed in hours.

### 18.2 traffic flow

The traffic flow (on a group of circuits or a group of switches) equals the amount of traffic divided by the duration of the observation, provided that the period of observation and the holding times are expressed in the same time units. Traffic flow calculated in this way is expressed in *erlangs*

## 19. traffic offered (to a group of circuits or a group of switches)

It is necessary to distinguish between traffic offered and traffic carried. The traffic carried is only equal to the traffic offered if all calls are immediately handled (by the group of circuits or group of switches being measured) without any call being lost or delayed on account of congestion.

The flow of traffic offered, and of traffic carried, is expressed in *erlangs*. The amount of traffic offered and of traffic carried is expressed in *erlang-hours*.

## 20. measurement of busy-hour traffic

### 20.1 busy hour (of a group of circuits, a group of switches, or an exchange, etc.)

The busy hour is the uninterrupted period of 60 minutes for which the traffic is at the maximum.

*Note.* — It is usual for the period of the busy hour and the amount of traffic in the busy hour to vary from day to day. In order to obtain a representative traffic estimate, it is recommended that an average value should be calculated from the measurement of a sample, as described later.

It is possible to calculate an average traffic flow which is the mean of the traffic flows during the busy hours of the different days in the sample. An alternative method is to find the continuous 60-minute period when the average of the sample is the maximum and to obtain from this period the representative traffic. The following recommendations relating to the determination of the sample period (see Recommendation E.500, "Measurement of traffic flow") and of the mean (sometimes called "time consistent" busy-hour) apply particularly to the second method.

**20.2 mean busy hour (of a group of circuits, a group of switches, or an exchange, etc.)**

The mean busy hour is the uninterrupted period of 60 minutes for which the total traffic of a sample is the maximum.

*Note.* – If it is not known which 60-minute period constitutes the mean busy hour, a sample measurement taken over 10 days (see Recommendation E.500, “Measurement of traffic flow”) should be sufficient to enable the position of the mean busy hour to be determined. As it is desirable to have a uniform method of analyzing the statistics thus obtained, the following method is recommended for adoption in the international service, the observations being made over quarter-hourly periods:

- for a number of consecutive days the values observed for the same quarter of an hour each day are added together;
- the mean busy hour is then determined as being the four consecutive quarters which together give the largest sum of observed values.

**21. circuit usage for a group of international circuits (or an international circuit)**

The percentage ratio between the sum of the holding times during a specified period equal to 60 consecutive minutes at least and the total length of that specified period.

In the case of a group of circuits, the circuit usage corresponds to the average traffic density per circuit during the specified period.

*Note.* – Unless otherwise indicated, circuit usage is based on the busy hour.

**22. percentage of call requests met**

The expression is a percentage of the ratio  $n/N$  where

$n$  is the number of these call requests that are followed by calls (see definition 1);

$N$  is the total number of call requests (see definition 2) in a specified time.

## SECTION 2

### GENERAL

#### Recommendation E.110

##### ORGANIZATION OF THE INTERNATIONAL TELEPHONE NETWORK

1. When there is preparation operating, international traffic should be decentralized whenever circumstances justify it, by the creation of international exchanges in adequate numbers in the centre of the areas to be covered by the service, to reduce waiting times and any lengthening of routes.
2. In the direct or indirect manual demand operating, it would be well to concentrate international traffic in a few international exchanges where major groups of international circuits end, so that international circuits may be more efficiently used, and in view, too, of the linguistic knowledge demanded of international operators.
3. With semi-automatic and automatic service, it would also be well to concentrate international traffic in a few international exchanges, because of
  - the high cost of the technical equipment required in incoming and outgoing international exchanges for this service;
  - the linguistic knowledge required of operators, in the case of semi-automatic international service; and
  - the need to provide automatic transit in certain exchanges (international routing plan).

However, it would be advisable when the traffic justifies it, to provide certain international exchanges or national manual exchanges in a country, with direct-access circuits to an international automatic exchange so that the operators in these exchanges can set up international semi-automatic calls in automatic relations without the intervention of an operator from the international exchange.

#### Recommendation E.111

##### EXTENSION OF INTERNATIONAL TELEPHONE SERVICES

Application of that provision of the *Telephone Regulations* (Geneva Revision, 1973) which states that Administrations shall endeavour to extend international telephone services to the whole of their territories might sometimes entail the establishment of calls leaving something to be desired from the point of view of transmission quality; it is therefore desirable:

- 1) to take no decision to create or extend a new relation unless such means are available as would provide satisfactory service;
- 2) to make the opening or extension of the relation dependent on the passing of satisfactory test calls.

**Recommendation E.112**

**ARRANGEMENTS TO BE MADE FOR CONTROLLING THE TELEPHONE  
SERVICES BETWEEN TWO COUNTRIES**

In controlling the organization of the telephone service in a given relation, Administrations might forego the conclusion of formal agreements signed by the heads of Administrations, as there is no need for such agreement in relations where the provisions of the *Telephone Regulations* (Geneva Revision, 1973) are mutually and fully accepted. On the following major points agreement can be reached by correspondence:

- *Date on which the relation is to be opened.*
- *Means used to provide the connection:*  
direct (transit) circuit;  
passage through a transit exchange;  
transit country or countries concerned.
- *Classes of call admitted* (List the classes of call and other media of communication, i.e. phototelegraph calls, programme transmissions and television transmissions).
- *Information:* Specify the provisions adopted to permit the exchange of lists of the principal local networks with all the information necessary for routing and accounting of calls.
- *Charging and accounting.*

**Recommendation E.113**

**INSTRUCTIONS FOR USERS OF  
THE INTERNATIONAL TELEPHONE NETWORK <sup>1)</sup>**

***Preamble***

This Recommendation outlines the principles and guidelines for Administrations in the preparation of user instructions.

The growth of the worldwide telephone network emphasizes the urgency to improve customer performance when using telecommunications services. The absence of clear and up-to-date information and instructions for users of the worldwide telephone service can only result in a low degree of customer satisfaction and unnecessarily high costs to Administrations. Consequently Administrations are urged to promote, through the use of this Recommendation, progress towards the adoption of the guidelines which follow:

**1. *General principles***

1.1 Up-to-date comprehensive instructions should be made readily available to users of the public telephone service, by Administrations.

1.2 The objective of such instructions is to allow customers to complete calls themselves to the maximum extent possible and reduce errors in the use of the international network thus:

- assisting the user and providing greater satisfaction on his part,
- effecting significant cost savings by Administrations through more efficient use of the network.

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<sup>1)</sup> Other Recommendations which should be considered in this respect are: E.114, E.130, E.160, E.161 and E.162.



1.3 On this basis, the full availability of current instructions should be considered as equally important as the overall planning, provisioning, operating and maintaining processes, the costs of which are a normal and inherent part of the supplying of good telecommunications service.

1.4 Established instructions provided by Administrations should be evaluated on a regular and continuing basis with a view to their improvement. Observations of service quality, studies of customer calling difficulties, questionnaires, customer comments, laboratory experiments, and any other means which may be available or practicable should be considered the normal tools for furnishing good instructions.

1.5.1 The introduction of new services shall include clear and easy to use instructions for use by the customer. These instructions constitute a normal part of the introduction of these services.

1.5.2 Every effort should be made to test the effectiveness of instructions before issue and then to promote and promulgate on an international basis those proven to be most effective in practice, with due regard to the needs of different countries.

1.5.3 Design of instructions should play a key role in the development of proposed new services, from the customer point of view, rather than being considered belatedly in operational and hardware decision making and manufacture.

1.5.4 Optimal instructional practices as proved in service might be made available to all interested Administrations in order to improve customer performance and effect significant cost savings.

## 2. *Instructions*

2.1 The most common means of providing a range of instructions and information to customers for the effective use of the telephone service is through the medium of printed *public telephone directories* issued on a general basis by Administrations.

2.2 In addition, these printed instructions should normally be placed in public places for use by customers, such as public call offices, coin telephone booths and post offices.

2.3 Further instructions for specific purposes may be issued to users, for example:

- dialling instruction booklets,
- dialling code booklets,
- operating procedure booklets (for supplementary services),
- personal telephone directories,
- other telephone guide books (multilingual), pamphlets or cards of a specialized nature.

2.4 Access to spoken instructions can be provided through the provision of operators or recorded announcement machines dedicated to this activity; one aim should be to reduce to the greatest extent customer references to the operator assistance service.

2.5 Specialized instruction can with advantage be given through the medium of inclusion in school curriculums, radio broadcast and television transmissions, other printed media and special public presentations for the purpose of improving customer performance.

## 3. *Public telephone directories*

3.1 *Public telephone directories* are published regularly by Administrations as the most common means of informing customers of service numbers which are generally available for public use, instructions on use of the service, and easy to find current customer telephone number listings. It is recognized that the layout of directories is governed by considerations which may vary from country to country; however, it is desirable that such lists of subscribers should be capable of ready consultation by the Administrations and/or subscribers of other countries. To this end, similarity in sequence and presentation of directory information should be regarded as a desirable international objective to be achieved within the constraints of language differences.

3.2 Such information can be conveyed by words, pictograms and internationally standardized symbols, the basic need being to impart clear information to the caller. It would be very useful, in order to encourage the use of the international telephone service, if directories (especially those supplied to other Administrations and/or to subscribers of other countries) were composed in roman characters, particularly those relating to the names and addresses of subscribers.

3.3 Public telephone directories may cover a single numbering plan area, or several numbering plan areas on an exchange or geographical basis or portions thereof based on a community of interest and are issued free of charge to subscribers in these areas.

3.4 They may be published as a single volume or as groups of volumes, keeping in mind the need for brevity and simplicity, regular editing and up-to-date publication, consistency between volumes, for maximum readability and ease of use by the customer. Each volume of the lists of subscribers could usefully contain a recapitulatory list of the subdivisions mentioned in the volume, or an equivalent chart.

3.5 Language difference on the part of residents and foreign visitors is an important factor to be considered in the publication of public telephone directories. Multilingual information, when included, should be well presented so that those who have partial knowledge of, or no language of the country are not deterred from using the service.

3.6 Public telephone directories should be subdivided into at least two basic parts easily recognizable for example by means of different coloured pages (for example pink for instructional pages and white for customer telephone number listings). Page edge-marking or intercover publicity are other alternatives.

#### 3.6.1 *Instructional pages*

Calling guide instructions for users should consist of, for example, the following, but not necessarily in order of priority:

- index;
- how to dial;
- emergency call numbers (police, fire, ambulance, language service, etc.);
- service department codes and operator assistance numbers;
- numbers of the administrative services of the Administrations, their addresses and enquiry points;
- how to use directory;
- local dialling instructions with lists of exchange or geographic place names, codes, maps of area coverage and applicable charges if any;
- national long-distance dialling instructions, with lists of place names, long-distance prefixes, area codes, maps and details of call charges;
- international long-distance dialling instructions, with international prefixes, country codes, area codes, and details of call charges, etc.;
- list of codes and telephone numbers of the telephone services which are available, together with internationally agreed symbols to assist visitors;
- general information which the Administration may feel useful or important to the user.

Instructions of these types should meet the needs of both experienced and inexperienced users.

### 3.6.2 *Customer listings*

- Alphabetical lists in black print on white pages of subscribers (surname, given names or initials and postal address) either by numbering plan, exchange or geographical area (or combinations thereof) with an appropriate identification in heavier type at the beginning of the list and at the top of each page and/or column.
- Listings belonging to another directory area including those of other countries should be easily distinguishable, and show the appropriate information in order that a call can be completed.
- Alphabetical lists may be split where desired, into residence and business listings.

3.6.3 The instructional pages should precede the customer listings.

3.6.4 Where there is a need for more than one language in a country, colours or other means of differentiation may be used as appropriate in the instructional pages.

3.7 The same directory may contain sections other than the alphabetical list of subscribers, but these sections may equally be published as a separate volume or volumes, for example:

#### 3.7.1 *Classified listings* (Yellow pages)

- a classified business trade and professional section in alphabetical order, followed by names in alphabetical order under the respective headings, together with address and telephone number.

#### 3.7.2 *Services promotion* (Green pages)

- a section or filler pages to allow the Administration to illustrate services it wishes to sell, or makes available free of charge, and provide instructions for specialized instruments which may be connected to the network, in addition to other information (e.g. postal or telegraph information, PBXs, telex or data services). Photographs, pictograms and symbols of agreed international standard could be used, particularly to help foreign visitors to take advantage of the services.

3.7.3 Optional classified listings and service promotion sections should follow the instructional pages and customer listings so as not to negate the basic nature of the latter, from the users' point of view.

3.8 It is desirable that the effectiveness of the existing public telephone directories should be tested periodically in order to improve customer performance in the use of the network.

3.9 The front cover or the first page of each book of a directory, or each section of a directory should preferably be used to emphasize important information such as emergency numbers although these may be also listed elsewhere.

3.10 Other information deemed important by Administrations, for example national laws or regulations, billing information, etc. might be placed on the back pages or spare pages due to the binding process. These pages might also be used for personal notation of telephone numbers to increase the value of the directory from the users' point of view.

3.11 Administrations may wish to consider the use of staff dedicated to the improvement of directory listings, resolution of particular listing problems and which can ensure a source of additional revenue (e.g. additional listings).

3.12 Recommendation E.114 outlines the conditions for supplying lists of subscribers (by directories and other means to other Administrations).

## 4. *Public call offices, coin telephone booths*

4.1 Public call offices and coin telephone booths should preferably be identified externally with the applicable internationally approved symbols particularly at locations frequented by tourists.

4.2 In addition, they should be equipped with public telephone directories relative to the areas in which they are located and associated calling instruction booklets as appropriate.

4.3 Public call offices should, as necessary, prominently display notices listing exchanges which can be reached without dialling the full national number. Lists of dialling codes, particularly those most frequently used should also be displayed to reduce enquiries to operators to the minimum.

4.4 Public call offices and coin telephone booths should display relevant pictograms and symbols to instruct customers on how to place national and international calls, to obtain assistance from operators, or to place calls to emergency numbers (fire, police, etc.).

4.5 Administrations should preferably display instructional information in more than one language and give careful consideration to the use of several languages for maximum assistance, particularly in call offices and transport terminals where foreign visitors can be expected and so help reduce costly operating assistance services.

4.6 Similarly, instructional information regarding other services provided by the Administration may be posted.

## 5. *Instructional information for specific purposes*

5.1 Considering the scope, size and normal availability of public telephone directories, the ease and need of travel by users, the increasing use and consciousness of telecommunications and the lack of knowledge on the part of foreign visitors, then personalized instructional information should be made available.

5.2 This generally takes the form of personal *pocket information* issued to new customers, either residence or business, heavy users, or generally available upon request. Such information includes:

- dialling instruction booklets,
- dialling code booklets,
- operating procedure booklets,
- personal telephone directories,
- other telephone guide books, pamphlets or cards.

5.3 While distribution would primarily take place in the country of origin, Administrations should consider making available appropriate foreign information to their customers who plan to visit other countries or who otherwise have a need. This might be arranged and exchanged on a bilateral basis for mutual benefit.

5.4 Careful attention should be directed to publishing instructions in more than one language for as widespread use as possible. The use of appropriate pictograms and symbols of the agreed international design would assist the customer in unfamiliar situations.

5.5 Dialling instruction booklets are published to facilitate the placing of national calls and international calls. Ideally, instructions for both should be in the same booklet and should be essentially the same as provided in public telephone directories.

5.6 Dialling code booklets should similarly list the appropriate codes for national and international calls, in separate sections of the same booklet.

5.7 Operating procedure booklets may be essentially the same as dialling code booklets but include appropriate control procedures for special services which the customer may want to use, preferably of an internationally standardized nature.

5.8 All three such booklets might be combined, where feasible, keeping in mind convenience of use by the customer.

5.9 Personal telephone directories can be particularly useful to users for their notation of particular or frequently called numbers. Administrations could consider the inclusion of a minimal amount of key instructional information.

5.10 Special cards or specialized pamphlets may also be made available to illustrate for example:

- dialling codes or instructions for foreign visitors on how to make national and international calls;
- tones which may be encountered in dialling national or international calls, illustrated by pictograms or internationally standardized symbols;
- use of particular services that are available or whose proper use should be encouraged;
- practical or helpful hints to foreign visitors regarding any aspect of the service.

5.11 Administrations are encouraged to establish and maintain close liaison with other countries' tourist boards to ensure that current information about its services is available to prospective visitors in suitably translated form.

## 6. *Instruction by operators or recorded announcements*

6.1 Correct dialling instructions can be given to customers as required in the process of placing a call, by special intercept operators or recorded announcements dedicated to that type of instruction.

6.2 This may be given in more than one language, or the customer directed to an appropriate language operator for assistance. Inferred is special training on the part of the operators.

6.3 Recorded announcement machines may be employed on a public basis, where feasible, to which users could be encouraged to call for instructional information (e.g. demonstration of foreign tones or announcements, etc.).

6.4 To aid in a clearer understanding of the world's telephone system, a verbal announcement used within the various networks should preferably be interleaved with the special information tone (SIT).

*Note.* — This tone is internationally standardized and designed to invite a calling subscriber to get in touch with an operator in his country when he cannot understand a message orally received.

6.5 It is paramount that if recorded announcements are used, the words should be chosen with extreme care to avoid customer confusion.

## 7. *Specialized instruction*

7.1 Administrations may choose to employ specialized instructions in a formal manner through other media for example:

- educational programmes in elementary or more advanced school curriculums,
- educational programmes and aids for teachers,
- radio broadcasts or television transmissions of instructional information, exclusive of advertising,
- presentation of instructions through newspapers or magazines,
- film presentations to private groups, or to larger public groups in cinemas,
- presentations at local, national or international exhibitions,
- special inserts with customer accounts,

- special leaflets for restricted or wide distribution,
- special classes on customers', or Administration, premises (e.g. PBX or Centrex users, etc.),
- change of number postcards and letterhead stickers for individual subscriber use, etc.

For the training of future users, who may become an increasingly important part of worldwide telecommunications, some of the above items may be applicable.

7.2 Some such programmes may be more effective than others and while efficacy may be difficult to determine, evaluation is an important aspect towards optimum instruction at least cost.

#### **Recommendation E.114**

### **SUPPLY OF LISTS OF SUBSCRIBERS (DIRECTORIES AND OTHER MEANS)**

1. Each Administration shall supply by mutual agreement and free of charge to the Administrations with which a telephone service exists a sufficient number of copies of its lists of subscribers for official use.
2. A subscriber wishing to obtain a telephone directory of another country must apply to his own Administration. If an application for one of its telephone directories is received directly by an Administration from a subscriber in a foreign country, the receiving Administration shall inform the subscriber that such requests should be addressed to his own Administration.
3. An Administration which has supplied telephone directories of its own country to another Administration for distribution to subscribers shall indicate the sale price of the directories plus any postal charges (in principle expressed in gold francs) for the use of the receiving Administration.
4. Accounting concerning the supply of such directories for subscribers' use shall be conducted according to the usual procedure followed between Administrations (see Recommendation E.270), unless Administrations, by mutual agreement, elect to forego such accounting.

#### **Recommendation E.115**

### **REQUESTS FOR INFORMATION ON TELEPHONE SUBSCRIBERS' NUMBERS IN OTHER COUNTRIES**

1. The method to be followed in providing the customers and operators in one country with information on the telephone numbers of subscribers in another country depends on the way the information service is organized in the country of destination, distance between the countries, operating procedures, etc.
2. The method adopted in any particular relation should conform to the following general principles:
  - 2.1 a) inquiries from customers concerning foreign subscribers' numbers should normally be addressed to operators in the country of origin who will obtain the required information;
  - b) technical arrangements should, as far as practical, bar access by a subscriber to an operator of the telephone information service of another country. The numbers or codes giving access to the telephone information services in other countries should not be included in published dialling code information;
  - c) exceptionally, however, subscribers in one country may be permitted to have access to the information service in another country subject to bilateral agreement between the Administrations concerned.

2.2 The operator in the country of origin dealing with international information inquiries should be able to obtain information according to the mode of operation agreed with each Administration;

- a) from telephone directories;
- b) from other information systems sent by the country of destination and kept up to date (e.g. microcards);
- c) by calling the information service operator in the country of destination;
  - outgoing operators in the originating country should, where language and other conditions permit, be given direct access to the appropriate foreign information centre(s) which hold, or will obtain from other centres, comprehensive up-to-date information;
  - where language or other conditions do not permit the outgoing operator to have direct access to the appropriate foreign information centre, the outgoing operator should call the operator in the international exchange of the country of destination.

2.3 Where access is given to a number of information centres, provision should be made for access to a centralized international centre or assistance operator in case of the originating operator encountering language or other difficulties.

3. When an outgoing operator has to obtain information from a foreign country it may be useful for the customer to remain on the line on which the information is being obtained.

#### Recommendation E.116

### CREDIT CARDS

1. Credit cards may be issued by Administrations to allow a credit card customer to make telephone calls in the international service at the appropriate charges for each call and have the charges billed to his account in the country which issued the credit card. However, the international credit card system should only be used for calls to the country of issue.

2. The use of credit cards may be allowed for station and personal calls.

The use of a credit card does not change the rules for charging applicable to these types of calls.

3. If the holder of a credit card is to derive the maximum benefit from it, he should not be required to show the card at a telephone office; he should be able to make his calls over the telephone, simply quoting the card number to the operator. The number on the card should provide sufficient guarantee of the card's validity.

4. There would be certain advantages in standardizing the general format and numbering scheme together with usage procedures for credit cards used in the international service. This would facilitate the recognition of such cards in hotels, etc., and the handling of calls. It is a matter for national decision whether separate cards are issued for the national and the international telephone services, or whether one card will serve both purposes.

5. Credit cards issued for use in the international service (whether or not used for the national service as well) should, as far as practicable, conform with the following specifications:

#### *Size*

The credit card should be designed to fit easily into a wallet or bill-fold. Although bank-notes vary in size from one country to another, and this may affect the size of wallets and bill-folds, there seems so far to be a certain uniformity in the dimensions of the credit cards issued by various organizations: namely, about 9 cm × 5.7 cm (3½ × 2¼ inches), and the CCITT considers that any cards issued by Administrations should have roughly these dimensions.

*General format*

When a separate card is issued for the international service, it should preferably bear the title "International Telephone Credit Card". The term "International" must not, however, exclude use of the card within the country of issue.

When a card is issued for both the national and the international service, the issuing authority may prefer that the title of the card should simply be "Telephone Credit Card".

The information on the card used in the international service should include:

- 1) country of issue and, where appropriate, the name of the Administration;
- 2) holder's name and signature;
- 3) the card number (on a combined national/international card, the international number, if different, should be appropriately designated);
- 4) the date of expiry or, alternatively, the year of validity.

In addition, instructions on how the card should be used and on how a call should be requested may be given on the back of the card. However, some Administrations may prefer to issue instructions separately, and to include, on the front or the back of the card, only the briefest instructions to prevent use by unauthorized persons if the card is lost.

*Numbering system*

For international purposes the credit card number will be composed of two parts:

The first part will consist of a code to indicate the country of issue followed by a letter denoting the year of validity;

The second part will consist of the credit card number assigned by the issuing Administration.

To reduce the risk of error in passing credit card numbers over the telephone, they should be kept short and, as a general rule, should not exceed a total of twelve digits and letters, including the letter of validity.


To indicate the country of issue, the country codes given in Recommendation E.161 should be used.

The code letter to indicate the year of validity for the following year will be chosen by the Secretariat of the CCITT from an approved list of letters. Advice of the letter selected will be furnished to Administrations by the end of June each year to allow time for cards to be printed and dispatched to customers.

**Recommendation E.117**

**PROVISIONS CONCERNING THE DEVICE SUBSTITUTING  
A SUBSCRIBER IN HIS ABSENCE**

1. Precautions will have to be taken by the Administrations to warn callers of the presence on the called subscriber's line of a device substituting him in his absence:

- a) Devices of this type should be indicated in the telephone directories by means of a special sign  ;
- b) Administrations should invite the owners or renters of such equipment to mention the fact on their letterheads by means of a printed indication.

2. To facilitate the disposal of international traffic on a device of this type, the Administrations should, when consenting to this equipment, insist that it complies with the essential conditions set out in the following Annex.



## ANNEX

## (to Recommendation E.117)

## Basic specifications for recording apparatus substituting the called subscriber

## A. OPERATING CONDITIONS

1. *Delay in answering*

The ringing current from the telephone exchange should be permitted to operate the telephone bell for at least 3 seconds but for not more than 10 seconds before the call is answered by the apparatus. This will enable the call to be answered in the *normal* way in those countries which wish to provide for such a facility. The timing of this interval (3 to 10 seconds) should be independent of the periodicity or the duration of the ringing current.

2. *Normal conditions for metering and supervision*

In answering a call the apparatus should loop the subscriber's line and should also give the normal conditions for control of metering and for supervision as with a normal subscriber's installation. The disconnection of the apparatus shall break the loop on the subscriber's line.

3. *Announcement of the presence of the apparatus*

- a) The presence of the apparatus should be indicated to the calling party by means of a verbal announcement following, in principle, immediately on the closing of the loop on the subscriber's line.
- b) This verbal announcement should include, in particular, the following:
  - first, whether the apparatus permits the recording of a message,
  - the subscriber's name or business style,
  - the subscriber's number and particulars of the locality (e.g. Genève, St. Moritz, etc.),
  - clear instructions as to the functioning of the apparatus (whether a message may be recorded, and if so, the moment when the message may be recorded and the maximum duration of a recording).

## B. SIGNALLING CONDITIONS

1. *Avoidance of interference from signalling frequencies*

The correct functioning of the apparatus should not depend upon (nor be affected to any extent by) the sending or receiving of signalling frequencies used in the telephone system or specially generated in the apparatus.

2. *Avoidance of interference with national signalling systems by the tones transmitted by the apparatus*

To avoid interference with the national signalling system of a country by the tones transmitted by the apparatus over the network of that country, it is recommended that, in the case of the transmission of tones by the equipment:

- the transmission of tones should be in short pulses and not a continuous transmission;
- the tones should not be composed of a single frequency, but should be a mixture of at least two frequencies, so that the guard circuit of the signal receiver of the corresponding country, where there would be a risk of interference, may operate (for this purpose, the choice of the following frequency-combinations should be avoided:

2040 and 2400 Hz  
600 and 750 Hz

1200 and 1600 Hz

500 and 20 Hz  
1000 and 20 Hz

## C. TRANSMISSION CONDITIONS

Any recording apparatus which takes the place of the called subscriber should give a level and quality of speech comparable to that given when the station is used by a person.

**Recommendation E.118**<sup>2)</sup>**LEASING OF TRANSMITTERS OR RECEIVERS**

1. There are no objections in principle to the lease of transmitters or receivers to users interested only in sending or receiving spoken messages or pictures, provided of course that such arrangements are compatible with the responsibilities which Administrations have accepted by their adherence to the International Telecommunication Convention and associated Regulations.
2. Charges for the lease of such equipment should be determined by the Administration concerned and they would not appear in international accounts.
3. Conditions to be met by lessees of transmitters or receivers should in principle be as follows:
  - a) the radio communications in question must not contain any advertisement or message of a private character;
  - b) names and addresses of senders and intended recipients must be made known to all Administrations, each one of which shall decide, in respect of recipients in its own territory, whether or not to permit participation. Any alterations should also be notified promptly;
  - c) the Administrations concerned shall take all practicable steps to ensure that communications shall only be used by authorized recipients and that the provisions of the Convention as regards secrecy of telecommunications are observed;
  - d) transmissions shall be at fixed times and, in the case of spoken messages, in pre-arranged languages;
  - e) such other conditions as may be required by national law.
4. Where the lease of a transmitter in one country and a receiver in another country is required to provide a unidirectional circuit, or even where a multi-destination service is envisaged, Administrations concerned, although retaining the right to determine the charges for equipment leased in their own country may nevertheless, if they think it desirable, consult with each other in order to ensure that overall charges do not prejudice public service tariff scales.

**Recommendation E.119****INSTRUCTION OF STAFF OPERATING INTERNATIONAL POSITIONS**

The professional instruction of operating and supervising staff is of the greatest importance in ensuring the efficient use of circuits in the international telephone service; to this end, it is extremely desirable to improve supervisors' and operators' knowledge of the language of other countries and to enable them to become informed about the customs of the subscribers, the organization of the service and the manipulation of equipment at the other end of the circuit.

It is therefore recommended:

1. That, during the training of these operators, they should be provided with some information about methods and operating procedures used in the countries with which they might be connected;
2. That there should be frequent exchanges of supervisors and operators between the telephone exchanges of different countries.

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<sup>2)</sup> Formerly Section H of Recommendation E.142, *White Book*, Mar del Plata, 1968.

**Recommendation E.130****PICTOGRAMS AND SYMBOLS TO ASSIST TELEPHONE USERS****1. General**

Pictograms<sup>3)</sup> and symbols are widely used within the telecommunications field, to instruct and aid foreign visitors and inexperienced users in the use of telephone equipment and services. An example is the pictogram of a telephone handset to convey the idea of *telephone* or *telephone number* or perhaps *telephone booth*. An important application of pictograms is in the instructions found in coin telephone booths.

Pictograms have the following advantages:

- they are independent of language,
- they are space saving,
- they may be easily perceived and understood.

Great advantages accrue when the meaning of pictograms become common knowledge. It follows that standardization is desirable especially when such standardization can be in conformity with existing standards in other organizations.

**1.1 Application**

Administrations may choose to use pictograms instead of, or in addition to, printed instructions or text. Whenever pictograms are used it is desirable that they be in accordance with this Recommendation.

**1.2 Specifications**

The styling, size, colour and position of each pictogram is left to the discretion of the Administration. Each pictogram however should bear a perceptual similarity to those shown in this Recommendation.

**2. Specific Recommendations****2.1 Pictogram for telephone**

A pictogram for *telephone* may be used:

- a) in place of the word *telephone*;
- b) as an adjunct to a telephone number;
- c) to indicate a place where telephone calls can be made.

When such a pictogram is used it should be a representation of a telephone handset. The pictogram given here (Figure 1/E.130) is similar to the one shown in IEC Publication 417 (1973) 5090-a and those commonly found on road traffic signs and in railway stations.

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<sup>3)</sup> A pictogram is defined as a symbol or collection of symbols conveying an idea or message in pictorial form with little or no supporting text.

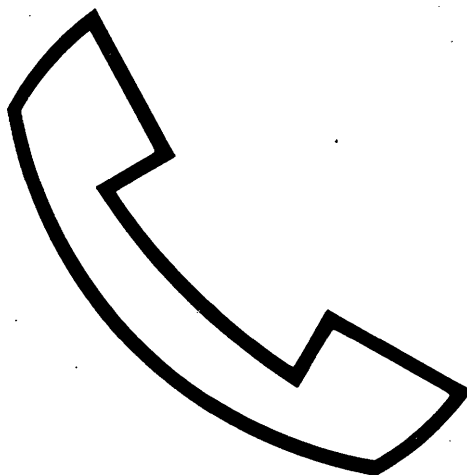


Figure 1/E.130

## 2.2 *Pictogram for information*

A pictogram for information can be used in telephone directories, in lists of relevant telephone numbers shown in telephone booths, in other places where information via the telephone can be given, or in printed information for foreign visitors. It may also be used in association with several telephone (service) numbers. It may be used to draw attention to:

- a) general telephone service information;
- b) information about national or international telephone numbers;
- c) assistance in foreign languages;
- d) information about hotels, theatres, etc.

When such a pictogram is used, it should consist of the letter i (lower case)<sup>4)</sup> as shown in Figure 2/E.130. The symbol may be contained within a suitable frame or border. Since this pictogram is a general reference, it should be associated with appropriate words or other pictograms to show the nature of the information provided at the corresponding telephone number. For example, the pictogram *telephone* for general telephone inquiry and the words "English", "Deutsch", "Francais" for assistance in foreign languages.



Figure 2/E.130

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<sup>4)</sup> NTT (Japan) and AT & T (USA) indicated that they may not be able to introduce the use of this symbol in connection with telephone assistance.

### 2.3 *Pictogram for emergency number*

In some countries a general emergency number is available to be dialled in all emergency situations. In other countries different telephone numbers are used for each emergency service such as fire, medical or police. Where a pictogram is used to indicate the general emergency number that pictogram should be "SOS"<sup>5)</sup> as shown in Figure 3/E.130. Where no general emergency number exists the symbol may be used to draw attention to the list of emergency numbers.



Figure 3/E.130

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<sup>5)</sup> At present, the AT & T (USA) has no plans to introduce this symbol.

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## SECTION 3

### OPERATION OF INTERNATIONAL TELEPHONE SERVICES

#### Recommendation E.140<sup>1)</sup>

#### PRINCIPLES FOR THE OPERATION OF INTERNATIONAL TELEPHONE SERVICES<sup>2)</sup>

The following principles should be respected as far as possible by the Administrations in the operation of international telephone services. These principles allow for the fact that certain relations depend exclusively on manually operated radiotelephone circuits. Detailed rules for the application of these principles are to be found in the *Instructions for the International Telephone Service*.

#### A. *Classes of calls and facilities offered to users*

##### 1. *Classes of calls*

The following classes of calls are accepted in the international telephone service:

- distress (emergency) calls;
- government calls;
- service calls;
- private calls.

##### 2. *Facilities offered to users*

The following facilities<sup>3)</sup> may be accepted in the international telephone service:

##### 2.1 without specific agreement between Administrations:

- requests for information;

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<sup>1)</sup> The provisions of this Recommendation were contained in former Recommendations E.142 and E.143 (*White Book*, Mar del Plata, 1968).

<sup>2)</sup> See also the following Recommendations:

- E.200 Charging for international calls in manual or semi-automatic operating.
- E.201 Charging in the automatic international telephone service.
- E.250 New system for accounting in international telephony.
- E.251 Old system for accounting in international telephony.
- E.270 Monthly telephone accounts.

<sup>3)</sup> In relations established on radio links the Administrations concerned may agree to accept subscription calls as a facility, i.e. calls normally exchanged regularly between the same stations, at the same time agreed upon in advance, for the same duration and which have been booked for a specified period. By agreement between the Administrations concerned, reduced charges may be made for subscription calls.

2.2 with agreement between the Administrations concerned:

- station calls;
- personal calls;
- collect calls;
- credit card calls;
- conference calls;
- data transmission calls

3. A station call is a call to a specified telephone number.

4. A personal call is a call between the number of a caller who may give his name (or the number of an extension) and some specific person (or extension); the person required must be adequately described (by name, position, address, etc.).

If the Administration of destination admits such a possibility a messenger may be sent if the person desired could not be obtained at a telephone station and, in particular, if he or she is not a telephone subscriber.

B. *Call requests*

1. When making a request for a call which cannot be complied with immediately and subject to the provisions on the validity of call requests contained in 3. below, the caller, in making his request, may specify:

- a) that the call should not be set up until after a particular time, stated by him; or
- b) that the call should not be set up during a given period; or
- c) that the request should be cancelled at a particular time.

*Note.* — Except where otherwise provided for in certain relations, these facilities are not admitted if the operating methods used include the setting up of calls without delay.

2. For any request which cannot be complied with immediately, the caller shall be free, subject to the provisions relating to the validity of call requests contained in 3. below, to alter his request for a call as long as he has not been told that the call was on the point of being put through.

3. *Validity of call requests*

3.1 Requests for calls shall remain valid until 0800 (local time at the exchange of origin) of the day indicated below if not cancelled by the caller or refused by the addressee, when all the exchanges concerned are permanently open, and at the daily closing time when they are not permanently open:

- i) for station calls, the day following the day on which the request was made;
- ii) for personal and conference calls, the second day following the day on which the request was made.

3.2 This period, however, may be prolonged by not more than 8 hours:

- i) when traffic routing difficulties have prevented the setting up of the call;
- ii) when justified by time differences between the two corresponding exchanges.

3.3 In relations operated by radio circuits working on a part-time basis only, requests for calls may, by agreement between the Administrations concerned, remain valid as long as they have not been complied with, or refused by the addressee, or cancelled by the caller.

C. *Setting up of calls*

1. In each international telephone relation, the Administrations concerned arrange by common agreement the *primary route(s)* and, if possible, one or more *secondary routes* taking into account such factors as hours of service, volume of traffic, accounting rates between Administrations, etc.



2. The *primary route*, which may follow more than one itinerary, is that which should normally be used for routing telephone traffic in a given relation.
3. The *secondary routes* are used, in particular, when there is congestion on the primary route or when transmission on this route is not of sufficiently good quality or when the call is outside the normal hours of service on the route. In advance preparation operating, if a call, after being prepared over a secondary route because the primary route was not available, cannot be put through at the first attempt, it should be completed on the secondary route. The call may, however, be transferred to the primary route, in case of necessity, when that route is no longer congested.
4. The collection rate in a given relation is the same, whether the primary or secondary route is used.

#### D. *Chargeable duration of international calls*

In principle, the outgoing operator is responsible for fixing the chargeable duration of the call; however, in advance preparation operating, and by agreement between the Administrations concerned, this chargeable duration may be fixed by the operator in the controlling international transit exchange.

For collect or credit card calls, the operator at the incoming exchange may, by agreement between the Administrations concerned, be responsible for fixing the chargeable duration.

#### Recommendation E.141

### INSTRUCTIONS FOR THE INTERNATIONAL TELEPHONE SERVICE

It has been noted that the rapid and reliable setting up of international telephone calls demands perfect coordination of the operations effected by the operators involved; consequently, it is highly desirable to unify the rules for the utilization of circuits; unity can be obtained only by respecting the same operating rules.

It is therefore recommended that Administrations should apply the *Instructions for the International Telephone Service* (edition of 1 January 1973 approved by the Vth Plenary Assembly of the CCITT, Geneva, December 1972, and modified by the VIth Plenary Assembly, Geneva, September-October, 1976).

The instructions must be observed both in the continental telephone service and in the intercontinental telephone service. However, by agreement between the Administrations concerned, special provisions may be applied to relations established on radio links (see Recommendation E.140).

These *Instructions* should be regarded as an integral part of the present Recommendation, although they are contained in a separate publication.

#### Recommendation E.142

### TIME-TO-ANSWER BY OPERATORS

1. Quick answering by operators to calls made over international circuits is essential for a rapid and satisfactory telephone service and for the efficient use of such circuits.
2. To this end, a sufficient number of operators should be provided, and they should cooperate with one another, so that the answering time does not exceed 5 seconds for 80% of calls.
3. These provisions apply to both the manual and semi-automatic service for incoming operators, assistance operators, and delay operators.

4. In semi-automatic operating, the time-to-answer for incoming operators, that is:
- incoming operators (code 11 or a specific number in the case of traffic with certain countries),
  - delay operators (code 12 or a specific number in the case of traffic with certain countries),

should, accordingly, be the time-to-answer shown in this Recommendation.

5. In semi-automatic operating, the time-to-answer by assistance operators should be shorter than the time-to-answer by incoming operators. To this end, operators playing the double role of assistance and incoming operators should give priority to answering assistance calls.

#### Recommendation E.143

### DEMAND OPERATING OF INTERNATIONAL CIRCUITS

In general, it is desirable in relations with manual operating to employ demand operating whenever possible.

Administrations concerned should make every effort (by ensuring that there are sufficient circuits, installations, personnel) to use demand operating.

In relations operated with preparation (outgoing or advance preparation) of calls, the Administrations concerned should make every effort to reduce delay as much as possible.

#### Recommendation E.144 <sup>4)</sup>

### ADVANTAGES OF SEMI-AUTOMATIC INTERNATIONAL SERVICE

For the following reasons the attention of Administrations is drawn to the advantages of semi-automatic operating from the point of view of economy and the quality of service:

- 1) from the introduction of semi-automatic operating at the incoming exchange, large economies in personnel can be the result;
- 2) the number of faults due to the equipment used for the international semi-automatic operating is very small;
- 3) the *efficiency* (ratio of chargeable time to total holding time) of semi-automatic circuits is very high compared with the efficiency of manual circuits operated on a demand basis;
- 4) the quality of the service given to users owing to the reduction in the time of setting up a call is improving considerably;
- 5) any type of call, station calls in particular, can be set up without difficulty over semi-automatic circuits and the use of as many semi-automatic circuits as possible is therefore recommended for an international relation.

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<sup>4)</sup> See also Recommendation Q.5 of Volume VI.

**Recommendation E.145<sup>5)</sup>****ADVANTAGES OF INTERNATIONAL AUTOMATIC SERVICE**

For the following reasons, the attention of Administrations is drawn to the additional advantages resulting from the introduction of international automatic service:

1. The advantages of semi-automatic operating mentioned in Recommendation E.144 apply equally well to automatic service in respect of reliability, circuit efficiency and the satisfaction given to users;
2. The advantages of automatic service are even greater as regards staff economy, since outgoing operators are dispensed with;
3. The changeover from semi-automatic to automatic service may be done without any major modification of the international circuits or of the switching equipment at transit and incoming exchanges;
4. The above advantages have been widely confirmed by experience on a large number of international relations;
5. Such experience has also shown that, when a relation changes from demand operating (manual or semi-automatic) to automatic service, there is considerable increase in traffic;
6. The introduction of an international automatic service follows logically on the introduction of a national automatic service.

**Recommendation E.146****DIVISION OF CIRCUITS INTO OUTGOING AND INCOMING CIRCUITS**

From the operating point of view the assignment of the circuits of a relation into incoming and outgoing groups is such as to facilitate the work of the operators.

**Recommendation E.147****MANUALLY OPERATED INTERNATIONAL TRANSIT TRAFFIC**

1. Direct circuits should be provided across transit countries whenever traffic justifies such a course; in this respect attention should be paid, for example, to the difficulties inherent in the use of an intermediate exchange for transit calls with manual operation.
2. In the absence of permanent direct routes, it is helpful to provide temporary direct circuits whenever a temporary traffic flow so justifies. As far as possible, such temporary direct circuits should not be set up via the operator's positions.
3. Whenever permanent or temporary direct circuits cannot be set up, the greatest possible degree of standardization in *the operating methods used in transit exchanges* is desirable. The following instructions will then be applied:
  - 3.1 if the two international circuits use manual demand operating, all the international transit exchange has to do is to make arrangements to set up the transit calls in accordance with the requests made by the outgoing international exchange, which means the controlling exchange;

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<sup>5)</sup> See also Recommendation Q.6 of Volume VI.

3.2 when, on the other hand, preparation operating is in force on either of the two international circuits, the international transit exchange becomes the controlling exchange; and

3.2.1 the controlling operator at the international transit exchange is the operator serving the most congested route. If there is no delay on the circuits to be interconnected, or if this delay is equal in both directions, the controlling operator shall be designated by the international transit exchange;

3.2.2 the controlling operator shall determine the time when a transit call is set up according to its class and priority and the time when the call request is received by the international transit exchange;

3.2.3 the controlling operator shall warn her two counterparts in the international exchanges of the time when it is expected to set up the transit call or calls in question, so that the operators in these exchanges may prepare the required circuits;

3.3 in the exceptional case when the call requires more than two international circuits, the Administrations concerned shall agree among themselves on the controlling exchange.

#### Recommendation E.148

#### ROUTING OF TRAFFIC BY AUTOMATIC TRANSIT EXCHANGES

In the two cases mentioned hereafter it may be advantageous from a general economic point of view (taking into account the loss probability and cost) to route traffic by automatic transit exchanges:

##### *Case 1*

Where there is a light traffic load between two countries, it may be desirable to route this traffic through an automatic transit exchange, rather than to provide a small group of direct circuits.

The considerations normally apply to the case where the introduction of semi-automatic operation is considered, but they should be equally valid for traffic which terminates on a manual international trunk exchange, reached through an automatic transit exchange.

*Note.* — The purely economic point of view from which these conclusions are drawn excludes all other considerations, particularly the following:

- a) It is necessary that the transit exchanges through which it is desired to route the traffic should be prepared to accept the transit traffic which would be offered to them and Administrations involved should design their circuit groups to satisfy the requirements of Part V of the present Volume in so far as loss probability is concerned.
- b) The provision of direct circuits may be preferred to a routing entirely via a transit centre for other reasons, e.g. the provision of broadcast programme circuits, control circuits for these transmissions, voice-frequency telegraph circuits, etc.

##### *Case 2*

In certain cases, particularly where the traffic between two countries is heavy, and when, for instance, it may lead to the deferment of a new installation, it may be advantageous to route a certain proportion of the additional traffic (peak traffic) by way of a transit automatic centre.

**Recommendation E.149****PRESENTATION OF ROUTING DATA**

When semi-automatic or automatic service is initially introduced between two countries it is recommended that a routing document be prepared by each Administration and an adequate number of copies exchanged. This routing document should be prepared as a booklet of A5 size (14.8 × 21.0 cm), and be divided into three sections. It seems important to keep the information up to date by exchanging data of the following types:

- a) Major routing changes involving existing routes and/or offices for which data have been previously supplied. Such information should be made available at least one month prior to the actual effective date of the change. In this consideration the importance of notification will be governed by the volume and characteristics of the traffic affected;
- b) Other routing changes in a country's networks which were not sufficiently important to be handled as described in a) above. This information should be supplied annually or more frequently when circumstances justify this course.

When forwarding routing changes under a) and b), forms on the model of Tables A or B in Section 2 of the routing document should be used, indicating whether the change is a revision or a new addition. In principle, a complete reprinting of the routing document is desirable from time to time. However, the frequency of production of a revised set of routing information should be left to the discretion of the issuing Administration, it being recommended that it should be not less frequent than once in five years.

Where an Administration finds it impracticable to provide all of the routing data in the manner recommended above, it is desirable that it adhere to this Recommendation to the maximum extent possible.

**Information to be entered on the routing document****Section 1 – Explanatory notes**

1. The issuing Administration should include the following items:

1.1 The numbering plan arrangements should be explained briefly, and the trunk prefix (if any) used in the national network should be quoted. Any useful information about the total number of digits in the national numbering system should be supplied;

1.2 The country code;

1.3 Language digits according to the availability of language assistance on incoming calls;

1.4 Name(s) of international exchange(s) used for incoming traffic. In specifying the name of the international exchange it should be indicated if it serves for continental and/or intercontinental traffic. If there is more than one exchange an explanation should be given as to which part of the national network each exchange serves by quoting the digit(s) of the trunk code which are necessary for this purpose. Where there is no uniform system for all incoming traffic to a country, the explanatory notes should make clear the specific instructions proper to each outgoing country;

1.5 It should be explained how subscribers in other localities than those listed in section 2 can be reached (for instance by code 11);

1.6 A table showing how to reach special services such as:

- supervisor,
- delay operator,
- transit calls,
- calls to/from ships,
- phototelegraph calls,
- collect calls,
- requests for information,
- personal calls for which word has been left at the called station;

1.7 If functions described in 1.6 above are performed on a decentralized basis, routing data will be indicated in section 2, Tables A and B. It should be observed that if the outgoing operator does not speak any of the languages indicated, she should direct her call to the appropriate incoming international operator;

1.8 A table of public holidays when general business and financial institutions may be closed;

1.9 It is recommended that a specific address be provided by each Administration to receive routing information and to handle questions regarding internal routing arrangements and inquiries about entries in the routing document.

## *Section 2 – Instructions for preparing and using routing tables*

The routing information considered appropriate for distribution to other Administrations should be set out in a standard form for ease of interpretation and in sufficient detail to enable the controlling operator to set up a connection without recourse to the incoming international operator on more than 5% of the calls.

It is in the interests of Administrations to ensure that adequate and accurate information is available to controlling operators in order that operating costs at both outgoing and incoming exchanges may be kept to the lowest figure commensurate with the cost of production and maintenance of the routing information.

It is recommended that the routing information should be produced in either of the forms shown below, i.e. Table A or Table B.

TABLE A  
(of the routing document)

Name of locality	Routing code to reach subscribers	Routing code to reach operators	Directory
1	2	3	4

### *How to fill in Table A*

#### *Column 1 – Name of locality*

This is the name of the community, e.g. city, town or village, which subscribers generally use to designate where their telephone service is provided.

#### *Column 2 – Routing code to reach subscribers*

The routing code (trunk code) used to reach telephones in the locality.

#### *Column 3 – Routing code to reach operators*

The routing code combined with a standardized operator code (see 1.7 in explanatory notes) which permits reaching an operator performing a specific function for the locality.

#### *Language indicator*

In column 3, insert, using a letter code, the language(s) spoken by the local operators. If the language(s) are spoken by all operators serving the localities listed in column 1, an explanatory note keyed to column 3 would suffice for indicating the common language(s). An explanation of the code should be annexed.

#### *Column 4 – Directory*

Where applicable the reference number or letter which indicates the particular directory volume or section where the telephone numbers for the locality may be found.

TABLE B  
(of the routing document)

Name of locality	Routing code to reach subscribers	Routing code to reach operators for			Directory
		Completing calls and verifying station conditions	Verifying station conditions only	Requests for information	
1	2	3a	3b	3c	4

*How to fill in Table B*

*Columns 1, 2 and 4*

See under Table A.

*Column 3a*

This column should contain the complete code that enables a controlling operator to gain access to an incoming operator who is in a position to extend the connection to the called number and verify the station conditions.

*Column 3b*

This column should contain the complete code that enables a controlling operator to gain access to an operator who can verify the conditions on a called station, e.g. that the number is of a working line, that there is no reply or that the line is engaged.

*Column 3c*

This column should contain the complete code that enables a controlling operator to obtain the subscriber number of a person in the locality in question.

As it is important that the controlling operator should know that she will be able to understand the called operator, an indicator should be used, as described in the paragraph language indicator of Table A. If separate routing codes are necessary to give access to operators speaking specific languages at the incoming exchange, these should be shown with the appropriate indication against each code. A routing code in column 3a should not be repeated in column 3b.

The country where uniform information is available throughout its territory for access to its operators handling:

- a) the completion of inward calls and verifying station conditions,
- b) verification of station conditions only, and
- c) local telephone number information,

ordinarily would use Table A. The method of access to these particular services would be indicated in section 1 above and need not be repeated against the individual items in the routing schedule.

In the case where a country provides differing access points beyond its international exchange for any or all of the three categories, *a)*, *b)* and *c)* mentioned above it would use Table B. The specific routing information to give access to the available point should be shown in sub-columns of column 3, headed respectively 3a, 3b and 3c. Where no facility exists for a particular locality there should be no entry of any kind, thus indicating the need for the controlling operator to call the international incoming operator.

*Section 3 — List of trunk (area) codes in numerical order*

Column 1 — routing code,

Column 2 — with identifying name of section or area reached.

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## SECTION 4

### NUMBERING PLAN AND DIALLING PROCEDURES IN INTERNATIONAL SERVICE

#### Recommendation E.160

#### DEFINITIONS RELATING TO NATIONAL AND INTERNATIONAL NUMBERING PLANS

##### 1. international prefix

The combination of digits to be dialled by a calling subscriber making a call to a subscriber in another country, to obtain access to the automatic outgoing international equipment.

Example:

00 in Switzerland.

*Notes.* — a) In some countries two or more international prefixes may be used:

- to reach different groups of countries;
- to obtain different classes of call (e.g. station call or personal call).

In the first case the use of two or more international prefixes allows the use of different groups of switching equipment and the use of *abbreviated* dialling (i.e. shorter country codes) for the calls to defined group of countries (see Definition No. 2, *country code*).

b) Where several countries are included in one integrated numbering plan, the international prefix is not used on a call from one of these countries to another.

##### 2. country code

The combination of one, two or three digits characterizing the called country.

Examples:

7 USSR;  
54 Argentina;  
591 Bolivia.

*Notes.* — a) In the case where a country uses different international prefixes, abbreviated dialling can be used. In this case, for calls to one country of a defined group of countries, a regional country code, composed of fewer digits than the normal country code, may be used.

Examples:

For traffic between Latin American countries, the following regional country codes might be used:

1 Argentina;  
2 Brazil;  
3 Chile, etc.

b) In the case where several countries are included in one integrated numbering plan, no country code need be dialled for the traffic from one of these countries to another. For access by other countries, these countries:

- may be included under one common country code, or
- may have separate country codes.

always keeping in mind the necessity to avoid exceeding the recommended maximum number of digits in the international number.

### 3. trunk prefix

A digit or combination of digits to be dialled by a calling subscriber, making a call to a subscriber in his own country but outside his own numbering area. It provides access to the automatic outgoing trunk equipment.

Examples:

- 0 in Belgium, Italy, Japan, Netherlands, Switzerland, United Kingdom;
- 1 and 0 in Canada and in the USA;
- 9 in Finland and Spain;
- 16 in France.

*Note.* — In the case where several countries are included in one integrated numbering plan, the trunk prefix is also used for calls from one of these countries to another.

### 4. trunk code

A digit or combination of digits (not including the trunk prefix) characterizing the called numbering area within a country (or group of countries, included in one integrated numbering plan).

The trunk code has to be dialled before the called subscriber's number where the calling and called subscribers are in different numbering areas.

The trunk code varies from one country to another and is composed of:

- a) Either a *regional code* indicating the geographical zone to which the called subscriber belongs and within which subscribers can call one another by their subscriber numbers.

Examples:

*In France:*

- Paris area (Departments of Seine, Yvelines, Seine-et-Marne, Oise, etc): trunk code 1,
- Nice area (Department of Alpes-Maritimes): trunk code 93;

*In Belgium:*

- Bruxelles area: trunk code 2,
- Namur area: trunk code 81;

*In the Federal German Republic and the Netherlands:*

- the geographical area defined above corresponds in general to the local network:
- Düsseldorf local network: trunk code 211,
- Amsterdam local network: trunk code 20;

*In the United Kingdom:*

- this definitions applies to certain networks such as that of London, the trunk code for which is 1;

*In Canada and the USA:*

- the geographical area defined above corresponds to a *Numbering Plan Area* (NPA):
- Montreal area: NPA code 514;
- New York City area: NPA code 212;

- b) Or a *numbering area code* followed by an exchange code when the directory entry of the called subscriber does not include the exchange code;

Example:

*in certain areas of the United Kingdom:*

Truro (group centre): trunk code 872;

Perranporth (in the Truro group): trunk code 872 57.

#### 5. subscriber number <sup>1)</sup>

The number to be dialled or called to reach a subscriber in the same local network or numbering area.

This number is the one usually listed in the directory against the name of the subscriber.

#### 6. national (significant) number

The number to be dialled following the trunk prefix to obtain a subscriber in the same country (or group of countries, included in one integrated numbering plan) but outside the same local network or numbering area.

The national (significant) number consists of the trunk code followed by the subscriber number.

It should be noted that, in some countries, it is customary to consider *for national purposes* that the trunk prefix is included in the national number [which is then not the national (significant) number]. A careful distinction must therefore be made between such national definition or practice and the CCITT definition, which is internationally valid. In order to avoid misunderstanding, the CCITT definition includes the word "significant" between brackets, reading as follows: "national (significant) number".

Examples:

<i>Subscriber</i>	<i>National (significant) number</i>
123 45 67 in Bruxelles	2 123 45 67
12 34 56 in Düsseldorf	211 12 34 56
21 34 56 in Nice	93 21 34 56
870 12 34 in Montreal	514 870 12 34
12 34 in Perranporth	872 57 12 34
248 45 67 in London	1 248 45 67

*Note.* — Where several countries are included in one integrated numbering plan, only the national (significant) number is to be dialled after the trunk prefix on calls from one of these countries to another.

#### 7. international number

The number to be dialled following the international prefix to obtain a subscriber in another country.

The international number consists of the country code of the required country followed by the national (significant) number of the called subscriber.

Examples:

<i>Subscriber</i>	<i>International number</i>
123 45 67 in Bruxelles	32 2 123 45 67
12 34 56 in Düsseldorf	49 211 12 34 56

<sup>1)</sup> Care should be taken not to use the term "local number" instead of "subscriber number".

<i>Subscriber</i>	<i>International number</i>
21 34 56 in Nice	33 93 21 34 56
870 12 34 in Montreal	1 514 870 12 34
12 34 in Perranporth	44 872 57 12 34
248 45 67 in London	44 1 248 45 67

*Note.* — Where several countries are included in one integrated numbering plan, the international number is not used on calls from one of these countries to another. (See the note to Definition No. 6.)

## **Recommendation E.161**

### **NUMBERING AND DIALLING PROCEDURES FOR INTERNATIONAL SERVICE**

#### **1. *National numbering plan***

1.1 Each telephone Administration should give the most careful consideration to the preparation of a *national numbering plan*<sup>2)</sup> for its own network. This plan should be designed so that a subscriber is always called by the same number in the trunk service. It should be applicable to all incoming international calls.

#### **1.2 *Number analysis***

1.2.1 The national numbering plan of a country should be such that an analysis of a minimum number of digits of the national (significant) number (see definitions in Recommendation E.160):

- a) gives the most economical routing of incoming international traffic from various other countries;
- b) indicates the charging area in those countries where there are several.

1.2.2 In the case of a country with a two- or three-digit country code, not more than two digits of the national (significant) number should be analyzed for these purposes.

In the case of a country with a one-digit country code, not more than the three digits of the national (significant) number should be analyzed for these purposes.

1.2.3 In the case where an integrated numbering plan covers a group of countries the digit analysis specified in 1.2.2 should also determine the country of destination.

1.2.4 For the requirements relating to frontier traffic see Recommendation E.290 R.

#### **2. *Limitation of the number of digits to be dialled by subscribers***

##### **2.1 *International number***

The CCITT recommended in 1964 that the number of digits to be dialled by subscribers in the automatic international service should not be more than 12 (excluding the international prefix). It is emphasized that this is the maximum number of digits and Administrations are invited to do their utmost to limit the digits to be dialled to the smallest possible number.

##### **2.2 *National (significant) number***

Noting that:

- a) the international number (excluding the international prefix) consists of the country code followed by the national (significant) number,
- b) the smallest possible number of digits to be dialled in the automatic international service is achieved by limiting the number of digits of the country code and/or of the national (significant) number,

<sup>2)</sup> See the CCITT *Manual on National Telephone Networks for the Automatic Service* for a comprehensive study of national numbering plans from the national point of view.

- c) in some countries where telephony is already developed to an advanced stage, the national numbering plans in force enable the number of digits of the international number to be limited to less than 12,
- d) some other countries which drew up their national numbering plans some time ago have taken steps to ensure that the number of digits of the international number will not exceed 12 and may even be less,

the CCITT recommended in 1964 that countries which had not yet established their national numbering plan ensure that, as far as practicable, the maximum number of digits of the international number be 11, at least for a period corresponding approximately to the life of automatic switching equipment (i.e. a minimum of 25 years).

For these countries, the number of digits of the national (significant) number should be equal to a maximum of  $11 - n$  (at least for the period of consideration),  $n$  being the number of digits of the country code.

### 3. *Digit capacity of international registers*

The CCITT considers it advisable to recommend that the digit capacity of registers dealing with international traffic should allow for future conditions that may arise, but not possible to specify at the present time. In this regard, registers dealing with international traffic should have a digit capacity, or a capacity that can be expanded, to cater for more than the maximum 12-digit international number envisaged at present. The increase in the number of digits above 12 is left as a matter of decision to be taken by individual Administrations.

### 4. *Use of figures and letters in telephone numbers*

4.1 For automatic international service, it is preferable that the national numbering plan should not involve the use of letters (associated with figures). The use of letters in national numbering plans may, however, be necessary for national reasons. For example, countries using letters in their subscriber numbers will naturally use them in their national numbering.

4.2 For automatic international service to countries using letters in telephone numbers, it would be helpful, in a country where letters are not used:

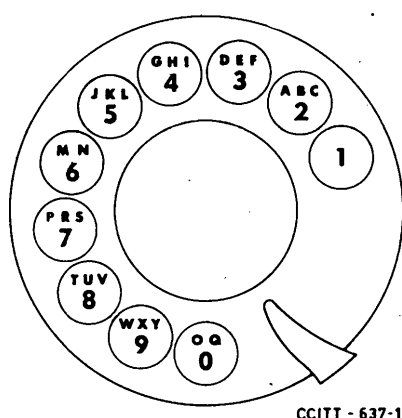
- a) to include in the directory a table for converting into figures the letter codes of exchanges in countries with which an automatic service is available;
- b) to supply, at the time of opening this automatic service, a booklet of instructions containing the conversion table to the main subscribers to the international service.

4.3 It would also be desirable, in countries with letters in the telephone numbers, that subscribers with considerable international traffic should be asked to show on their letterheads, next to their telephone number, the international number with figures only. (See Recommendation E.162.)

### 5. *Rotary dials (see Figure 1/E.161)*

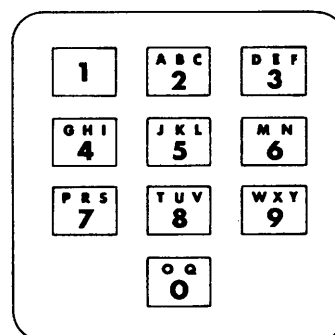
5.1 For countries which have not yet adopted any specific type of dial, the figures on the dial should be arranged in the following order: 1, 2, 3, ..., 0.

5.2 The dial shown in Figure 1/E.161 uses the arrangement of letters and figures employed by some European Administrations. It may be convenient that the dials (or keysets) used by international operators for semi-automatic operating in Europe have this arrangement of letters and figures.



CCITT - 637-1

FIGURE 1/E.161



CCITT - 637-2

FIGURE 2/E.161

*Note.* — On the North American dials and keysets, the digit 0 is not associated with letters O and Q but with the word *operator*, the letter O being associated with digit 6.

## 6. *Push-button telephone sets*

### 6.1 *10-button sets*

#### 6.1.1 *Arrangement and numbering*

The standard arrangement and numbering for push buttons corresponding to the digits 1 to 0 is as shown in the figure below:

1	2	3
4	5	6
7	8	9
0		

This arrangement, which corresponds to that already adopted in many countries — and on which a certain number of Administrations has based their standardization — is one found suitable for telephone users. This recommendation results from thorough studies made by several Administrations on subscriber reactions to various conceivable push-button patterns.

Where a need exists within an Administrations for a  $5 \times 2$  array for use on special telephone apparatus, the array should be as shown in the figure below.

1	2
3	4
5	6
7	8
9	0

*Note.* — User dialling performance on this special array is slightly inferior to that on the standard array given above.

In view of the fact that purely numerical numbering plans are now recommended and that the association of letters to digits is not the same in different countries<sup>3)</sup>, it is undesirable to standardize letter symbols for the push buttons corresponding to each of the digits. In cases where a mixed letter-and-digit dialling system is still in use in a country, the letters associated with the figures in the dialling system of the country concerned may, of course, be included on the corresponding push buttons of their country's telephone sets (see Figure 2/E.161).

### 6.1.2 Symbols

The symbols for these buttons are the digits 1 to 0 as indicated in the figures of 6.1.1 above. These buttons are to be known as button 1, button 2, etc.

## 6.2 12-button sets

### 6.2.1 Arrangement

In the 12-button set the standard arrangement shown in 6.1.1 above is extended by two additional buttons, one of the left and the other to the right of the button 0, thus making a pattern of four horizontal rows of three buttons each forming a  $4 \times 3$  array.

Two buttons may also be added to the  $5 \times 2$  array shown in 6.1.1 above. These should be located below and in line with buttons 9 and 0, thus making a  $6 \times 2$  array.

### 6.2.2 Symbols

On the  $4 \times 3$  array the symbol on the button which is immediately to the left of the button 0 (on the  $6 \times 2$  array, the corresponding button is located below button 9) and which, according to Recommendation Q.23, is used to transmit the frequency pair 941 Hz and 1209 Hz, should have a shape easily identified as the general shape shown in Figure 3/E.161.

The symbol will be known as the *star* as translated in the various languages. In France, the term *asterisk* may also be used for this symbol.



CCITT-4693-1

FIGURE 3/E.161

On the  $4 \times 3$  array the symbol on the button which is immediately to the right of the button 0 (in the  $6 \times 2$  array, the corresponding button is located below the button 0) and which, according to Recommendation Q.23, is used to transmit the frequency pair 941 Hz and 1477 Hz, should conform in shape to the specifications given in Figures 4/E.161 or 5/E.161. This symbol shall consist of four lines of equal length (*b*), forming two pairs of parallel lines. One pair is horizontal while the other is vertical or inclined to the right at an angle  $\alpha$  of  $80^\circ$  as shown in Figure 5/E.161. It will be seen that the two pairs of parallel lines overlap. The ratio  $a/b$ , where  $a$  is the overlap, shall be between 0.08 and 0.18.

<sup>3)</sup> Thus, for example, on the North American dials and keysets the digit 0 is not associated with the letters O and Q, but with the word *operator*, the letter O being associated with the digit 6.

The preferred values are:

- in Europe <sup>4)</sup>:  
 $\alpha = 90^\circ$  with  $a/b = 0.08$
- in North America <sup>4)</sup>:  
 $\alpha = 80^\circ$  with  $a/b$  close to the upper limit of 0.18

The symbol will be known as the *square* or the most commonly used equivalent term in other languages <sup>5)</sup>.

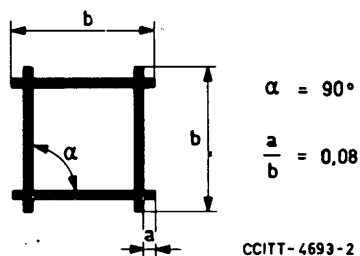


FIGURE 4/E.161

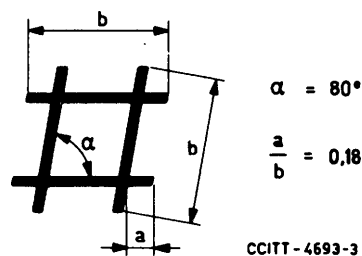


FIGURE 5/E.161

The additional buttons with these symbols will be placed as shown below:

Standard 4 × 3 array

1	2	3
4	5	6
7	8	9
*	0	#

6 × 2 array

1	2
3	4
5	6
7	8
9	0
*	#

### 6.3 16-button sets

#### 6.3.1 Arrangement

In the 16-button set, the 4 × 3 array shown in 6.2.2 above is extended by four additional buttons placed to the right in such a way as to form a 4 × 4 array.

#### 6.3.2 Symbols

On the 4 × 4 array, the symbols on the additional buttons are A, B, C and D <sup>6)</sup>. (The reasons for the choice of these four symbols are explained in Annex 1 to this Recommendation.)

<sup>4)</sup> No information is available at the present time as to which of these values would be preferred in other continents.

<sup>5)</sup> In some countries an alternative term (e.g. "number sign"), may be necessary for this purpose, unless further investigation indicates that "square" is suitable for the customers.

<sup>6)</sup> If letters still appear on buttons 1 to 0 of the push-button set when 16-button sets are introduced, Administrations may choose to use the lower case letters a, b, c, d rather than the upper case letters until such a time as it is possible to remove the alphabetic characters from buttons 1 to 0.



- A is the symbol for the button to the right of button 3 and is used to transmit the frequency pair 697 Hz and 1633 Hz <sup>7)</sup>.
- B is the symbol for the button to the right of button 6 and is used to transmit the frequency pair 770 Hz and 1633 Hz <sup>7)</sup>.
- C is the symbol for the button to the right of button 9 and is used to transmit the frequency pair 852 Hz and 1633 Hz <sup>7)</sup>.
- D is the symbol for the button to the right of button # and is used to transmit the frequency pair 941 Hz and 1633 Hz <sup>7)</sup>.

In order to avoid any possibility of auditory confusion in transmitting these letters over international telephone lines the phonetic equivalents:

Amsterdam	or	Alfred
Baltimore		Benjamin
Casablanca		Charles
Denmark		David

as already used in international telephone working, are recommended for identifying the letters A, B, C, D.

The additional buttons with these symbols will be placed as shown below <sup>8)</sup>:

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

#### 6.4 *Design of symbols*

Symbol size and the line thickness should be appropriate to provide optimal recognition.

#### 6.5 *Use of colours*

The question of standardization of button and symbol colour for international purposes is still under study. In the meantime, colours different from the digit buttons and symbols should not be used <sup>9), 10)</sup>.

### 7. *Additional buttons for use on telephones*

#### 7.1 *General*

For purposes other than dialling, additional buttons may be required on a telephone. For example, a telephone may have a button to recall during an active call, control logic (e.g. a register) or an operator, or to effect the transfer of an active call to another station. To prevent subscriber confusion it may be desirable that the symbols used on those buttons which have identical functions be standardized.

<sup>7)</sup> These are the frequency pairs specified for the right hand column as indicated in Recommendation Q.23.

<sup>8)</sup> Some Administrations may wish to provide spatial separation for special reasons between buttons A, B, C, D and the other twelve buttons.

<sup>9)</sup> Where exceptionally, for national purposes, Administrations use colours for the \* and # symbols which are different from those used for the digit symbols, they should be red and blue respectively.

<sup>10)</sup> Further study may show whether some form of perceptual separation, such as colour or size is required between the buttons A, B, C, D and the other twelve buttons.

## 7.2 *Specific Recommendations*

### 7.2.1 *Register recall button*

For the recall of a register during an active call the following methods are possible:

- a switchhook flash,
- a depression of one of the buttons of the normal 10, 12 or 16 button array,
- a depression of another button specially provided for this purpose, the register recall button.

From the human factors viewpoint the depression of a button for register recall seems to be preferable to the use of a switchhook flash.

If a special register recall button is used, this button should be designated with the symbol R (capital) on or next to the button. The button should be clearly distinguishable and spatially separated from the standard 12 or 16 button array.

This symbol is recommended because:

- a) it symbolizes the term "Recall" in a number of languages;
- b) studies have shown that it is subject to minimal auditory and visual confusion;
- c) it avoids the difficulties inherent in specific technical terms for any lay subscribers.

The exact position, shape and colour of the button should not be standardized at the present time. Such standardization would inhibit design innovation and be unnecessarily restrictive.

## 8. *Prefixes and codes*

### 8.1 *International prefix*<sup>11)</sup>

International standardization of a code for access to the international network for automatic international operation has not been possible since it was in conflict with national numbering plans already in existence. (Standardization of a code for access to the international automatic network would have been useful to international travellers.)

### 8.2 *Country code*<sup>11)</sup>

#### 8.2.1 Country codes will be used:

- in semi-automatic working, to route calls to the required country when the calls are transit calls or when, on the outgoing positions, there is common dialling access to all the outgoing routes;
- in automatic working.

#### 8.2.2 A list of country codes was prepared by the CCITT in 1964 within the framework of a worldwide automatic telephone numbering plan.

This list was set up according to the following principles:

- a) the number of digits of the country code is one, two or three according to the foreseeable telephonic and demographic development of the country concerned;
- b) the nine digits from 1 to 9 have been allocated as the country code or as the first digit of the country code. These digits define *world numbering zones*;
- c) in the case of Europe, owing to the large number of countries requiring two-digit codes, the two digits 3 and 4 have been allocated as the first digit of the country codes.

#### 8.2.3 The list of country codes is given in Annex 2 at the end of this Recommendation.

<sup>11)</sup> See definitions in Recommendation E.160.

### 8.3 *Trunk prefix*<sup>11)</sup>

8.3.1 The *national (significant) number* (see definition 6. of Recommendation E.160 does not include the trunk prefix. Accordingly, in international service, the trunk prefix of the country of destination must not be dialled.

It should be noted that, in some countries, it is customary to consider *for national purposes* that the trunk prefix is included in the national number [which is then not the national (significant) number]. A careful distinction must therefore be made between such national definition or practice and the CCITT definition, which is internationally valid. In order to avoid misunderstanding, the CCITT definition includes the word "significant" between brackets, reading as follows: "national (significant) number".

8.3.2 It is recommended by the CCITT that the Administrations of countries that have not yet adopted a trunk prefix for access to their national automatic trunk network should adopt a prefix composed of a single digit, preferably 0.

The reasons for this recommendation are:

- to provide the maximum degree of standardization of the trunk prefixes used in different countries, so that dialling is made as easy as possible for a person travelling in different countries, and
- to minimize the number of digits to be dialled in the national automatic service.

8.3.3 In the automatic international service, following the international prefix and country code of the called country, the caller should dial the national (significant) number of the called subscriber (i.e. without dialling the trunk prefix).

8.3.4 The use and printing of symbols and separators in national and international telephone numbers is detailed in Recommendation E.162.

## ANNEX 1

(to Recommendation E.161)

### Method used in selecting the symbols for buttons 13 to 16 of 16-push-button keysets

During its Montreal meeting in June-July 1970, Study Group II agreed that a study had to be undertaken forthwith in order to choose suitable symbols for buttons 13 to 16 of the 16-push-button set. The matter was considered urgent because at that time 16-button telephone sets were commercially available and various manufacturers had expressed an interest in their production. Standardization of the symbols was immediately needed to guide manufacturers before a large number of unstandardized sets was produced, that is, using different symbols or symbols that do not satisfy elementary human factor rules.

Push-button sets, it was noted, could be used not only for communications between subscribers but also for other purposes, e.g. for end-to-end data transmission. A large number of possible applications is envisaged. Many telephone and data applications, or functions, are not yet known but are likely to appear in the future when 16-button sets are introduced. These considerations led the CCITT to decide that the symbols for the buttons 13 to 16 should not have any special meaning related to the functions of the buttons.

A variety of symbols was considered during the studies made from 1970 to 1972. However, it appeared that only a set of four letters of the Latin alphabet satisfies most of the requirements mentioned in the Annex to Recommendation E.162, "Desirable properties of diallable symbols". In short, these desirable properties are:

- 1) distinct from other diallable symbols,
- 2) widely known by name,
- 3) reproducible,

- 4) CCITT-ISO compatible,
- 5) made up of a single character,
- 6) abstract,
- 7) immediately recognizable as a diallable character.

A test programme was designed in 1970 to find the most suitable set of four letters. This included a study of auditory and visual confusion between letters and the existing digits and symbols for the buttons 1 to 12. Eight countries participated in the auditory tests and eight in the visual confusion tests. In addition, configuration (layout) tests were performed in seven countries.

The countries participating in the auditory confusion tests were: Australia, Denmark, Finland, Federal Republic of Germany, Japan, Sweden, United Kingdom (Post Office), and United States of America (AT&T).

The countries participating in the visual confusion tests were: Canada, Denmark, Finland, Federal Republic of Germany, Italy, Sweden, United Kingdom (Post Office), and United States of America (AT&T).

The countries participating in the configuration (layout) tests were: Canada, Japan, Federal Republic of Germany (Siemens), Netherlands (PTT/IPO), Sweden, United Kingdom (Post Office), and United States of America (AT&T).

The results of the configuration test showed a small decrement in the dialling performance with a 16-button set as compared to a standard 12-button set which, however, is not statistically significant. In this test, buttons 13 to 16 were labelled A, B, C and D.

The results of the three types of tests were examined together with considerations of other desirable properties of the symbol set, e.g.:

- 1) simplicity for the user,
- 2) a logical sequence,
- 3) ease of recognition in as many countries as possible,
- 4) possibility of extending the set of symbols.

It was then agreed that the A, B, C, D was the most satisfactory from a general point of view.

## ANNEX 2

(to Recommendation E.161/Q.11)

### List of country codes for the international semi-automatic and automatic service <sup>12)</sup>

#### Foreword

The IIIrd, IVth and Vth Plenary Assemblies of the CCITT have approved the international telephone numbering plan on condition that it should mention only the codes of countries within the jurisdiction of the Members of the International Telecommunication Union, and the names of those countries should be as they appear in the International Telecommunication Convention.

In the list hereunder, the countries in each world numbering zone are not arranged in alphabetical order but in the numerical order of their codes, their classification, when they have a three-digit code, being initially made on the basis of the first two digits.

Numbering zone 1 is an integrated numbering area covering the North American continent and the countries in it are listed in geographical order from North to South, beginning with Canada.

<sup>12)</sup> This list originates from the Plan Book of the World Plan Committee which is responsible for keeping it up to date.

**List of country codes incorporating amendments proposed  
by the World Plan Committee, Geneva, 1975**

**World numbering ZONE 1**

(Integrated numbering area)

Canada	British Virgin Islands
St. Pierre and Miquelon	Bermuda
United States of America, including Puerto Rico and the Virgin Islands	Bahamas (Commonwealth of the)
Jamaica	Dominican Republic
Barbados	Grenada
Antigua	Montserrat
Cayman Islands	St. Kitts
	St. Lucia
	St. Vincent

**World numbering ZONE 2**

Egypt (Arab Republic of)	20	Congo (People's Rep. of the)	242
Morocco (Kingdom of)		Zaire (Republic of)	243
Algeria (Algerian Dem. and Pop. Rep)	21 <sup>a</sup>	Angola (People's Rep. of)	244
Tunisia		Guinea-Bissau (Republic of)	245
Libyan Arab Republic		Seychelles	248
Gambia	220	Sudan (Democratic Rep. of the)	249
Senegal (Republic of)	221	Rwanda (Republic of)	250
Mauritania (Islamic Republic of)	222	Ethiopia	251
Mali (Republic of)	223	Somali Democratic Republic	252
Guinea (Republic of)	224	Afars & Issas	253
Ivory Coast (Republic of the)	225	Kenya (Republic of)	254
Upper Volta (Republic of)	226	Tanzania (United Rep. of)	255
Niger (Republic of the)	227	Uganda (Republic of)	256
Togolese Republic	228	Burundi (Republic of)	257
Benin (People's Republic of)	229	Mozambique (People's Rep. of)	258
Mauritius	230	Zanzibar (Tanzania)	259
Liberia (Republic of)	231	Zambia (Republic of)	260
Sierra Leone	232	Madagascar (Democratic Rep. of)	261
Ghana	233	Reunion (French Department of)	262
Nigeria (Fed. Rep. of)	234	Rhodesia	263
Chad (Republic of the)	235	Namibia	264
Central African Empire	236	Malawi	265
Cameroon (United Rep. of)	237	Lesotho (Kingdom of)	266
Cape Verde (Republic of)	238	Botswana (Republic of)	267
Sao Thome and Principe (Dem. Rep. of)	239	Swaziland (Kingdom of)	268
Equatorial Guinea (Republic of)	240	Comoros (State of the)	269
Gabon Republic	241	South Africa (Republic of)	27

*Spare codes 28, 29, 246, 247.*

<sup>a</sup> *Integrated numbering area with subdivisions:*

- Morocco: 210, 211, 212
- Algeria: 213, 214, 215
- Tunisia: 216, 217
- Libya: 218, 219.

**World numbering ZONES 3 and 4**

Greece	30	Denmark	45
Netherlands (Kingdom of the)	31	Sweden	46
Belgium	32	Norway	47
France	33 <sup>a</sup>	Poland (People's Republic of)	48
Monaco	33 <sup>a</sup>	Germany (Federal Rep. of)	49
Spain	34	Gibraltar	350
Hungarian People's Republic	36	Portugal	351
German Democratic Republic	37	Luxembourg	352
Yugoslavia (Socialist Federal Republic of)	38	Ireland	353
Italy	39	Iceland	354
Roumania (Socialist Republic of)	40	Albania (Socialist People's Republic of)	355
Switzerland (Confederation of)	41	Malta (Republic of)	356
Czechoslovak Socialist Republic	42	Cyprus (Republic of)	357
Austria	43	Finland	358
United Kingdom of Great Britain and Northern Ireland	44	Bulgaria (People's Republic of)	359

<sup>a</sup> Integrated numbering plan.

**World numbering ZONE 5**

Belize	501	Chile	56
Guatemala	502	Colombia (Republic of)	57
El Salvador (Republic of)	503	Venezuela (Republic of)	58
Honduras (Republic of)	504	Guadeloupe (French Department of)	590
Nicaragua	505	Bolivia (Republic of)	591
Costa Rica	506	Guyana	592
Panama (Republic of)	507	Ecuador	593
Haiti (Republic of)	509	Guiana (French Department of)	594
Peru	51	Paraguay (Republic of)	595
Mexico	52	Martinique (French Department of)	596
Cuba	53	Surinam (Republic of)	597
Argentine Republic	54	Uruguay (Oriental Republic of)	598
Brazil (Federative Rep. of)	55	Netherlands Antilles	599

*Spare codes 500, 508.*

**World numbering ZONE 6**

Malaysia	60	Papua New Guinea	675
Australia	61	Tonga (Kingdom of)	676
Indonesia (Republic of)	62	Solomon Islands	677
Philippines (Republic of the)	63	New Hebrides	678
New Zealand	64	Fiji	679
Singapore (Republic of)	65	Wallis and Futuna	681
Thailand	66	American Samoa	684
Guam	671	Gilbert and Ellice	686
Portuguese Timor	672	New Caledonia and Dependencies	687
Brunei	673	French Polynesia	689
Nauru (Republic of)	674		

*Spare codes 69, 670, 680, 682, 683, 685, 688.*

**World numbering ZONE 7**

Union of Soviet Socialist Republics 7

**World numbering ZONE 8**

Japan	81	Macao	853
Korea (Republic of)	82	Kmer Republic	855
Viet Nam (Socialist Republic of)	84	Lao People's Democratic Republic	856
Hong-Kong	852	China (Popular Rep. of)	86
		*	87*
		Bangladesh (People's Republic of)	880 <sup>a</sup>

*Spare codes 80, 83, 89, 850, 851, 854, 857, 858, 859.*<sup>a</sup> The remaining combinations of the 88 series will be assigned only when the 3-digit codes of the region have been used up.

\* The country code 87 is reserved for the maritime mobile service.

**World numbering ZONE 9**

Turkey	90	Yemen Arab Republic	967
India (Republic of)	91	Oman (Sultanate of)	968
Pakistan	92	Yemen (People's Dem. Rep. of)	969
Afghanistan (Republic of)	93	United Arab Emirates <sup>a</sup>	971
Sri Lanka (Ceylon) [Republic of]	94	Israel (State of)	972
Burma (Socialist Republic of the Union of)	95	Bahrain (State of)	973
Lebanon	961	Qatar (State of)	974
Jordan (Hashemite Kingdom of)	962	Mongolian People's Republic	976
Syrian Arab Republic	963	Nepal	977
Iraq (Republic of)	964	United Arab Emirates (Dubai)	978
Kuwait (State of)	965	United Arab Emirates (Abu Dhabi)	979
Saudi Arabia (Kingdom of)	966	Iran	98

*Spare codes 99, 960, 970, 975.*<sup>a</sup> E.A.U: Ajman, Fujairah, Ras el Khaimah, Sharjah, Umm al Qiwain.

**Recommendation E.162****THE USE AND PRINTING OF SYMBOLS AND SEPARATORS IN  
NATIONAL AND INTERNATIONAL TELEPHONE NUMBERS****1. General**

The statements below apply specifically to the printing of national and international telephone numbers on letterheads, business cards, bills, etc. Regard has been given of the printing of existing telephone directories. It is desirable that in the future the printing of letterhead, etc., and directories should not cause any unnecessary subscriber confusion <sup>13)</sup>.

1.1 The international number should be printed below the national number, with corresponding digits lined up one under the other to facilitate understanding of the composition of the international number as shown in the example in 1.3 below.

1.2 The words "National" and "International" in the appropriate language should be placed to the left of the national and international numbers, and these should be separated by a horizontal line.

1.3 The word "Telephone" should provisionally be placed to the left of (or above) the national and international numbers (to avoid confusion with other letterhead numbers). Further study is required to suggest an international symbol for the word "Telephone".

<i>Example:</i> Telephone	National	(0607) 123 4567
	International	+ 22 607 123 4567

(Additional examples are shown in 6. below)

**2. Classes of symbols**

2.1 There are four classes of symbols in national or international numbers. No symbol should be used in more than one class, nor should any symbol within a class have more than one meaning.

2.2 These classes are:

- diallable symbols (in French: *symboles de composition du numéro*).
- procedural symbols (in French: *symboles opératoires*).
- information symbols (in French: *symboles d'information*).
- spacing symbols (in French: *symboles d'espacement*).

**3. Diallable symbols**

A *diallable* symbol is a symbol which is to be dialled and appears on a telephone set to designate either a finger hole of a dial or a push button of a keyset <sup>14)</sup>. These symbols can be digits, letters, or other signs. Some desirable properties to be considered when selecting diallable symbols are listed in the Annex to this Recommendation.

**4. Procedural symbols**

A *procedural* symbol is a symbol which tells the subscriber how to dial. Such symbols should not appear in a finger hole or on a push button because they are not to be dialled.

4.1 The *international prefix symbol* should be + (plus) and should precede the country code in the international number. It serves to remind the subscriber to dial the international prefix which differs from country to country and also serves to identify the number following as the international telephone number.

<sup>13)</sup> It is also desirable that the printing of other information on letterheads, etc., such as telex and telegraph numbers and postal codes should not cause subscriber confusion with the telephone number.

<sup>14)</sup> Specific recommendations on the symbol for buttons 11 to 16 of a telephone keyset are contained in Section 6 (revised during the period 1968-1972) of Recommendation E.161.



4.2 The symbol ( ) (parentheses) should be used to indicate that the digits within the ( ) are not always dialled.

The ( ) should enclose:

- the trunk prefix and trunk code in a national number <sup>15)</sup>,
- the trunk code when the trunk prefix is not in universal use within a country.

This is done to remind the user never to dial the enclosed digits for call within the same numbering area, but always to dial them for calls between different numbering areas.

The ( ) should not be used in an international number.

4.3 Further study is required to recommend an international symbol to denote an extension number. Provisionally, it is suggested that an abbreviation of the word, extension, e.g. ext., in the appropriate language be typed or printed after the subscriber number followed by the appropriate digits.

4.4 For a subscriber with multiple numbers reached through automatic search from the main number, only the main number should be printed, without any symbol to denote the existence of the multiple numbers.

4.5 For a subscriber with multiple numbers but who does not have automatic search, the symbol / (oblique stroke, solidus or slant) may be used to separate the alternative numbers.

Example (a) <sup>16)</sup>: (0607) 123 4567 / 123 7272 / 627 1876  
(0607) 123 4567 / 393 9844 / 564 1692

To avoid dialling confusion in example (a), it is especially important that there be a space on either side of the symbol /.

When it is desired to abbreviate the alternative numbers and they are consecutive, only the last digit should be shown for the alternative numbers.

Example (b) <sup>16)</sup>: (0607) 123 4567/8/9

To avoid dialling confusion in example (b), it is especially important that there be *no* space on either side of the symbol /.

The general use of / is to indicate a choice when dialling. It may therefore also be used to indicate a choice of prefix codes as, for example, the choice of dialling personal or station calls.

4.6 In the national and international number no symbol should be used to show that a subscriber number is an in-dialling number of a PBX. Where it is desired to indicate the existence of an in-dialling facility within a PBX and to indicate the in-dialling access code the following format <sup>16)</sup> should be recommended:

(0607) 123 ....  
(0607) 1 23 4...

The number of dots (periods) is equal to the number of digits in the extension number of the PBX. The spacing between numbers and dots should conform with national standards.

On letterheads, subscribers could insert their extension numbers in the dotted spaces. Presentation of the main listed number should conform to 1.3 above.

<sup>15)</sup> It should be noted that certain Administrations, for national purposes, use a hyphen between the trunk code and subscriber number as a substitute for the symbol ( ) parentheses in national numbers.

<sup>16)</sup> For brevity, the examples shown are for national numbers only. The international numbers are produced by adding the symbol + and country code and omitting the ( ) parentheses and trunk prefix (the 0 in the example given).

## 5. *Information symbols*

An information symbol is a symbol associated with the subscriber number describing special features of the subscriber telephone service, e.g. the symbol  $\bigcirc$ , where used, indicates that the subscriber has an answering device attached to his telephone (reference should be made to Recommendation E.117, 1a and 1b).

5.1 Such symbols are not to be dialled and therefore should not appear in a finger hole or on a push button, nor can such symbols be procedural in instructing the subscriber how to dial.

5.2 Information symbols <sup>17)</sup> should be associated with the word "Telephone". To avoid confusion in dialling, they should not appear either as prefixes or suffixes to the telephone number.

Example: Telephone (0607) 123 4567 or Telephone  $\bigcirc$

$\bigcirc$

(0607) 123 4567

## 6. *Spacing symbols*

Spacing symbols are symbols which are used solely to separate parts of a telephone number from each other. They cannot be diallable, procedural or information symbols.

6.1 Grouping of digits in a telephone number <sup>18)</sup> should be accomplished by means of spaces <sup>19)</sup> unless an agreed upon explicit symbol (e.g. parentheses or hyphen) is necessary for procedural purposes.

6.2 The major separation among digits in a telephone number (national or international) should occur between trunk code and subscriber number. This separation should therefore always be wider than any other separation within the number.

<sup>17)</sup> It is recognized that in the future there will be a considerable increase in the number of information symbols and that further studies for their standardization are essential and are being carried out.

<sup>18)</sup> Studies on grouping of digits have not yet been completed and recommended groupings are not therefore available. Some commonly used existing groupings are:

Telephone	National	(06) 5432
	International	+39 6 5432
Telephone	National	(071) 78 901
	International	+41 71 78 901
Telephone	National	(0211) 65 43 21
	International	+49 211 65 43 21

<sup>19)</sup> Administrations using dots or hyphens as separators may require an extended period of time to determine the consequences of discontinuing the use of these in directories.

## ANNEX

(to Recommendation E.162)

**Desirable properties of diallable symbols**

This Annex lists some desirable properties to be considered by the CCITT when this body standardizes new diallable symbols. There are a large number of properties which are desirable for such symbols and those indicated below seem particularly relevant. However, their relative importance has not been evaluated, and it is recognized that it may not always be possible to fulfil all these properties when selecting symbols.

The properties of diallable symbols should be:

1. *Distinct from other diallable symbols*

As used here, "distinct" refers to dissimilarity from other symbols compared with them visually, or aurally. The dissimilarity should be evident in low probability of confusion with other symbols under degraded perceptual conditions.

1.1 The symbols should be visually distinct in their designated form as well as in typewritten, handwritten or printed form, including variations which might occur in each.

1.2 The symbols should be aurally distinct in naming them in at least the official languages of the ITU.

2. *Widely known name*

The name of the symbol should be as widely known as possible and be constant over as wide a range of population as possible.

3. *Reproducible*

The symbol should be easily reproducible in handwritten and typewritten form.

4. *CCITT-ISO compatible*

The symbol should be one which is given as a member of the CCITT Alphabet No. 5 and the ISO (International Organization for Standardization) standard code for information interchange.

5. *Made up of a single character*

The symbol should not be composed of more than one individually valid symbol; nor should more than one key operation on a typewriter, for example, be required to produce it.

6. *Abstract*

The symbol should not already have intrinsic meaning resulting from other specialized usage.

7. *Immediately recognizable as a diallable character*

The symbol should not be one which is used for procedural or information purposes.

**Recommendation E.165****SUBSCRIBER CONTROL PROCEDURES FOR  
SUPPLEMENTARY TELEPHONE SERVICES****1.     *General***

1.1     Many Administrations are planning to introduce supplementary telephone services which are likely to be viable only if controlled by the user (a list of possible supplementary telephone services is given in Supplement No. 10). It is therefore necessary to consider means of providing users with procedures by which such control can be achieved. The purpose of this Recommendation is to prevent an undesirable proliferation, in various countries, of subscriber control procedures for such services. Descriptions are given below of three control procedures schemes now in use or in various stages of evolution. Guidelines are offered to Administrations planning to offer subscriber controlled supplementary services. Reference is made to the Annex for a glossary of terms used in this Recommendation.

1.2     It is recognized that not all aspects of all supplementary services will affect the international telephone service, but a degree of international coordination is considered necessary because:

- a)     the same or similar supplementary services will exist on national and international networks. It is desirable to have similar control procedures for both applications.
- b)     a supplementary service which is only national now may be international in the future. In that case changes in control procedures might be impossible or expensive.
- c)     subscribers who travel or move will be less inconvenienced if control procedures for supplementary services do not change from one country to another.
- d)     compatibility between control procedures for telephone services and simple parallel end-to-end data transmission is highly desirable, because the same telephone instrument is used in both cases.
- e)     standardised control procedures make possible lower equipment and customer instruction costs.

1.3     Access to individual services requires a supplementary service numbering plan with sufficient capacity to meet all reasonable future needs; control of the services requires the ability to define functional requirements to the system.

The introduction of push-button telephones providing signals in addition to the normal decimal range (0-9) offers a means of providing the necessary function signals. Since the 12-button instrument is likely to be used by most subscribers, only two additional non-numerical signals will be available for control purposes. Study therefore has been directed towards involving schemes for control procedures which are acceptable both from the human factor and technical aspects and do not require more than two non-numerical signals.

1.4     The same push-button telephone set that is used in dedicated telephone networks may be used as a subscriber instrument in service integrated networks. It is desirable that in this case the control procedures for a given supplementary telephone service still apply.

Where the normal 12-button telephone set is also used for services other than telephony, e.g. for data, video-telephone, etc. the control procedures used during calls should be compatible with the control procedures used for supplementary telephone services.

**2.     *Schemes for control procedures***

Recognizing that:

- there is as yet no single recommended scheme of subscriber's control procedures for supplementary telephone services;
- the CCITT is still studying such control procedures;

- further proliferation of schemes is undesirable because this would result in subscriber confusion, less efficient use of the telephone network and might make it more difficult to work towards an optimum scheme;

it is recommended that:

- Administrations contemplating the introduction of services which require new control procedures join actively with the ongoing study;
- Administrations wishing to adopt a scheme of subscriber control procedures should apply one of those detailed below to the maximum extent feasible rather than establish a new scheme.

### 3. *Description and analysis of code schemes for supplementary telephone services*

#### 3.1 *General*

3.1.1 Three code schemes for supplementary telephone services, currently in use or under study will be briefly described and analyzed. They are:

- 1) AT&T code scheme (USA);
- 2) CEPT code scheme (Europe);
- 3) NTT code scheme (Japan).

3.1.2 It is intended that Recommendation E.165 should be reviewed when experience of the three code schemes is available. It may then be possible to determine if one of them, or perhaps a fourth which incorporates the best features of all three, is to be preferred.

3.1.3 These schemes are still evolving and are liable to changes in details as study progresses or experience is gained. The information presented is an outline only and presents the position at a point in time, when the Recommendation was adopted. Administrations considering the implementation of supplementary services requiring control procedures should approach the appropriate Administration or authority to seek detailed and up-to-date information.

#### 3.2 *Description of the code schemes*

3.2.1 The information sent by the subscriber to the exchange for the control of a service is made up of a number of basic functional elements, some or all of which may appear explicitly in a particular message. These basic functional elements are (see glossary annexed to this Recommendation):

- 1) mode or type of communication identification,
- 2) access to supplementary services,
- 3) service identification,
- 4) function identification,
- 5) supplementary information,
- 6) block separation,
- 7) end-of-message identification.

3.2.2 The mode or type of communication identification element is unlikely to be used for telephone services and allocation of codes for this purpose within these schemes is tentative. This element is therefore excluded from consideration for the present.

3.2.3 The main differences between the three code schemes are in the methods used to encode the various functional elements and the order in which they must be presented. In all code schemes a separate code is used for the dialling of abbreviated numbers.

3.2.4 For each of the three code schemes, Table 1/E.165 gives the format of the information sent by the subscriber to the exchange:

- i) without supplementary information,
- ii) with one block of supplementary information,
- iii) for the dialling of abbreviated numbers.

In the Table 1/E.165, the digits below each message identify the functional elements as listed in 3.2.1 above.

The symbols used in Table 1/E.165 are as follows:

- N = a digit;
- SI = supplementary information;
- DT = dial tone;
- (...) = not always used. For detailed explanations see 3.2.5 below;
- \* = "star" button of telephone set as defined in Recommendation E.161;
- = "square" button of telephone set as defined in Recommendation E.161.

TABLE 1/E.165

*AT&T*

i)	Information Element No.	NN 3 and 4	(□) 2 and 7			
ii)	Information Element No.	NN 3 and 4	(□) 2 and 7	DT	SI 5	(□) 7
iii)	Abbreviated dialling	N(N)	(□)			

*CEPT*

i)	Information Element No.	* or □ 2 and 4	NN 3	□ 7		
ii)	Information Element No.	* or □ 2 and 4	NN 3	φ 6	SI 5	□ 7
iii)	Abbreviated dialling or or exceptionally	N(N) ** *	□ N(N) N(N)			

*NTT*

i)	Information Element No.	1 or □ 2	NN 3	(DT N) 4	(□) 7	
ii)	Information Element No.	1 or □ 2	NN 3	(DT N) 4	(*) 6	SI 5
iii)	Abbreviated dialling	*	NN			(□) 7

For φ, see 3.2.5 (element 6, CEPT).

3.2.5 In the three code schemes the basic functional elements are realized in the following way:

*Access to supplementary services (element 2)*

- AT&T: message suffix □, that may be replaced by a time-out.
- CEPT: service code prefix \* or □.
- NTT: prefix digit 1 for services available from both dial and push-button telephones, prefix □ for services available from push-button telephones only.

*Service identification (element 3)*

- AT&T: a two-digit service code that is also used to indicate the function: codes 72-79.
- CEPT: two-digit service codes beginning with 2, 3, 4, and 5 are reserved for CEPT allocation. The other service codes are available for national use.
- NTT: two-digit service codes.

*Function identification (element 4)*

- AT&T: the function is expressed in the service code, different functions for the same service use consecutive codes.
- CEPT: service code prefix \*: activation and registration  
service code prefix □: deactivation and erasure.
- NTT: a numerical function code that is only required for certain services. (If a function code is needed the subscriber is informed by means of a dial tone).  
0 = deactivation,  
1 = activation,  
2 = registration.

*Block separation (element 6)*

- AT&T: no block separation required.
- CEPT: no definitive decision has been taken yet concerning the systematic use of a separator following the service code. Successive blocks of supplementary information will be separated by the block separator \*.
- NTT: the block separator \* may be used between the function code and the first block of supplementary information, and between successive blocks of supplementary information for push-button telephones only.

*End-of-message identification (element 7)*

- AT&T: the message suffix □ may be replaced by a time-out.
- CEPT: the message suffix □ is mandatory.
- NTT: the message suffix □ is used for push-button telephones only.

*Abbreviated dialling*

- AT&T: abbreviated numbers: 2-9 and 20-49 available.
- CEPT: N(N)□ abbreviated numbers: 0-9 and 00-99 available; \*\*N(N) abbreviated numbers: 0-9 or 00-99 available; exceptionally \* N(N) abbreviated numbers: 0, 1, 6-9 or 00-99 available.
- NTT: abbreviated numbers: 00-99 available.

**3.3 Features of each of the code schemes**

The features of each of the code schemes compared with one or both of the other two are given below.

**3.3.1 AT&T code scheme**

- 1) Only one non-numerical character is used.
- 2) The \* symbol is available for future use.
- 3) Control procedures from rotary dial and push-button telephones are compatible.
- 4) The messages sent by the subscriber to the exchange are short.
- 5) The service code numbering plan is open-ended. Three- digit (or longer) service codes can be introduced without change of the existing service codes.
- 6) The message suffix is not essential.
- 7) One, two and more digit abbreviated numbers are possible without the need to use different initial digits.

### 3.3.2 *CEPT code scheme*

- 1) When only prefixes are used the telephone numbering plan is not influenced by the code scheme for supplementary services.
- 2) When only prefixes are used exchange logic is simplified.
- 3) When only prefixes are used the use of similar control procedures in PABXs and the public network is facilitated.
- 4) The abbreviated dialling numbering plan is divorced from the service code numbering plan and does not impose restrictions on it.
- 5) The service code remains the same irrespective of the function required.
- 6) Each important function is defined by a unique prefix.
- 7) Other prefixes are available for new service functions.
- 8) A mandatory suffix avoids the need for time-out, fixed message length or complex programming.
- 9) When the suffix method for abbreviated dialling is used, one, two and more digit abbreviated numbers are possible without the need to use different initial digits.

### 3.3.3 *NTT code scheme*

- 1) The use of a prefix simplifies exchange logic.
- 2) The use of a prefix facilitates the use of similar control procedures in PABXs and the public network.
- 3) Other prefixes are available for future use.
- 4) A measure of compatibility between the control procedures from rotary dial and push-button telephones is possible.
- 5) The abbreviated dialling numbering plan is divorced from the service code numbering plan and does not impose restrictions on it.
- 6) The service code remains the same irrespective of the function required.
- 7) Each important function is defined by a unique function code.
- 8) Ten function codes are available.
- 9) Allocating a function code after a service code makes it possible to separate basic switching functions from supplementary service processing functions. This facilitates the application of new services to an existing old-type exchange.
- 10) The control procedures are similar to the control procedures in the NTT end-to-end communication services.
- 11) The function code can be deleted if not required.

## ANNEX

(to Recommendation E.165)

### Glossary of terms

This glossary gives the meanings currently allocated to various terms to facilitate the study and evaluation of control procedures. They are subject to review as the code schemes evolve.

#### 1. **supplementary telephone service**

Any service provided by the telephone network in addition to fundamental telephone service.



2. **control procedure**

A method in which information is exchanged in a pre-determined forward order and backward order between subscriber and exchange to effect control of a service.

3. **command**

A single specific manipulation at the subscriber set causing transmission of a signal which specifically indicates the manipulation to the exchange. For certain control procedures either one single command or a succession of commands are required.

4. **character**

A single specific symbol, number or letter used to designate the diallable signal caused by a command.

5. **message**

A defined entity of information from the subscriber to the exchange pertaining to a call or a control operation for a service sent in one sequence over the signalling medium. A message may consist of one or more characters transmitted in one or more blocks.

6. **code**

One character or a sequence of characters forming a part or a whole of a message with a specific meaning.

7. **mode or type of communication identification**

Information used to give an instruction to the switching equipment to select the required network or mode of communication, for example in the use of a multifunction terminal (video-telephone, 48 kbit/s wideband switched-network service, etc.).

8. **access to supplementary services**

Information used to give instruction to the switching equipment that the associated information relates to a supplementary service.

9. **service identification**

Information designating a supplementary service.

10. **function identification**

Information indicating the type or types of process to be applied to the service.

11. **block separation**

Information indicating that the next character is the first character of a block of supplementary information.

12. **end-of-message identification**

Information indicating the end of the message.

**13. supplementary information**

Any information, except the mode or type of communication identification, access to supplementary services, service identification, function identification, block separation and end of message identification, which is required to be sent by the subscriber to the exchange for the performance of a control operation. The supplementary information may consist of one or more more blocks.

**14. service code**

A numerical code designating a supplementary service.

**15. service code prefix**

A non-numerical code preceding the service code and indicating the type or types of process to be applied to the service.

**16. function code**

A code indicating the type or types of process to be applied to the service.

**17. block separator**

The character indicating that the next character is the first of a block of supplementary information.

**18. message suffix**

The character indicating the end of the message.

**19. abbreviated number**

The numerical code sent by a caller using the Abbreviated Dialling Service which identifies the telephone number of the party to whom he wished to be connected.

**20. abbreviated dialling prefix**

The non-numerical code indicating that the information following is an abbreviated number.

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## SECTION 5

### ROUTING PLAN FOR INTERNATIONAL SERVICE

#### Recommendation E.170

#### OVERFLOW – ALTERNATIVE ROUTING – REROUTING – AUTOMATIC REPEAT ATTEMPT

1. When a call cannot find a free circuit in one group of circuits (first choice), technical arrangements can be made to route the call automatically via another group of circuits (second choice), at the same exchange; this process is called *overflow*. There may also be overflow, at the same exchange, from a second choice group of circuits to a third choice group of circuits, etc.
2. When the group of circuits over which the overflow traffic is routed involves at least one exchange not involved in the previous choice route, the process is called *alternative routing*.
3. It should be noted that overflow can occur without alternative routing for cases such as, when there are in one relation two groups of circuits, one group reserved for one-way operation and the other group used for both-way operation. In this case, when all one-way circuits are busy, the call can overflow to the both-way circuit group.
4. When congestion occurs at a transit exchange, arrangements can be made in some signalling systems, at the outgoing international exchange on receipt of a busy-flash signal or a congestion signal sent by the transit exchange, to reroute the call automatically from the outgoing international exchange over another route. This process is called *rerouting*. (The use of rerouting is not envisaged in the International Routing Plan.)

It should be noted that rerouting serves no purpose when congestion conditions exist at the incoming exchange. In the same way, a call must not overflow from a direct route used exclusively for terminal traffic to an alternative transit route if the busy-flash signal or a congestion signal has been received on the direct route.

5. When a difficulty is encountered in the setting up of a connection – such as double seizure on both-way circuits or error detection – arrangements can be provided to make another attempt to set up the connection for that call from the point where the first attempt took place. This process is called *automatic repeat attempt*.

An automatic repeat attempt may take place

- on the same circuit, or
- on another circuit of the same group of circuits, or
- on a circuit in another group of circuits.

**Recommendation E.171****THE INTERNATIONAL ROUTING PLAN****1. *Introduction*****1.1 The following contains definitions and recommendations for the International Routing Plan.**

In 2. : Structure of the International Routing Plan;

In 3. : Basic rules for routing;

In 4. : Effects of satellite communications;

In 5. : Additional rules for routing.

1.2 The International Routing Plan described in this Recommendation has been revised within the limits of the knowledge available at the time of revision in 1967 and particularly with a view to application during the ensuing five years. It is recognized that future revision will be necessary when further information becomes available concerning demand assignment satellite systems and future methods of routing control including network management.

1.3 The Plan concerns automatic and semi-automatic telephone traffic. An objective in developing the automatic and semi-automatic service is to enable a satisfactory connection between any two stations in the world. The Plan is necessary to allow the objective to be achieved with maximum economy by the most efficient use of costly circuits and switching centres while safeguarding the grade of service and the quality of transmission.

1.4 The Plan should be able to evolve as a function of traffic streams, the establishment of new routes and new international centres. The application of the Plan should be considered well in advance of any change to semi-automatic or automatic operation. However, caution should be exercised against premature decisions on transit points, etc., before the full routing possibilities have been evaluated.

1.5 The International Routing Plan has been established independently of the numbering plan, the rules for charging the calling subscriber, and the rules for the apportionment of charges (international accounting).

**2. *Structure of the International Routing Plan*****2.1 *Switching of international calls***

International calls originated in a national telephone network will be switched to the worldwide telephone network through a transit centre (called hereafter CT) which can interconnect national circuits and international circuits. This CT acts as international originating centre.

A similar transit centre (called hereafter CT) serves the incoming international calls to be switched to the national network. That CT centre acts as international destination centre.

Between an international originating centre and an international destination centre, a number of international transit centres which can interconnect international circuits may, if necessary, be used to switch the calls through the worldwide telephone network (see Annex 1 for some brief explanatory notes on the International Routing Plan).

**2.2 *Transit centres***

There are three categories of transit centres, called CT1, CT2 and CT3.

According to the theoretical final route structure of the network described below, each CT1 and each CT2 interconnects international circuits, thus acting as an international transit centre.

A CT3 normally acts as a transit centre interconnecting only a national network (or part of it) and international circuits. However, there are cases where a CT3, permanently or temporarily, may act as a transit centre of another category for specified routes.

### 2.3 Theoretical final route structure (backbone structure) of the network

The international telephone network has a theoretical final route structure (backbone structure) as illustrated in Figure 1/E.171.

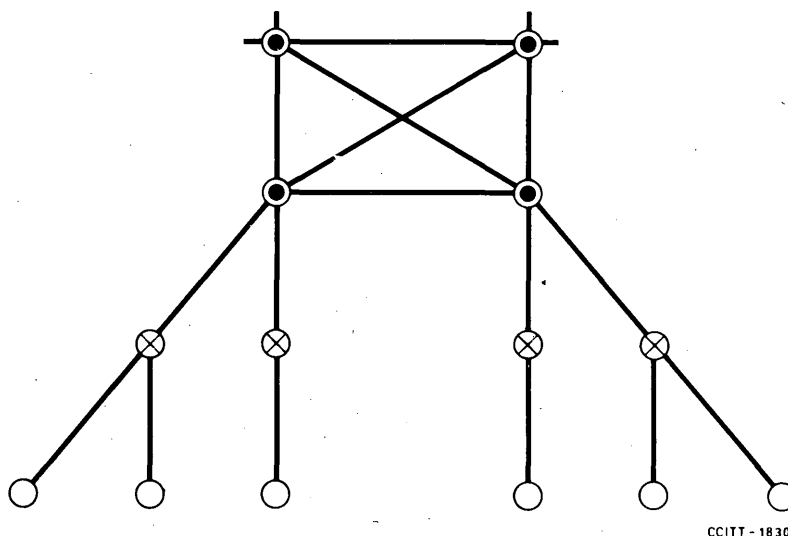


FIGURE 1/E.171 – Theoretical final route structure (backbone structure) of the international telephone network

#### 2.3.1 A first category transit centre, CT1, may serve a continent or part of it.

Each CT1 is connected by low loss probability circuit groups to all CT2s in its zone and to all other CT1s.

#### 2.3.2 A second category transit centre, CT2, serves a part of the zone of the parent CT1. In a very large country the zone of CT2 may be restricted to its own country or even to a part of it.

Each CT2 is connected by low loss probability circuit groups to all CT3s in its zone and to its homing CT1.

#### 2.3.3 A third category transit centre, CT3, serves a part of the zone of the parent CT2. As a general rule, the zone of a CT3 is restricted to its own country or even to a part of it.

Each CT3 is connected by a low loss probability circuit group to its homing CT2.

#### 2.3.4 The route followed by an international call from any CT of an originating chain (CT3-CT2-CT1) to any CT of a terminating chain (CT1-CT2-CT3) only via the low loss probability circuit groups of the backbone structure is called the *theoretical final route*. The theoretical final route has no overflow possibilities.

### 2.4 Actual structure of the network

The actual network structure will be vastly expanded by the use of direct circuit groups and will not be restricted to its backbone structure. Many CTs will be directly interconnected to fulfil the aims of the International Routing Plan as well as possible.

#### 2.4.1 *International direct circuit groups* may be established between any two CTs of any category in order to effect routing economy and other service benefits. Such direct circuit groups will by-pass the theoretical final route or part of it. These circuit groups may be dimensioned with a low loss probability (without overflow facilities) or they may be set up as high-usage groups (with overflow facilities).

2.4.2 The route followed by an international call from any CT of an originating chain to any CT of a terminating chain only via circuit groups without overflow facilities is called the *actual final route*. An actual final route may coincide with the theoretical final route or parts of it.

2.4.3 In cases where a significant economy may be made and provided that transmission and other quality of service standards are maintained, two CTs may be interconnected through an intermediate transit centre of unspecified order (hereinafter called CTX). The CTX then acts as a CT1 for this traffic and must be connected to the other two CTs by low loss probability circuit groups, provided for actual final route grade of service.

2.4.4 The traffic between two countries can be routed either by international direct circuits (as already mentioned in 2.4.1 above) or through international transit centres.

To obtain a good loading of the long and costly circuits a substantial fraction of the international traffic may be allowed to overflow from a direct circuit group, called high-usage group, directly or lastly to an actual final route which must be dimensioned to handle this traffic.

An example of the actual structure of the worldwide telephone network, including its backbone structure, is given in Figure 2/E.171.

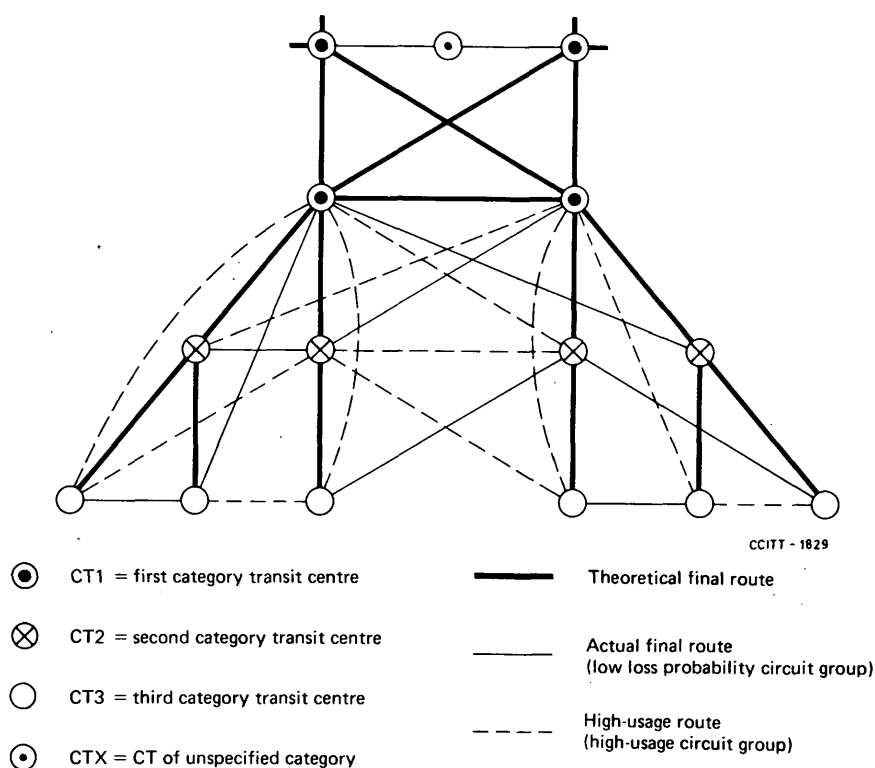


FIGURE 2/E.171 – Example of actual structure of the international telephone network

### 3. Basic rules for routing

#### 3.1 Number of circuits in tandem

For reasons of transmission quality and the efficient operation of signalling, it is desirable to limit as much as possible the number of circuits connected in tandem.

The apportionment between national and international circuits in such a chain may vary.

The maximum number of circuits to be used for an international call is 12 with up to a maximum of six of the circuits being international.

In exceptional cases and for a low number of calls, the total number of circuits may be 14, but even in this case the maximum number of international circuits is six.

## 3.2 *Routing principles*

The rules to be followed for routing traffic between two countries which are connected by a high-usage group which cannot act as a part of an actual final route will be specified below.

3.2.1 The division of the worldwide telephone network into zones of various classes applies directly to the theoretical final route and it is a guide for all traffic routing.

3.2.2 The routing of all outgoing traffic from a CT, whether originating or in transit, is determined by the Administration having that CT. It is assumed that the transit Administration having that CT will have reached prior agreement with the terminal Administrations whose traffic is to be handled in transit, in regard to the general conditions for routing this traffic.

The routing of outgoing traffic may be altered according to the time of day or period of the year; when the routing conditions on leaving a transit CT are changed by the Administration to which the CT belongs it is essential for the Administrations using the CT as a transit point for their traffic to be informed of the changes.

3.2.3 From a CT, the various circuit groups for routing a call are used in the following order:

- a) high-usage direct route, if it exists;
- b) high-usage transverse routes which by-pass a part of the actual final route. The order of selection of the routes begins with those that end up at the transit centres nearest to the international destination centre (*far-to-near sequence*);
- c) as a last choice, an actual final route which can be the theoretical final route. The arrangement of the theoretical final route (CT3-CT2-CT1) – (CT1-CT2-CT3) illustrates the need for 5 international circuits connected in tandem. In the cases mentioned in 2.4.3 above there may be the need for connecting in tandem the maximum number of six international circuits quoted in 3.1 above.

3.2.4 The following rules apply to the use of high-usage circuit groups:

- a) As a general rule, a high-usage group is used for traffic to the zone of the CT where this route ends (this includes zones served by CTs of subordinate category in the parent chain);
- b) Nevertheless, the same route can be used as a transverse route for traffic to another zone on condition that the route between the second and the third CT is of low loss probability;
- c) In the case of a direct route between a CT3 and its CT1, this route can be used as a transverse route to reach any centre connected to this CT1, even if the group of circuits connecting the CT1 to that centre is not established with a low loss probability.

## 4. *Effects of satellite communications*

### 4.1 *Use of geostationary satellites*

The introduction of geostationary satellite circuits on a fixed or time-preassigned basis into the International Routing Plan does not call for any alteration in the basic principles of that Plan. However, the transmission delay associated with such circuits, taken in conjunction with the acceptable limits specified in Recommendation Q.41<sup>1)</sup> indicates a need for certain precautions:

- a) to guard against the inclusion of two or more satellite links in a connection where this can be avoided, and
- b) to ensure that the total transmission delay is minimized within the provisions of Recommendation Q.41.

These precautions are enumerated in 4.2 and 4.3 respectively.

<sup>1)</sup> If circuits are provided using a satellite channel in one direction of transmission and a terrestrial channel in the other, the mean one-way transmission delay will be less.

#### 4.2 *Avoidance of the inclusion of two or more satellite links in an international connection*

Arrangements should be made to prevent the inclusion of two or more satellite links in an international connection. In very exceptional circumstances such a connection may be used, for example where no other reliable means of communication is available or where the connection is required for special purposes.

4.2.1 Where two or more satellite circuit groups are terminated at the same transit centre of whatever category, arrangements should be made to ensure that a connection of two satellite circuits in tandem should not be used except under the most exceptional circumstances.

4.2.2 The exclusive use of satellite circuits in a group used for transit traffic that may be expected to utilize another satellite link elsewhere in the connection should be avoided whenever possible. This applies particularly to a circuit group forming part of an actual final route.

#### 4.3 *Minimizing transmission delay*

4.3.1 In so far as possible, final routes should use terrestrial circuits.

4.3.2 When a circuit group has both terrestrial and satellite circuits, the choice of circuit for use as part of a connection should be governed by:

- a) the guidance given in the provisions of Recommendation Q.41, and
- b) the possible need to use a satellite circuit in another part of the connection.

4.3.3 Where two or more routings are possible, each involving a satellite circuit and one or more terrestrial circuits, that one is to be preferred that has the shortest total transmission delay.

#### 4.4 *Use of demand assignment*

4.4.1 A demand assigned circuit (e.g. SPADE, see Annex 2 for a detailed description) includes three signalling links <sup>2)</sup>. These are:

- a) from the outgoing CT to the earth station;
- b) between earth stations;
- c) from an earth station to an incoming CT.

Information relating to the use of standardized CCITT signalling systems for the cases of a) or c) is given in Recommendation Q.7.

4.4.2 To route via a demand assignment system, the outgoing CT is governed in its operation by its ability to utilize congestion information.

- 1) When congestion information from the demand assignment system can be utilized by the outgoing CT, then normal routing rules apply.
- 2) When congestion information cannot be utilized, the outgoing CT can route calls only as programmed. When calls are routed into the demand assignment system in this manner, two possibilities are recommended:
  - a) dimension all access and satellite links in the demand assignment system on the final probability basis, and/or
  - b) arrange for alternative routing and/or international rerouting within the demand assignment system in accordance with arrangements agreed upon by the Administrations involved <sup>3)</sup>.

<sup>2)</sup> According to the provisional agreement of CCITT for transmission planning purposes the whole speech path between two CTs via the two access links and the satellite link is considered equivalent to a single circuit. A change in this provisional agreement may influence the provisions of 4.4 of this Recommendation.

<sup>3)</sup> See Supplement No. 8 (figure and text) in Volume VI of the Green Book for a detailed description of these arrangements for alternate routing and internal rerouting.



## 5. *Additional rules for routing*

### 5.1 *Introductory notes*

In 5.2 below supplementary routings are described which are admissible in the International Routing Plan and which may be introduced as particular arrangements agreed upon by the Administrations concerned. They do not require the provision of any special facilities.

It is emphasized that such routings will apply only in those special cases where significant economic and/or service advantages are to be achieved and will be continued no longer than these benefits remain.

The Administrations concerned should carefully note that special considerations have to be borne in mind, including:

- a) procedures for obtaining and employing traffic data and costs associated with supplementary routings may introduce traffic engineering and administration complexities. Great care must be exercised to prevent multiple supplementary routings from disrupting the engineering and circuit provision of the worldwide telephone network;
- b) many routing procedures which are admissible in a single traffic flow direction are not reciprocal and may therefore introduce different transit payments in the two traffic flow directions;
- c) in some cases the transit facilities may need to be introduced or augmented. This applies in particular when a CT3 has to provide international transit facilities in certain specific relations;
- d) the provision of high-usage circuits by-passing portions of the final route is desirable for very long connections in order to reduce the number of switched circuits in tandem. As a consequence the quality of service will be improved;
- e) the use of supplementary routes without overflow facilities may result in a reduced grade of service because of the reduced ability to absorb overload.

### 5.2 *Supplementary routing principles*

5.2.1 The design of supplementary routings should ensure that the route selected or its alternatives will never involve a greater number of circuits in tandem than would be involved by the theoretical final route for the call. Exceptions are allowed for supplementary routings between CT1s (see 5.2.7 below).

5.2.2 Supplementary routings should not be combined in tandem to form further supplementary routes.

5.2.3 Special consideration must be exercised to ensure that two satellite circuits will not be inadvertently employed in the same connection (see 4.2 above for complete details).

5.2.4 Calls may leave the originating chain (CT3-CT2-CT1) at any centre but only one link in the chain may be traversed in the direction of decreasing category. In this case the outgoing route beyond the mentioned one link must be a low loss probability route without overflow facilities. Figures 3 a)/E.171 and 3 b)/E.171 show such routing from CT A to CT B.

5.2.5 Calls may enter a terminating chain (CT1-CT2-CT3) at any centre but may traverse only one link in the direction of increasing category. Such routings are shown in Figures 3 c)/E.171 and 3 d)/E.171 from CT A to CT B.

5.2.6 Calls may be routed over direct or transverse circuits via a transit centre of unspecified category in an intermediate chain, but if this CT is not of higher category than the exit centre of the originating chain, then the terminating chain must be entered by a low loss probability route without overflow facilities. Calls cannot be routed in this way if they have traversed in the direction of decreasing category a link in the originating chain. Figure 3 e)/E.171 gives an example of this type of supplementary routing.

5.2.7 In some cases large time differences in circuit group busy hours may be exploited by permitting additional switching of circuits in tandem at no more than two intermediate CTXs to interconnect two CT1s. Care must be exercised to provide for a sufficient number of circuits to accommodate the total traffic for each interval of the entire day. Figure 3 f)/E.171 illustrates this rule, which applies to both traffic flow directions.

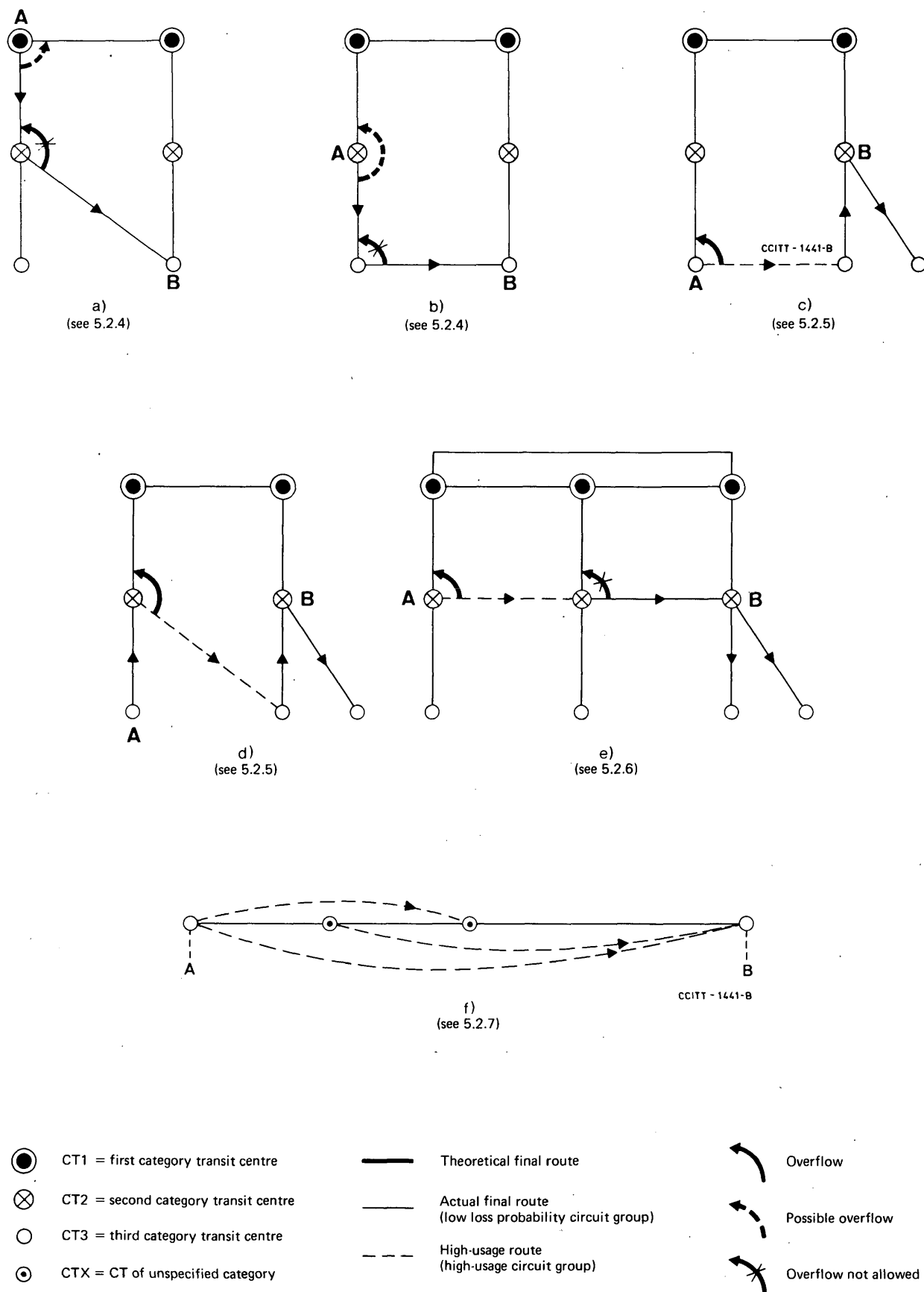


FIGURE 3/E.171 – Examples of supplementary routings

## ANNEX 1

(to Recommendation E.171)

**Explanatory notes on the Routing Plan**

The following explanatory notes on the Routing Plan are provided as a basis for general familiarity with the Plan for conditions which do not require a detailed knowledge of the complete Recommendation E.171.

1. The designation of CTs, as CT1, CT2 or CT3, indicates the magnitude of functional requirements, and the routing arrangements for orderly procedures and economic network operation. It does not imply seniority of status of CTs.

2. Each CT, whether a CT1, CT2 or CT3, interconnects the national network (or part of it) and international circuits. Each CT thus performs a CT3 function.

3. While a CT1 may function as a CT3, in addition, a CT1 also routes the relevant concentrated traffic to and from the CT2s directly connected to that CT1. Similarly, while a CT2 may function as a CT3, in addition a CT2 also routes the relevant concentrated traffic to and from the CT3s directly connected to that CT2. These requirements arise in order to carry out the transit switching of international circuits according to the theoretical final routing structure of the Plan.

4. A centre is designated by the most involved function it performs.

A CT1 is more costly than a CT2 or a CT3 because of the equipment to interconnect directly with all other CT1s by means of expensive low-loss probability circuit groups and thus because of the greater number of circuits required for the transit switching of traffic. This has the consequences of greater:

- maintenance requirements,
- number of signalling equipments,
- interworking problems (e.g. between different signalling systems),
- accounting problems.

A CT2 is more costly because of the relatively greater number of circuits required. The consequences stated above for a CT1 also arise in a CT2 to a relative degree.

5. The size of each centre is determined by the volume of international traffic and by the number of circuits between that country and others.

As much traffic as economically possible is routed over direct circuits to destination countries, such direct circuits may be:

- high usage, which necessitates overflow to the low-loss probability network; or
- low-loss probability, in which case overflow does not apply.

As an alternative to direct circuits, traffic which can be more economically combined at an intermediate transit exchange is directed along the low-loss probability final route. Overflow from the final route does not apply.

6. The Routing Plan takes account of the need for it to develop independently of the Numbering Plan and the rules for charging and accounting. This independence promotes freedom for evolution of all such associated plans by reducing the complexity of necessary coordination. Nevertheless, it should be recognized that some mutual interactions exist among these plans and rules and this should be kept in mind.

## ANNEX 2

(to Recommendation E.171)

**Single channel per carrier PCM multiple access demand assignment equipment (SPADE) system**

The SPADE system is a single channel per carrier system employing PCM 4-phase PSK modulation which has been developed for operation on the INTELSAT satellite communications system.

A chosen satellite RF band of 36 MHz is divided to form a *pool* of individual frequencies on the basis of assigning a single voice channel to each RF carrier.

The system is fully variable allowing any pair of channels to be selected on demand by any of a maximum of 49 stations in the network to form circuits in a demand assignment pool of approximately 400 circuits. Each station terminal uses a demand assignment signalling and switching unit (DASS) for the assignment of channels based on continually updated channel allocation status data provided via a common signalling channel (CSC). Consequently, the system does not require to be controlled by a central station.

In addition the DASS performs the necessary interface functions between the SPADE signalling system and the particular international signalling systems used by the countries concerned.

The signalling aspects of the SPADE system have been designed in accord with Recommendation Q.48.

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## SECTION 6

### TONES FOR NATIONAL SIGNALLING SYSTEMS

#### Recommendation E.180

#### CHARACTERISTICS OF THE RINGING TONE, THE BUSY TONE, THE CONGESTION TONE, THE SPECIAL INFORMATION TONE AND THE WARNING TONE<sup>1)</sup>

##### 1. *General*

Administrations are reminded of the advantages of standardizing as far as possible supervisory tones, so that subscribers and operators may quickly recognize any tone transmitted, of whatever origin<sup>2)</sup>.

In considering the degree of possible standardization, the CCITT in 1960 took account of the nature of the various tones already used in Europe, and set limits for cadence, frequency and level so that in the CCITT view no confusion will be caused when subscribers hear these tones. It was also considered that Administrations introducing new tones would find it helpful to know the preferred limits of cadence, frequency and level.

Limits for tone cadences and frequencies are set forth below, all working tolerances being included in the limits.

Besides the limits applying to specifications of new equipment for new exchanges, limits have been laid down for application to existing exchanges.

These latter limits are herein called *accepted* limits, while those for new equipment are called *recommended* limits.

##### 2. *Power levels for tones*

2.1 For international purposes, the levels of the ringing tone, the busy tone, the congestion tone and the special information tone have to be defined at a zero relative level point at the incoming (in the traffic direction) end of the international circuit.

The level of tones so defined must have a nominal value of  $-10$  dBm0. The recommended limits should be not more than  $-5$  dBm0 nor less than  $-15$  dBm0 measured with continuous tone.

For the special information tone, a difference in level of 3 dB is tolerable between any two of the three frequencies which make up the tone.

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<sup>1)</sup> See also Supplement No. 4 to the present Volume for particular values of tone cadences and frequencies in actual use.

<sup>2)</sup> Recommendation E.181 specifies the information which could be given to subscribers to facilitate recognition of foreign ringing and busy tones.

2.2 The level of the warning tone described under 6. below has to be defined at a zero relative level point at the incoming or at the outgoing end of the international circuit.

This level should not be higher than  $-5$  dBm0 measured with continuous tone.

### 3. Ringing tone

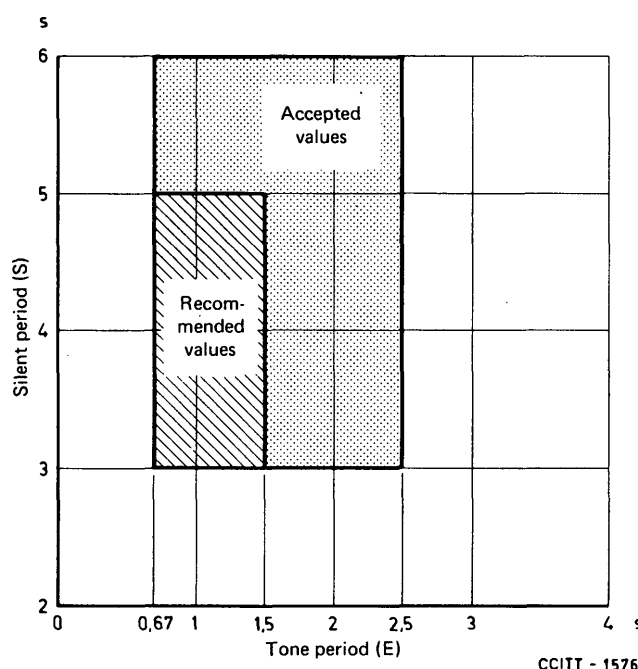
3.1 Ringing tone is a slow period tone, in which the tone period is shorter than the silent period.

The *recommended* limits for the tone period (including tolerances) are from 0.67 to 1.5 second. For existing exchanges, the *accepted* upper limit for the tone period is 2.5 seconds.

The *recommended* limits for the silent period separating two tone periods are 3 to 5 seconds. For existing exchanges, the *accepted* upper limit is 6 seconds.

The first tone period should start as soon as possible after the called subscriber's line has been found.

Figure 1/E.180 shows the recommended and accepted limits for the ringing tone periods.



Frequency:

- recommended interval: 400-450 Hz
- accepted interval: 340-500 Hz

FIGURE 1/E.180 – Ringing tone

3.2 The *recommended* frequency for the ringing tone should be between 400 and 450 Hz<sup>3)</sup>. The *accepted* frequency should not be less than 340 Hz, nor more than 500 Hz. Frequencies between 450 and 500 Hz in the accepted frequency range should, however, be avoided.

The ringing tone frequency may be modulated by a frequency between 16 and 100 Hz, but such modulation is not recommended for new equipment. If the accepted frequency is more than 475 Hz, no modulation by a lower frequency is allowed.

<sup>3)</sup> For the frequencies used in the North American network, see Supplements Nos. 4 and 5 to the present Volume.

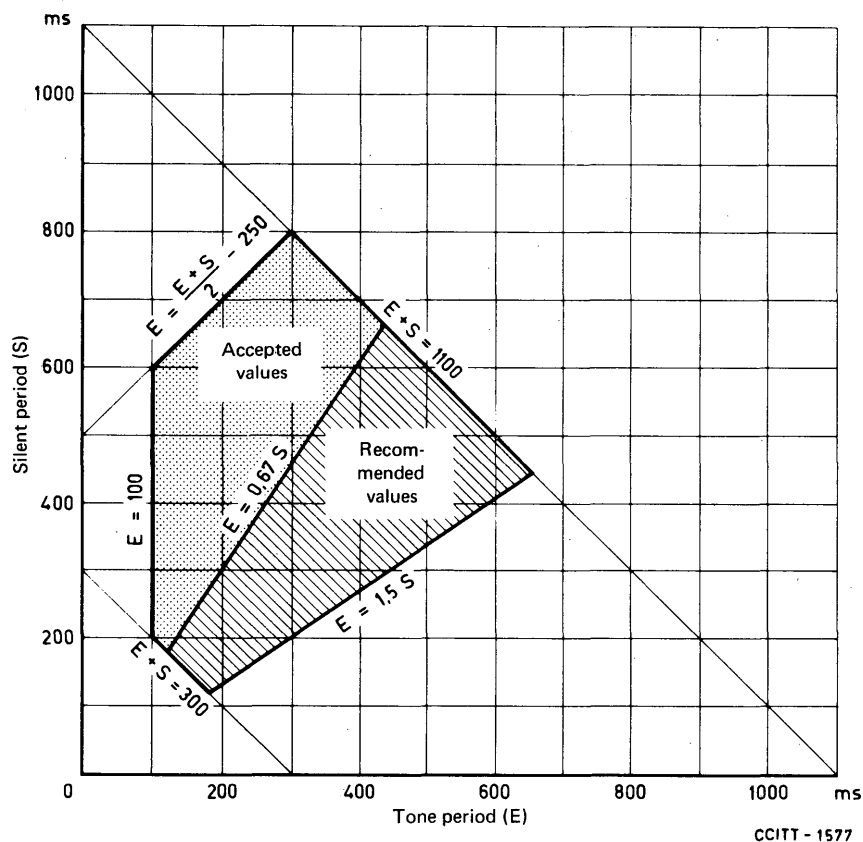
#### 4. Busy tone and congestion tone

4.1 The (subscriber) busy tone and the (equipment or circuit group) congestion tone are *quick* period tones in which the tone period is theoretically equal to the silent period. The total duration of a complete cycle (tone period  $E$  + silent period  $S$ ) should be between 300 and 1100 milliseconds.

The ratio  $E/S$  of the tone period to the silent period should be between 0.67 and 1.5 (*recommended* values).

For existing exchanges, or for tones to be used in a special way, it is *accepted* that the tone period may be 250 milliseconds shorter than the theoretical value  $E + S/2$  (which gives  $E = E + S/2 - 250$ , that is to say,  $E = S - 500$  milliseconds). In no circumstances should the tone period be shorter than 100 milliseconds.

Figure 2/E.180 shows the recommended and the accepted areas for the busy tone and the congestion tone periods.



Frequency :

- recommended interval: 400-450 Hz
- accepted interval: 340-500 Hz

FIGURE 2/E.180 – (Subscriber) busy tone and (equipment or circuit group) congestion tone

4.2 The (subscriber) busy tone condition and the (equipment or circuit group) congestion condition may be indicated by one and the same audible tone, as is often the case in existing national networks.

For newer developments an Administration may wish to adopt a distinction in the tones denoting these conditions; for international uniformity it is recommended that in these circumstances:

- a) the same *frequency* should be used for the busy tone and for the congestion tone,
- b) the busy tone should have a slower *cadence* than the congestion tone but both cadences should be within the limits mentioned under 4.1 above.

4.3 The *recommended* frequency for the busy tone and for the congestion tone must be between 400 and 450 Hz <sup>3)</sup>. The *accepted* frequency must not be less than 340 nor more than 500 Hz. Frequencies between 450 and 500 Hz in the accepted frequency range should, however, be avoided.

## 5. *Special information tone*

5.1 The special information tone is a *standardized international tone* universally comprehensible and designed to invite the calling subscriber, in international automatic working, to get in touch with an operator in his country when he cannot understand a message orally received.

The special information tone is provided for special cases, that is to say, all cases in which neither the busy nor the ringing tone can give the required information to the calling subscriber. There are three instances in which it may be used:

- a) when the call is connected to a recorded voice machine; the tone is then given during the silent intervals between transmissions of the announcement;
- b) under arrangements made at manual positions serving lines which have been abnormally routed so that by operating a key the operators may send the special information signal when, for example, the calling subscriber fails to understand the operator;
- c) when in special cases no provision is made for recourse either to a recorded announcement or to an operator, the special tone must be connected by the equipment at the point which the calls have reached.

5.2 The special information tone has a tone period theoretically equal in length to the silent period.

*Tone period.* — The tone period consists of three successive tone signals, each lasting for  $330 \pm 70$  milliseconds. Between these tone signals there may be a gap of up to 30 milliseconds.

*Silent period.* — This lasts for  $1000 \pm 250$  milliseconds.

5.3 The frequencies used for the three tone signals are:  $950 \pm 50$  Hz;  $1400 \pm 50$  Hz;  $1800 \pm 50$  Hz, sent in that order.

## 6. *Warning tone to indicate that a conversation is being recorded*

Where a conversation is being recorded at a subscriber's station the Administration, if it so desires, may cause the subscriber to introduce a warning tone to indicate that the conversation is being recorded. When such a tone is applied, it is recommended that:

- a) it consists of a 350-500 ms pulse every  $15 \pm 3$  seconds of recording time, and
- b) the frequency of the tone is  $1400 \text{ Hz} \pm 1.5\%$ .

## 7. *Machine recognition of tones*

The CCITT appreciates the value of machine recognition of tones for the purpose of service observations, maintenance, testing or for the collection of statistics where equivalent electrical signals do not exist. However, the CCITT considered, at Mar del Plata in 1968, that such machine recognition should not be a substitute for electrical signals. Where machine recognition of audible tones is to be introduced, the tone frequencies and cadences must be within close limits of precision. It is not envisaged that machine recognition of tones will be applied outside a national or an integrated network.



**Recommendation E.181****CUSTOMER RECOGNITION OF FOREIGN RINGING  
AND ENGAGED (BUSY) TONES**

In order to facilitate recognition of foreign ringing and engaged (busy) tones by a subscriber dialling an automatic international call, the information given to subscribers:

- 1) should emphasize that a slow repetition rate of the tone means "ringing" whereas a rapid repetition rate means "busy";
- 2) should indicate that in some countries the ringing tone may be heard as a sequence of two short tones, pause, two more short tones, pause, and so on.

In addition, it may be useful for the purpose of educating subscribers:

- to provide auditory samples of such tones by tape recording or other means, or
- to include detailed descriptions of tones in directories.

*Note.* — This Recommendation is complementary to Recommendation E.180 on the standardization of tones in the international telephone network. Whilst standardization is of primary importance, telephone users need information to assist them in recognizing foreign tones until such time as standardization is complete.

This is the purpose of the present Recommendation which, as extensive human factor experiments show, should greatly reduce subscriber confusion.

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## **PART II**

**Series E Recommendations (E.200 to E.292 R)**

### **CHARGING AND ACCOUNTING IN THE INTERNATIONAL TELEPHONE SERVICE**

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## **DIVISION A**

### **RECOMMENDATIONS FOR GENERAL APPLICATION**

#### **SECTION 1**

#### **CHARGING (DETERMINATION OF COLLECTION CHARGES) IN THE INTERNATIONAL TELEPHONE SERVICE**

##### **Recommendation E.200 <sup>1)</sup>**

#### **CHARGING FOR INTERNATIONAL CALLS IN MANUAL OR SEMI-AUTOMATIC OPERATING**

1. The unit charge for a particular international service is the charge for an ordinary private station call of one minute duration, set up during the period of heavy traffic. The minimum charge for a call in manual or semi-automatic operating is three charge units.

The unit charge is always the same, whatever the route (primary, secondary or emergency) used between any two countries.

2. The charge for a call established over a chain of circuits, should not exceed the sum of the charges for calls over each individual circuit. However, the Administrations concerned may agree to fix a total unit charge less than the sum of the charges.

3. Subject to agreement between Administrations, two different rates may be applied to traffic exchanged over their mutual routes:

- one rate during the period of heavy traffic;
- the other rate during the period of light traffic (see Recommendation E.206).

4. The charge for a personal call is the same as that for a station call in the same class, with the same priority and of the same duration, exchanged during the same charge period, plus a special charge for personal calls fixed by agreement between the Administrations concerned.

However, in certain relations and, in particular, those operated by radio circuits, the Administrations concerned may agree to apply the same charges for station calls and personal calls.

5. The facility of collect calls or the use of credit cards may be accepted for station calls, personal calls (possibly including personal calls with dispatch of a messenger), data transmission calls and conference calls.

6. Personal collect calls and personal credit card calls are subject only to the special charge for personal calls.

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<sup>1)</sup> The provisions of this Recommendation were contained in former Recommendations E.142 and E.143 (*White Book*, Mar del Plata, 1968).

7. Station credit card calls are not subject to any additional charge.
8. Station-collect calls may be subject to a special personal call charge or to a special charge <sup>2)</sup> fixed by agreement between the Administrations concerned. In this case the called subscriber may be informed that the charge he will have to pay will be the charge for personal calls or the charge for station calls plus a special charge.
9. For the sake of simplifying the telephone service and in view of the small proportion of personal calls requiring the dispatch of a messenger, Administrations are recommended not to apply a special surcharge. However, if Administrations wish to apply such a surcharge they should fix for themselves a uniform rate for all calls involving a messenger and inform the General Secretariat of the ITU so that this rate can be circulated to other Administrations.
10. *Principles for application of charges*
  - 10.1 When the call requested has been set up, the appropriate charge is payable. When the call requested has not been set up, no charge is payable.
  - 10.2 In the case of a request for a station call, the call is considered set up when the two stations are interconnected.
  - 10.3 In the case of a request for a personal call, the call is considered set up when the caller is interconnected with the called party.

#### Recommendation E.201 <sup>3)</sup>

### CHARGING IN AUTOMATIC INTERNATIONAL TELEPHONE SERVICE

#### A. PRINCIPLES FOR CHARGING

1. It has been the general practice to charge for international telephone calls on the basis of a minimum indivisible period of 3 minutes, and then by whole minutes.
  - 1.1 This system of charging, which is still in existence, was adopted at a time when automatic international service was not envisaged;
  - 1.2 Many Administrations have adopted methods of charging for use with their national automatic service, in which the charges are recorded on subscribers' meters, but based on two different principles:
    - a) some Administrations have for many years used a system based on trains of meter-pulses issued at the start of each period of 3 minutes, the number of pulses in the train depending on distance;
    - b) other Administrations use, or intend to use, a system based on individual meter-pulses issued at short intervals of time, the length of the interval depending on the distance.
  - 1.3 Certain Administrations which have adopted the system of charging by periodic pulses in their national services have made it known that it will not be possible for them to use a different system of charging for automatic international calls.

<sup>2)</sup> In certain European countries the special charge for station-collect calls levied by Administrations is equal to the charge for two minutes of conversation.

<sup>3)</sup> Approved in 1958 by the Special Assembly of the CCITT. Slightly modified and brought up to date in 1973 by the CCITT Secretariat in preparing the *Green Book*.

1.4 The use, on the same international relation:

- a) at one end, of a 3 minute + 3 minute method of charging (national type) or of a 3 minute + 1 minute method of charging (the type prescribed for international calls in manual operation);
- b) at the other end, of a periodic pulse method of charging (national type);

would lead to a grave dissymmetry in the charges made to users in the two countries concerned.

1.5 This serious dissymmetry would be likely to provoke adverse reactions from the subscribers of one country, who would be less favourably treated than their correspondents in the other country;

1.6 This serious dissymmetry would be likely to create certain financial difficulties for one of the countries:

- a) as a result of changes which may possibly take place in the balance of traffic;
- b) as a result of the fact that the country which charged on the basis set out in 1.4 a) above would receive, in respect of the use of its system for incoming traffic, substantially less than it would collect from its own subscribers.

2. In order to avoid too great a dissymmetry in the charges collected, it was recommended in 1958 that either of the two following methods of charging might be used in the international automatic service:

- a) charging minute by minute;
- b) charging by periodic pulses, of the type used in the national automatic services.

## B. REDUCTION OF DISSYMMETRY IN THE CHARGES

1. As the existence, in the same relation, of the two methods *a)* and *b)* in 2. above lead to a dissymmetry in the charges made, and as moreover the existence, in the same relation, of periodic charging methods with different intervals in the two countries concerned results in a very small dissymmetry in the charges made, in a given service between two countries A and B, the Administrations shall endeavour to see that the revenue obtained from users and the amounts entering in the international accounts correspond.

2. Hence, for a given relation, each Administration fixes the unit-charge and the unit-interval according to the characteristics of its national charging system but endeavours to observe the following equalities:

$$\sum_n d_r u_r = \sum_n d_A u_A = \sum_n d_B u_B$$

which equalities apply to a group of  $n$  messages chosen in such a way as to constitute a representative sample of the traffic on the relation in question.

In this equality,

$d_r$  = actual call duration,

$d_A$  = chargeable duration in the charging system of country A,

$d_B$  = chargeable duration in the charging system of country B,

$u_r$  = unit-charge used in drawing up international accounts in the automatic international service,

$u_A$  = charge per unit-interval in the charging system of country A,

$u_B$  = charge per unit-interval in the charging system of country B.

Notes. —  $d_r$  is expressed in minutes, with the appropriate decimals.

$d_A$  and  $d_B$  are expressed by the whole number of unit-intervals in the charging system of country A or country B (the interval between two periodic pulses in periodic-pulse systems, or one minute in a 1 + 1 system).

$u_r$  is a charge per (actual) call duration, is expressed in gold francs per minute of conversation and is the same for both directions in the relation in question.

**Recommendation E.202****CHARGEABLE DURATION OF CALLS**

1. International operators should allow no tolerance in their assessment of the chargeable duration of calls.
2. Metering devices controlled by operators should be rapid in action and have the utmost accuracy.
3. In the automatic service (and, in the case of station calls, in the manual and semi-automatic service) the chargeable duration should begin from the receipt of the answer signal from the called station (see the definitions in Recommendation E.100), since the existence of an unchargeable call period, however short, might lead to misuse of the service for the transmission of short messages without payment.

The chargeable duration ends when the caller gives the clear-forward signal or, if the caller has not replaced the receiver, when the call is cleared down by an operator in the performance of her duties in manual or semi-automatic working, or as a result of a clearing signal from the called party when an exchange clears the connection. In the latter case, the chargeable duration ends with some slight delay following receipt of the clearing signal from the called party.

4. It is unnecessary to inform the person making an international call of the exact moment at which the charging begins.
5. An Administration should not give its operators instructions to advise subscribers of successive charging periods unless a prior agreement to this effect has been reached with the other Administrations.
6. Nevertheless, if some Administrations consider it desirable to indicate to callers the expiry of each charging period, an automatic device, or one controlled by the operator at the originating international exchange, can be used for this purpose, on condition that this indication is regarded merely as an advice which is not binding on the Administration as regards charging.

**Recommendation E.203**

**CHARGING IN AUTOMATIC SERVICE FOR CALLS TERMINATING  
ON SPECIAL SERVICES FOR SUSPENDED, CANCELLED  
OR TRANSFERRED SUBSCRIBERS**

It is desirable for calls terminating on special services for suspended, cancelled or transferred subscribers in the international automatic service to receive the same treatment in different countries.

The CCITT considers that no charge should be made for these calls and that no answer signal should normally be given when the interception operator of these services intervenes.

**Recommendation E.204**

**CHARGING FOR CALLS TO SUBSCRIBER'S STATION CONNECTED  
EITHER TO THE ABSENT SUBSCRIBER'S SERVICE OR TO A  
DEVICE SUBSTITUTING A SUBSCRIBER IN HIS ABSENCE**

1. When a subscriber's line is connected to the absent subscriber's service or to a device which answers the telephone in the subscriber's absence (and may possibly record a message or exchange data) the absent subscriber's service or the device is assumed to be equivalent to a person answering for the subscriber at the latter's express wish. The call shall therefore be set up and charged in the normal manner.



### 1.1 *Station calls*

For station calls, charging takes effect on receipt of an answer:

- from the absent subscriber's service, or
- from a device substituting a subscriber in his absence.

### 1.2 *Personal calls*

The caller is informed that the line is connected to the absent subscriber's service or to a device substituting the called party in his absence. If he accepts the call he is charged on the basis of duration and the special charge for a personal call is levied. If he does not accept the call, no charge is levied.

2. This Recommendation applies to manual, semi-automatic and automatic services.

## Recommendation E.205

### CHARGING FOR CALLS FROM OR TO A PUBLIC CALL OFFICE

The establishment of a station call from or to a public call office entails special expenses, but these special expenses are negligible in comparison with the other costs involved in the establishment of an international call.

It is therefore preferable not to collect a supplementary charge for the use of a public call office for an international call, but, notwithstanding, the Administrations which collect a supplementary charge in their national services may apply such a supplementary charge to international calls, it being understood that this supplementary charge is not included in the international accounts.

## Recommendation E.206

### INTRODUCTION OF REDUCED RATES DURING PERIODS OF LIGHT TRAFFIC IN THE INTERNATIONAL TELEPHONE SERVICE

1. It is desirable for Administrations to have uniform guide lines for applying reduced rates during periods of light traffic in the international telephone service. Observance of the following rules should lead to some degree of uniformity in this sphere.

2. Subject to the agreement of the Administrations concerned and with due regard to 5. below, a reduced rate may be charged during light traffic periods both for fully automatic calls and for semi-automatic or manual calls.

3. According to the reasons for which the reduced rate is introduced, Administrations may choose a percentage reduction ranging from a minimum of 10 per cent to a maximum of 50 per cent. In selecting the percentage, Administrations should take into account the following:

- the necessity of informing the customers, by some means, of the hours and level of reduction,
- the need to determine the effects on distribution of traffic during the various hours and on revenues obtained from the service. In order to determine such effects, it may be well to introduce a series of small reductions rather than one large reduction.

3.1 The percentage reduction should be fixed by agreement between the terminal Administrations concerned to avoid dissymmetry between the charges at the two extremities of a relation.

3.2 Within regions, Administrations should agree to apply, as far as possible, the same percentage reduction.

3.3 For charging and accounting purposes, calls should be considered in principle to fall entirely within the charge period in which they start, regardless of the fact that they may end in another charge period.

4. The reduced rate periods and the date of introduction must be fixed by bilateral agreement or possibly by multilateral agreement for a region in the light of the following considerations.

4.1 The days and times during which reduced rates are offered may not be the same in both directions of the same relation, in particular as regards:

- public holidays, which vary from country to country;
- hours, owing to the difference in local times, especially in intercontinental relations. It is recommended, however, that the duration of the period in which the reduced rates apply should be the same in both directions.

4.2 The reduced rate period should begin and end on the hour (and not at subdivisions of an hour).

4.3 When there is a time difference between the two ends of the same relation the reduced rate period will be determined on the basis of the local time in the country of origin of the traffic. Calls paid for in the country of destination should be charged and accounted for according to the charge period in force in the country of origin at the start of the call.

4.4 Since business hours do not generally extend beyond 1900 hours (local time) in the evening and do not start in the morning before 0800 hours (local time), it is recommended that the intervening period be adopted for charging reduced rates on working days (see also 4.6 below) in relations where the end-to-end time difference is not more than 3 hours.

4.5 In relations where the time difference is greater than 3 hours, the night reduced rate shall not be applied in the country of origin as long as the busy period has not yet ended in the country of destination.

4.6 The reduced rate shall normally be charged on Saturdays in countries where this is a rest day and on Sundays in countries where this is not a working day.

5. It is recommended that the application of reduced rates to the automatic service (see also 2. above) be delayed until all or nearly all subscribers are able to dial their own calls in the relation concerned or until nearly all traffic can be routed automatically.

6. If the introduction of reduced rates is made before full dial capability exists, in the interest of fairness to subscribers who still must pass their traffic by semi-automatic or manual means, the reduced rate should be granted to these subscribers also.

#### Recommendation E.207

#### TRANSMISSION OF INFORMATION NECESSARY FOR THE COLLECTION OF CHARGES AND THE ACCOUNTING REGARDING COLLECT AND CREDIT CARD CALLS

1. Information regarding collect and credit card calls, where the chargeable duration is determined in the outgoing country, should be transmitted promptly to the Administration which will be collecting the charges ideally within 10 days, but in any event within one month after the call took place, unless otherwise bilaterally arranged.

2. The method of transmitting this information (telecommunication or postal media) should be agreed between the Administrations concerned.

3. Where Administrations have not agreed on the exchange of tickets (or photocopies) and lists are used in order to facilitate prompt billing and establishment of accounts, the following minimum information should be transmitted:

- a) date of establishment of the call;
- b) calling party national number;
- c) called party national number;

- d) type (collect, credit card or third number paying);
  - e) credit card number or billed number;
  - f) basis of charging (full, reduced, personal or station);
  - g) chargeable duration (minutes);
  - h) connect hour.
4. By bilateral agreement between Administrations, certain items in 3. above may be omitted or additional items included.
5. For uniformity it would be advantageous that the items be transmitted in the order listed in 3. above.

#### Recommendation E.208

#### CONFERENCE CALLS <sup>4)</sup>

Conference calls may be accepted in the international service by agreement between the Administrations concerned, subject to the following conditions:

##### 1. *Types of conference calls*

Conference calls are normally of two types:

- bidirectional calls in which each participant can listen and speak whenever he wishes to intervene in the conversation;
- unidirectional calls in which only one of the participants can speak, the other participants being able only to listen.

However, a conference call may consist of a combination of both types of call defined above.

##### 2. *Operating conditions*

2.1 The technical equipment shall in every case be such that good quality of service is guaranteed for conference calls.

Administrations wishing to offer this service shall equip at least one of their international exchanges with facilities for handling:

- bidirectional conference calls with about 10 participants;
- unidirectional conference calls with about 20 participants.

The CCITT will keep an up-to-date list of the international exchanges so equipped, with information in each case as to the maximum possible number of bidirectional or unidirectional connections. This list will also supply the names of countries which, although not possessing the appropriate equipment, agree to the setting up of conference calls via a foreign exchange. This list shall be distributed to all Administrations.

<sup>4)</sup> *Important note.* — The denomination "conference call" without further clarification or addition has been chosen to designate communication between several subscribers in different countries, known before the Vth Plenary Assembly of the CCITT (1972) as "multiple calls" or as "conference (multiple) calls".

This new denomination, which corresponds to that traditionally used by the public, should not be confused with the franking privilege "conference calls" which is allowed to delegates during international telecommunication conferences or meetings (a franking privilege granted not only to them personally but also to the Administration setting up the call). To avoid confusion, these latter calls should in future be known as "franking privilege calls". Administrations responsible for arranging telecommunication conferences or meetings should take the necessary steps to see that the new terminology is strictly applied by the staff (relatively small) used to set up these franking privilege calls.

2.2 The use of satellite circuits and of loudspeakers for conference calls is allowed provided that they are in conformity with the CCITT Recommendations in that respect.

2.3 Conference calls may be set up by semi-automatic or manual working, according to the facilities available in the Administrations concerned.

### 3. *Conditions for setting up a call by semi-automatic or manual working*

3.1 In setting up a conference call, two diagrams may be used:

3.1.1 The operator of the country in which the originator is located connects all the called subscribers to the appropriate equipment. Each foreign participant will therefore be connected by an international circuit and the connection diagram will thus take the form of a single-star network.

3.1.2 The operator in the country in which the originator is located asks the operator in one or more foreign international exchanges with the appropriate equipment to call the called subscribers and to connect them, through that equipment, to the equipment of the international exchange of the Administration in the country of origin. In this way, several interconnected star networks will be created.

The choice of the diagram to be used for setting up each conference call shall be left to the operator in the controlling exchange (operator in the international outgoing exchange which has the appropriate equipment).

3.2 All or some of the communications making up conference calls may be set up either with specified stations or individuals (or with additional stations).

3.3 Conference calls may be granted priorities in each relation concerned for all or some of the calls involved, in accordance with the provisions of the Instructions for the *International Telephone Service* (Articles 48 and 49). These calls shall normally take their turn, depending on their class and the priority with which they were requested. Nevertheless, in view of their special nature, efforts should be made to set them up as near as possible to the time specified by the originator, due regard being paid to the availability of circuits and special equipment.

3.4 Administrations which accept collect or credit card facilities for telephone calls may extend these facilities to conference calls.

In the case of a collect call, the subscriber in question shall be consulted before the call is set up in order to ascertain whether he agrees to pay the charge for the call.

### 4. *Assessment of the chargeable duration of calls*

4.1 In determining the chargeable duration of an international conference call, the basic principles outlined in Recommendation E.202 shall be applied. It should moreover be noted that:

4.1.1 the chargeable duration shall begin when all participants have been connected to the originator of the call;

4.1.2 the chargeable duration shall end when the originator gives the clearing signal;

4.1.3 if, by prior agreement, the originator of the call asks for the withdrawal or introduction of one or more participants during the call, the original call shall be regarded as terminated. In the case of withdrawal, the end of the original call coincides with the start of the next call. In the case of an addition, the start of the next call coincides with the moment when the new participant(s) is/are connected to the others;

4.1.4 no charge shall be levied when a call cannot be set up.

*Note.* — Some Administrations offer the facility of setting up conference calls, treated as personal calls or station calls, with the introduction or withdrawal of participants, on request, during the call. The introduction of such a service is a national affair and is not contrary to the provisions of the present Recommendation, provided that the bridging equipment for conference calls is used solely in the country of origin and that the call with each of the participants situated outside the country of origin appears in the international accounts as a separate international call of the appropriate type between the country of origin and the country of each of the participants. In this case, the provisions of 4.1.3 above do not apply.

## 5. *Charging*

The charges applicable to conference calls shall be determined in accordance with the following principles:

- 5.1 No account shall be taken of the circuits, the equipment or the routing channels actually used.
- 5.2 The charge for a conference call shall be the sum of the charges calculated as shown in the following:
  - 5.2.1 for the first participant in each country of destination, the charge shall be that for a personal call between the country of origin and the above-mentioned country of destination;
  - 5.2.2 for each additional participant in a country of destination, the charge shall correspond to a percentage (100% or less) of the charge for a personal call between the country of origin and the above-mentioned country of destination;
  - 5.2.3 for participants in the country of origin, the charge shall be determined by the Administration of the country: the fixing of the amount and the components of that charge are a national affair; a special charge may possibly be included for the use of the bridging equipment for conference calls.
- 5.3 In view of the fact that the charging for conference calls is based on the tariff for personal calls in the country of origin, the charge for a conference call with a given number of participants may vary according to the country of origin of the call.
- 5.4 The country of origin of a conference call shall be the country where the call is billed.
- 5.5 If an Administration does not have the bridging equipment required for conference calls, but nevertheless wishes to provide users with that service, it shall take the necessary steps, in liaison with an Administration possessing such equipment, to have conference calls set up on its behalf. In that case, the charging rules set out in 5.2 above remain valid and, in calculating the charge relating to participants in the country of origin (see 5.2.3), account shall be taken of the remuneration due for the use of the bridging equipment for conference calls, that remuneration being fixed by agreement between the Administrations concerned.

*Note.* — See the Note under 4. above, “Assessment of the chargeable duration of calls”.

## 6. *Preparation of international accounts*

- 6.1 The remuneration of the countries of destination for conference calls shall be governed by the same basic principles as are applied to ordinary calls (depending on the special facilities supplied) and shall be subject to the relevant CCITT Recommendations.
- 6.2 The remuneration of the countries of transit and destination shall be governed by the provisions agreed for the preparation of accounts for personal calls in the relation in question, as if there had been a personal call between the country of origin and each of the participants in the countries of destination. This remuneration shall include the charge for the use of the bridging equipment for conference calls in the country of destination.
- 6.3 When the bridging equipment for conference calls is used in an intermediate country, the conversation shall be charged in the accounts as if there had been a personal call between the country of origin and each of the participants in the intermediate country (or as a personal call between the country of origin and the intermediate country, if there was no participant in the intermediate country) and as if there had been a personal call between the intermediate country and each of the participants in the country of destination. In such cases, the Administration of the intermediate country may make a charge for the use of its bridging equipment for conference calls and should inform the Administration of the country of origin of the amount of the charge and how it is shared between itself and the Administrations of the countries of destination.
- 6.4 The remuneration of transit countries in which no use was made of bridging equipment for conference calls shall be governed by the arrangements concluded for personal calls in the relation in question.
- 6.5 When flat-rate price and traffic-unit price procedures are applied (see Recommendation E.250), and bridging equipment for conference calls is used in the country of destination, the remuneration for the use of that equipment and of additional national connections shall:
  - a) either be included in the traffic-unit price or in the flat-rate price fixed by the country of destination;
  - b) be the subject of a special accounting arrangement between the Administrations concerned.

*Note.* — See Note under 4. above, “Assessment of the chargeable duration of calls”.

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## SECTION 2

### PROCEDURES FOR REMUNERATION OF ADMINISTRATIONS FOR FACILITIES MADE AVAILABLE

#### Recommendation E.250

#### NEW SYSTEM FOR ACCOUNTING IN INTERNATIONAL TELEPHONY

##### 1. *Introduction*

1.1 The introduction of automatic and semi-automatic operation entails the use of alternative and overflow routings which make it impracticable to follow the path of a telephone call without considerable technical complications.

1.2 In order to avoid complicating too much the new technical equipment required — thereby raising its cost — new procedures are required so as to eliminate the need to know the path of every call as the basis for accounting in international telephony.

1.3 There is also the situation in certain international relations whereby Administrations purchase or lease direct transit circuits for the handling of their traffic.

1.4 The following procedures to meet these new situations and improve the efficiency of the world telephone network are valid, above all, for semi-automatic and automatic operation. They can be applied on relations operated manually, subject to agreement between the Administrations of all the countries concerned.

1.5 These procedures introduce the new concept of remunerating the Administrations of countries of destination and transit for making telephone network facilities available for use (e.g. for the routing of telephone calls including those with special facilities and calls indistinguishable from telephone calls such as facsimile transmission, etc.) by Administrations of countries of origin.

1.6 Annex 1 provides the explanation of terms used in this Recommendation.

##### 2. *Basic principles of a new system for accounting in international telephony*

2.1 The remuneration of the Administrations of *transit countries* (direct transit or switched transit) should not depend upon the procedure selected by the terminal Administrations for accounting for their remuneration. That is, the different procedures affect only the remuneration of terminal Administrations.

2.2 As regards the remuneration of the Administrations of the countries of destination and transit countries, it is preferable to make no distinction between automatic and semi-automatic traffic when establishing international accounts. This is in line with the idea that Administrations should be remunerated on the basis of the facilities made available. Whilst expenses of setting up calls in these two cases are different in countries of origin, they are approximately the same in the countries of destination and transit countries.

2.3 It is preferable, in order to simplify accounting, that one procedure or the other be used to the greatest possible extent. Certain regions may find it expedient to select one of the procedures for use within their region.

### 3. *Procedures*

Procedures relating to remuneration of Administrations of *destination and transit countries* are as follows:

#### 3.1 *Remuneration of countries of destination*

Administrations of countries of destination will be remunerated:

*either by:*

3.1.1 A procedure whereby the Administration of the country of origin keeps its revenue and remunerates the Administration of the country of destination for the facilities made available, including the international circuit, the international exchange and the national extension <sup>1)</sup>:

- 3.1.1.1 on the basis of a flat-rate price per circuit (called the *flat-rate price procedure*); or
- 3.1.1.2 on the basis of traffic units carried (called the *traffic-unit price procedure*);
- 3.1.1.3 in either case, the price will be fixed by the Administration of the country of destination;

*or by:*

3.1.2 the procedure whereby accounting revenue is shared between terminal Administrations (called the *accounting revenue division procedure*).

#### 3.2 *Remuneration of transit countries*

Administrations of transit countries will be remunerated for facilities made available,

*either by:*

3.2.1 the *flat-rate price procedure* relating in the main to direct transit operations;

*or by:*

3.2.2 the *traffic-unit price procedure* relating in the main to switched transit operations.

### 4. *Traffic unit*

#### 4.1 *Definition of the traffic unit — conversation time*

It is recommended that, when the traffic-unit price procedure is used (3.1.1.2 and 3.2.2 above), the traffic unit adopted for the purpose of remunerating other Administrations should be *one minute of conversation time*.

4.1.1 With regard to a call, conversation time is the interval that elapses between:

- the moment when the reply condition (answer signal in the backward direction) is detected at the point where the recording of the call duration takes place, and
- the moment when the clear forward condition (clear forward signal) is detected at the same point.

4.1.2 The above duration conforms to that in Recommendation E.202 and E.260 for the “call duration” of automatic calls; it is now to be applied to all calls covered by this Recommendation. In practice, the reply condition is detected by recognition of the answer signal generated upon answer of the called party or distant

<sup>1)</sup> This element will have due regard to the location of the international exchange and the distribution of the international traffic within the country of destination.



operator. The clear forward condition is detected by recognition of the signal generated by the calling party or outgoing operator clearing down the connection. In default of such action, the connection will be automatically cleared down and a clear forward signal generated in the outgoing exchange after a delay period following receipt of the clear back signal generated by the called party replacing the receiver.

4.1.3 Conversation time has been chosen as the traffic unit because it is capable of being measured automatically in response to signals generated by CCITT signalling systems. Furthermore, it allows accounts to be settled by an Administration of a transit country without waiting for information from countries "up the line" as regards call durations taken from data on operators' tickets.

4.1.4 The only other unit which meets these criteria, holding time, is not recommended because of the wide variations between chargeable time and holding time in different relations and in different call types, which makes the use of holding time inappropriate for remunerating Administrations of countries of destination.

## 4.2 *Remarks*

### 4.2.1 In relation to individual calls, conversation time:

4.2.1.1 will be less than circuit-holding time by reason, in particular, of the extra time circuits are held because there will be a period between the seizure of the circuit and the answer signal;

4.2.1.2 will be the same as chargeable time in the case of fully automatic and station calls, and charged time also as regards the former when periodic pulse-metering systems are used;

4.2.1.3 may be more than chargeable time in the case of personal calls where time is spent in obtaining the called party; calls with special facilities requiring operator intervention such as credit card, collect, conference or data calls or phototelegraph transmissions; or those station calls requiring operator assistance in the called country of destination or a transit country;

### 4.2.2 In relation to overall use of the circuit:

4.2.2.1 there will be additional holding time because of any inability to reach the distant subscriber;

4.2.2.2 there will be additional conversation time because of time on the circuit for service calls, directory inquiry or other information exchanges between operators;

4.2.2.3 exceptionally, conversation time could be less than charged time depending on the mixture of traffic on the circuit and whether the Administration of the country of origin rounds up the charged time in 3 + 3 or 3 + 1 minutes charging systems, or when the final pulse in a periodic pulse-metering system does not coincide with the end of the conversation time.

4.2.3 It should further be noted that where conversation time is not known, but other time periods such as circuit-holding time or charged or chargeable time are known, e.g. from operators' tickets, it is possible to convert these other times to approximate conversation times by the use of factors which allow for the time differences referred to in 4.2.1 and 4.2.2 above. These factors can be established on the basis of periodic measurement or sampling procedures, and may need to take account of individual characteristics.

## A. REMUNERATION OF THE ADMINISTRATION OF THE COUNTRY OF DESTINATION

### 5. *Flat-rate price procedure*

5.1 Under this procedure the Administration of the country of destination receives payment for the facilities made available by a flat-rate price fixed by it as a price per circuit. The price per circuit would cover:

5.1.1 the international circuit section provided by the country of destination;

5.1.2 the use of its international exchange;

5.1.3 the national extension <sup>2)</sup>.

5.2 In fixing these flat-rate prices, Administrations of countries within the same region may find it desirable to follow the principles in CCITT Recommendations.

#### 6. *Traffic-unit price procedure*

6.1 Under this procedure, the country of destination receives payment on the basis of the price fixed by it per traffic unit. This price will be related to the facilities made available and will take account of:

6.1.1 the international circuit section provided by the country of destination;

6.1.2 the use of its international exchange;

6.1.3 the national extension <sup>2)</sup>.

6.2 In fixing these traffic-unit prices, Administrations of countries within a region may find it desirable to follow the principles in CCITT Recommendations.

#### 7. *Accounting revenue division procedure*

7.1 Under this procedure, the accounting revenue from the traffic exchanged in their relationship is divided between the Administrations of the terminal countries, in principle on a 50/50 basis. Proportions other than 50/50 may be used when the facilities made available by each of the Administrations of the terminal countries are not approximately equivalent.

7.2 The Administration of each terminal country in principle pays an appropriate share (normally half) of any remuneration due to the Administrations of transit countries.

#### 8. *Consideration regarding choice of accounting procedure*

8.1 The accounting revenue division procedure is particularly appropriate when there is a significant volume of traffic exchange or when operation is over both-way circuits <sup>3)</sup> as in the case of certain intercontinental traffic relations. The establishment of accounts for collect and credit card calls may be easier under the accounting revenue division procedure.

8.2 On the other hand, other accounting procedures are more appropriate when:

8.2.1 the volume of traffic exchanged between the Administrations of terminal countries is light, as is the case when all traffic is handled only by switched transit;

8.2.2 there is one-way operation on all the international circuits concerned <sup>3)</sup>.

#### 9. *Simplification of accounts and use of traffic sampling*

9.1 In certain conditions, the Administrations of terminal countries may agree not to exchange international accounts when, for example:

9.1.1 the balance of settlement of their accounts is normally negligible;

9.1.2 the *terminal countries'* traffic levels in both directions are more or less equal;

9.1.3 there is approximate equivalence as regards their national extension <sup>2)</sup>.

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<sup>2)</sup> This element will have due regard to the location of the international exchange and the distribution of the international traffic within the country of destination.

<sup>3)</sup> In connection with one-way and both-way circuit operations, actual circuit operation should not be confused with the possibilities of operating such circuits that signalling systems may offer. Even though the circuits between the terminal countries have a signalling system permitting both-way operation, it is common practice, when the volume of traffic is large enough, to split the both-way circuit groups into three groups, two of which are operated on a one-way basis, the third, operated on a both-way basis, being used for overflow from the first two.

9.2 Traffic sampling may be used for the establishment of international accounts when the countries involved in a given traffic relation so agree. This sampling may then avoid the necessity for continuous traffic measurements. For example, the samples could cover five working days and could be taken at regular intervals, such as once a year or four times a year, or they could be taken on the occasion of any significant change in the number of circuits in the given relation. Sampling is particularly useful when traffic in any international relationship is reasonably stable.

## B. REMUNERATION OF THE ADMINISTRATIONS OF TRANSIT COUNTRIES

### 10. *Flat-rate price procedure*

10.1 It is recommended that in the case of direct transit via other countries, the Administrations of these direct transit countries should be remunerated for the exclusive use of the facilities made available on the basis of a flat-rate price per circuit.

10.2 Under the flat-rate price procedure, the terminal Administrations will ensure that the best possible use is made of the circuits because if those Administrations:

10.2.1 provide too few circuits, they pay the penalty in the form of the lower quality of service they offer to their subscribers;

10.2.2 provide too many circuits, they will have to pay more in remuneration and will be penalized financially.

10.3 The flat-rate price is fixed by the Administrations of the transit country. In fixing these flat-rate prices, the Administrations of countries within a region may find it desirable to follow the principles in CCITT Recommendations regarding the establishment of recommended values for facilities provided.

### 11. *Traffic-unit price procedure*

11.1 When transit traffic is not handled on direct circuits, the remuneration for the transit routing in the case of traffic passing by switched transit, through one or more countries should be made to the Administrations of the country of the first transit exchange used, which fixes a price per unit of handled traffic. This price should also include the remuneration to the Administrations of other transit countries, if any, and to the Administrations of the country of destination, where appropriate.

11.2 The procedure of remuneration to the Administration of the country of the first transit exchange for the entire routing of the traffic to the country of destination (remuneration of the first transit exchange) is necessary to meet the situation where traffic may be routed through subsequent transit exchanges, each of which, under automatic operation, will be unable to identify the country of origin of the traffic. This procedure makes the source of the traffic irrelevant for the establishment of accounts. Depending on the accounting methods in force between Administrations, the remuneration of the first transit centre may or may not include payments for use of the facilities of the country of destination.

### 12. *Establishment of a switched-transit relation*

12.1 Before switching traffic via a transit exchange, the Administration of the country of origin will request the country in which the first switching transit exchange is situated for a price quotation per transit-traffic unit to the country of destination.

12.2 The Administration of the country to which the first exchange belongs advises the price per traffic unit for handling the traffic from the transit exchange to the country of destination, including remuneration of the latter country where appropriate. This price may be set up by the Administration of the country to which the transit exchange belongs on the basis either of a special study or of a price already fixed for the transit routing to the same terminal country of traffic originating in other countries.

12.3 The Administration of any country with traffic to be routed in transit may, of course, find it advisable to consult the Administrations of several countries to ascertain which transit routing is the most economical.

12.4 The consultations by the Administration of the country of origin regarding the transit routing (by switching) of its traffic should be in accordance with the principles of the International Routing Plan described in Recommendation E.171.

13. *Calculation of the remuneration to the Administration of the country of the first transit exchange on the basis of traffic units*

13.1 Remuneration to the Administration of the switched transit country depends on the number of traffic units handled by its transit exchange.

13.2 For the establishment of international accounts, the Administration of the country of origin should determine the volume of traffic in minutes of conversation time routed each month towards each country of destination through this transit exchange. If it is not technically possible to measure units of conversation time, the originating Administration may use charged minutes (shown on operators' tickets) or measurements of holding time and make the necessary conversion to obtain an assessment of conversation time. The procedure for determining the conversion factor to be used for each relation will be decided by agreement between the Administrations of the originating and transit countries and if necessary, the destination country, taking the remarks made in 4.2 above into account.

13.3 An alternative version of this system can be contemplated when the traffic to the country of destination routed via a given international transit centre is sufficiently stable; the Administrations of the country of origin and of the country where the first transit exchange is situated might then agree to settlement on the basis of an estimated number of traffic units determined by means of traffic sampling and subject to periodic revision (such as once a year or four times a year).

### C. NOTES AND EXAMPLES

To assist in an understanding of the new procedures, the following three annexes deal with:

*Annex 1:* Explanation of terms used in international telephone accounting.

*Annex 2:* Differences between collection charges and accounting rates.

*Annex 3:* Examples of the various procedures for remunerating Administrations.

### ANNEX 1

(to Recommendation E.250)

#### Explanation of terms used in international telephone accounting

1. **(telephone) relation**

A (telephone) relation between two terminal countries exists when there is between them an exchange of telephone traffic (and, normally, a settlement of accounts).

2. **country (or Administration) of origin**

The country of origin is the country in which the calling subscriber is located.

3. **country (or Administration) of destination**

The country of destination is the country in which the called subscriber is located.

4. **terminal country (or Administration)**

A terminal country is both a country of origin and a country of destination in a given relation.

**5. transit country (or Administration)**

5.1 A transit country is a country through which traffic is routed between two terminal countries.

**5.2 direct transit country**

A direct transit country is one through which traffic is routed on direct circuits, i.e. on circuits provided for the exclusive use of other countries.

**5.3 switched-transit country**

A switched-transit country is a transit country through which traffic is routed by switching in an international transit exchange.

**6. international circuit**

6.1 A circuit between two international exchanges situated in different countries is called an international circuit.

6.2 A continental circuit is an international circuit between two international exchanges situated in two different countries in the same continent.

6.3 An intercontinental circuit is an international circuit between two international exchanges in different continents.

**7. national extension**

A national extension is that part of the connection which extends from the national side of the international exchange to the subscribers.

**8. Remuneration for shared use and exclusive use****8.1 Remuneration for shared use of circuits and equipment**

The expression "remuneration for shared use" refers to the remuneration paid to the Administration of a country P which makes its facilities available to a number of Administrations of other countries  $L_1, L_2, \dots, L_n$  for the routing of different international traffic streams. It may apply either to circuits or to switching equipment. Under the control of the owner Administration, the use of such facilities may be shared in any appropriate manner with other Administrations (including the Administration which owns them). The latter sets the price for the shared use of its facilities:

8.1.1 either according to the number of traffic units; or

8.1.2 by a fixed amount covering a certain period of time and based on the estimated volume of traffic and its time characteristics.

**8.2 remuneration for exclusive use of circuits**

8.2.1 The remuneration for exclusive use is the remuneration paid to the Administration of a country which makes its circuits available for direct transit, each circuit being assigned on an exclusive basis. The volume of traffic, its origin and its fluctuations in time are not the concern of the owner Administration and have no effect on the amount of the remuneration, which is paid circuit by circuit. The owner does not control the traffic routed over the circuit. This is the conventional lease arrangement between Administrations.

8.2.2 For further clarification, it should be mentioned that:

- a) the general term "lease" (in French: *location*) used until now applies only to the case cited in 8.2.1 above where exclusive use is granted;
- b) the term "owner" in these definitions refers to an Administration which receives the remuneration and which grants the rights to another Administration. The owner may have real ownership or the indefeasible right of use of the facilities.

**9. accounting rate**

The accounting rate is the rate per traffic unit agreed between the Administrations for a given relation which is used for the establishment of international accounts.

**10. collection charge**

The collection charge is the charge collected by an Administration from its public for the use of the international telephone service. The establishment of that charge is a national matter.

**11. flat-rate price (per circuit) procedure**

The flat-rate price procedure is a procedure which consists of remunerating an Administration on the basis of a flat-rate price per circuit.

**12. traffic-unit price procedure**

The traffic-unit price procedure is the procedure whereby remuneration of an Administration is based on traffic units.

**13. conversation time**

A minute of conversation time is the traffic unit that is recommended for use in the traffic unit price procedure. Conversation time is the interval that elapses between:

- the moment when the reply condition (answer signal in the backward direction) is detected at the point where the recording of the call duration takes place, and
- the moment when the clear forward condition (clear forward signal) is detected at the same point.

**14. accounting revenue division procedure**

The accounting revenue division procedure is the procedure whereby accounting revenue is shared only between terminal Administrations.

**ANNEX 2**

(to Recommendation E.250)

**Differences between collection charges and accounting rates**

1. The collection charge is the charge collected by an Administration from its public for the use of the international telephone service.
2. The accounting rate is the rate per traffic unit agreed between Administrations for a given relation, which is used for the establishment of international accounts.
3. Whilst, in general, Administrations correlate collection charges and accounting rates, the two cannot always be the same because, for example:
  - 3.1 in most countries collection charges and accounting rates will be expressed in different currencies;
  - 3.2 collection charges and accounting rates may be based on different traffic units;
  - 3.3 the value of national currencies can fluctuate relative to the gold franc;
  - 3.4 collection charges may be influenced by government fiscal policies.
4. As a general principle, in fixing the collection charges, Administrations should make every effort to avoid too large a dissymmetry between the charges applicable in each direction of the same relation.

## ANNEX 3

(to Recommendation E.250)

## Examples of the various procedures

1. *General*

1.1 The diagram below shows a typical pattern of circuit interconnections between various countries, with particular reference to the exchange of traffic between countries A and B carried partly on direct circuits through countries C and D, and partly on switched transit circuits through country E which in turn may also make use of transit-switching facilities in country F.

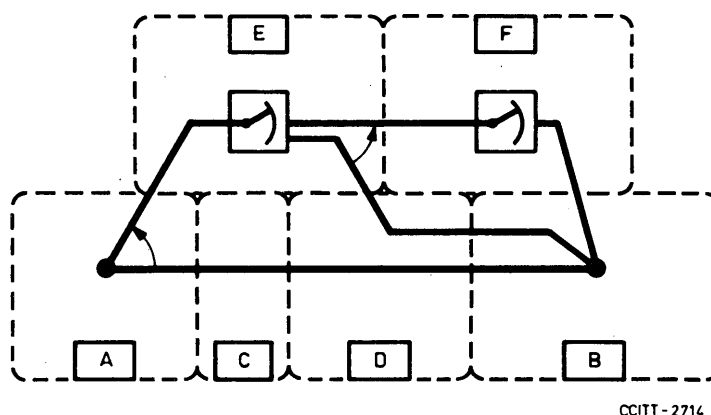


FIGURE 1 – Typical pattern of circuit interconnections between various countries

1.2 Three basic situations are examined in relation to use of Recommendation E.250.

1.2.1 Case 1 where countries A and B account for the total traffic between them on the basis of the accounting revenue division procedure and the sharing of the costs of facilities obtained from countries C, D, E and F.

1.2.2 Case 2 where countries A and B account for the total traffic between them on the basis of the traffic unit and/or flat-rate price procedure, each being responsible for accounting forward for the traffic it originates.

1.2.3 Case 3 where countries A and B account for some of their traffic on the accounting revenue division procedure, and the balance of their traffic on the traffic-unit price procedure.

1.3 The selection of methods of remuneration to be used will be agreed jointly between the Administrations of countries A and B taking into account among other things the routes and facilities made available and the traffic-unit and flat-rate prices quoted by countries C, D, E and F.

2. *Case 1 – Use of the accounting revenue division procedure for all traffic*

2.1 In accordance with the accounting revenue division procedure the Administrations of countries A and B jointly share the revenues of the traffic between their countries, each paying their appropriate shares (normally 50/50) of

- a) the remuneration due to direct transit countries C and D for the use of the circuit sections traversing those countries; and
- b) the costs incurred in use of overflow routes via E and F.

No separate or identified payment is made by the Administration of country A or country B for the facilities made available in country of destination B or A, at least for the portion of traffic using the direct route.

## 2.2 *Direct-transit traffic*

Remuneration to the Administrations of the direct-transit countries C and D is based on a flat-rate price per circuit and calculated according to the (crowflight) length of the circuit sections on the territories of countries C and D.

## 2.3 *Switched-transit traffic handled by the exchange in E*

2.3.1 The remuneration to the Administration of country E for traffic routed from A to B by switched transit at the exchange E is paid by the Administration of country A. The Administration of country E receives from the Administration of country A a payment calculated from the number of traffic units passed to country B on behalf of the Administration of country A.

Since the accounting revenue division procedure implies that each of the Administrations of the terminal countries A and B pays a share (normally half) of the remuneration due to the Administrations of the transit countries, irrespective of whether these are switched transit or direct-transit countries, the appropriate share of the remuneration paid by the Administration of country A to the Administration of country E must be debited in the statement of revenue divided between the Administrations of countries A and B.

2.3.2 The Administration of country E fixes the price to be paid by the Administration of country A per unit of traffic between the transit exchange E to country B; the Administration of country E must take into consideration:

- its expenses on its own territory;
- the expenses incurred for the direct-transit circuits E-B through country D;
- the expenses for switched transit after overflow in E through the transit exchange in country F.

2.3.2.1 In determining expenses in its own territory, E should include expenses for the circuits A-E from the frontier AE to transit exchange E as well as its switching expenses.

2.3.2.2 The Administration of country E must also take into account the expenses relating to:

- the section of international circuits provided by the Administration of country B;
- the international exchange and the national extensions in that country.

These expenses may be:

- counted as part of the accounting revenue shared between the Administrations of country A and country B, or
- be included in the price fixed by country E, if it is more convenient or even necessary for that country to fix a price (normally one-half) for facilities made available in B. In this case A should, in principle, remunerate B with the appropriate share (normally one-half) of the gross revenue from this stream of traffic, minus:
  - i) *the appropriate share* (normally one-half) of the amount due from A to E for the transit of E and D or F, and minus
  - ii) *the whole* of the amount due from A to E for the destination country B.

In practice, it may be difficult for A to obtain the necessary information to split the total remuneration due to E into two parts i) and ii) above because E will have quoted a combined rate for the two routes via D and F and the amounts due to B for these two routes may be different; A will not know the distribution of traffic between the routes via D and F. In such cases, the Administrations of A and B may agree not to take into account the distribution of the traffic on the routes E-D-B and E-F-B and make separate arrangements to ensure the fair division of costs between A and B. For example B may agree with A on an average share for the extension on its territory of the routes D-B and F-B. These shares would be deducted from the gross revenue for the part of the traffic transited via routes E-D-B and E-F-B. Alternatively, they may agree to dispense with the accounting revenue division procedure for this stream of traffic and account for it in accordance with 4. below.



### 3. *Case 2 – Use of traffic-unit and/or flat-rate price procedure for all traffic*

#### 3.1 *Traffic on direct circuits*

##### 3.1.1 *Remuneration to the Administrations of direct-transit countries*

The Administration of the country of origin A remunerates each of the Administrations of countries C and D for use of the sections of circuit A-B. Remuneration is based on a flat-rate price per circuit and is calculated according to the (crowflight) length of the circuit sections on the territories of countries C and D.

##### 3.1.2 *Remuneration of the country of destination*

The Administration of the country of origin A should remunerate the Administration of country B:

- for the circuit section A-B provided by the Administration of country B;
- for the use of the international exchange in B;
- for the national extensions in country B.

Depending on the agreements concluded by the Administrations of countries A and B, the remuneration is based:

- a) either on a flat-rate price per circuit, or
- b) on the traffic-unit price.

##### 3.1.3 *One-way operating and both-way operating*

In the case of one-way circuits the remuneration of an international circuit by the Administration of a country of origin presents no difficulty. In the case of both-way circuits, the Administrations of the terminal countries A and B decide how the costs of the international circuits are to be divided after taking account of the outgoing traffic of each.

#### 3.2 *Switched-transit traffic handled by the exchange in E*

##### 3.2.1 *Remuneration for circuits in the group A-E*

With respect to the traffic transiting the transit exchange in country E, the Administration of country A first of all remunerates the Administration of country E for the use of the section of the circuit A-E provided by the Administration of country E.

This remuneration is normally independent of the traffic in transit to country B, because the circuits A-E are used not only for traffic in transit to country B but also for terminal traffic from country A to country E. This is the case when the remuneration paid by the Administrations of countries A and E for terminal traffic between them is based on the flat-rate price procedure.

When the remuneration paid by the Administrations of countries A and E for terminal traffic between them is based on the traffic-unit price procedure, i.e. on the measurement of all traffic routed over the circuits A-E, a meter could be used to measure the whole of the traffic sent from A to E on the circuits A-E, regardless of the destination (i.e. regardless of the country codes); these measurements therefore would include traffic from A to B and A to F.

Alternatively, separate meters could be used in country A to measure the traffic destined for each of the countries B, E and F; this might facilitate the accounting for each of these streams of traffic.

##### 3.2.2 *Remuneration for transit routing by the exchange E*

The Administration of country A remunerates the Administration of country E for routing calls to B beyond the transit exchange in E on the basis of the number of traffic units from A to B passing through the international transit exchange in E. This number of traffic units might be measured by a special meter, reserved for calls to country B, which could be placed in country A on the circuits A-E. The meter is activated only when the country code of country B is sent by the outgoing register of the exchange in country A.

The Administration of country E is credited by the Administration of country A for the transit traffic sent via its international transit exchange to country B on behalf of country A and is entirely responsible for remunerating the Administrations of countries D, F and B. This remuneration is included in the remuneration it makes for the entire traffic emanating from E and sent to country B, since the national traffic originating in E and the transit traffic originating in other countries is consolidated for accounting purposes.

In principle, the remuneration of the Administration of country B by the Administration of country E should comprise not only remuneration for use of the international circuit sections provided by the Administration of country B and remuneration for use of facilities in the international transit exchange in country B, but also any remuneration for use of national extensions in country B.

If the remuneration for the circuits in section A-E (which carry both terminal and transit traffic) is made on a flat-rate price basis which includes remuneration for the international exchange and the national extension, the transit traffic proportion of the amounts so included should be taken into account in calculating the remuneration to be paid by the Administration of country A to the Administration of country E for the traffic which is switched at E and routed to country B.

4. *Case 3 — Use of the accounting revenue division procedure for the direct traffic between A and B and the traffic-unit price procedure for the traffic switched via country E*

4.1 This case represents the situation where countries A and B wish to use the accounting revenue division procedure for the traffic carried over the direct A-B circuits and the traffic-unit price procedure for remuneration of the destination country for traffic switched through country E.

4.2 *Traffic on direct circuits*

By way of meters or statistical assessments the Administration of country A will identify that traffic sent on the direct circuits A-B, and account for that traffic on the accounting revenue division procedure as in Case 1 under 2.1 above.

4.3 *Switched-transit traffic handled by the exchange in E*

4.3.1 By way of meters or statistical assessments the Administration of country A will identify the traffic sent on the switched-transit route via country E, and account for that traffic on the traffic-unit price procedure as in Case 2 under 3.2 above.

4.3.2 The traffic-unit price quoted by country E in this case will include an amount for the facilities in country B. It should in fact be the same price as quoted in Case 2.

**Recommendation E.251**

**OLD SYSTEM FOR ACCOUNTING IN INTERNATIONAL TELEPHONY**

1. *Introduction*

The new system for accounting (Recommendation E.250) might not always be applied in some relations especially where radiotelephone circuits are used and, in these cases, the following provisions may be adapted appropriately.

When Recommendation E.250 is not applied, it is recommended that the accounting rate for intercontinental calls, expressed in units of charged time, should be divided in accordance with the principles set out below.

## 2. *Calls over direct intercontinental circuits*

The accounting rate for calls over direct circuits should in principle be divided equally between the terminal Administrations unless other arrangements are agreed among the Administrations concerned <sup>4)</sup>.

## 3. *Calls over a chain of intercontinental circuits*

For calls over a chain of intercontinental circuits, the accounting rate should not exceed the sum of the accounting rates for calls over each of the individual circuits. However, the Administrations concerned may agree to fix a total accounting rate less than the sum of the individual accounting rates.

The total accounting rate should in principle be apportioned between the individual circuits in proportion to the accounting rate for direct calls over each individual circuit. The amounts accruing to each circuit should then be divided equally between the Administrations at each end of each circuit unless other arrangements are agreed between them.

## 4. *Calls extended over continental landlines* (that is, using them as an intermediate section or as an extension of an intercontinental circuit)

The principles for the determination of the total accounting rate are the same as in 3. above, except that continental countries operating a radiotelephone circuit may agree to forego any quota for the terminal land section used on their continent to extend calls over intercontinental circuits.

Administrations concerned in the provision of the landline section should not ask for higher payments than those applying in the case of calls obtained entirely by landline.

The total accounting rate should in principle be divided as follows:

- a) the part of the accounting rate accruing to the intercontinental circuit (or circuits) should be divided between the Administrations at the end of the intercontinental circuit (or circuits) as indicated in 2. and 3. above;
- b) the part of the accounting rate accruing to the continental circuit should be divided in proportion to the amounts required by each Administration concerned in the provision of the continental circuit.

Where the application of the above principles would result in different accounting rates for calls over different routes in a given relation, the Administrations concerned with the operation of the most expensive route (or routes) should agree how the rate should be scaled down to the lower figure. Unless otherwise decided by agreement between the Administrations concerned, this should be done by a proportionate reduction in the hypothetical quotas applicable to the most expensive routes.

## 5. Similar considerations may apply to continental relations especially where radiotelephone circuits are used

### **Recommendation E.252**

#### **MODE OF APPLICATION OF THE FLAT-RATE PRICE PROCEDURE SET FORTH IN RECOMMENDATION E.250 FOR REMUNERATION OF FACILITIES MADE AVAILABLE TO THE ADMINISTRATIONS OF OTHER COUNTRIES**

## 1. *Introduction*

1.1 The general procedures for remuneration of Administrations for facilities made available are given in Recommendation E.250. In B. of Recommendation E.250 the principles for remuneration of transit countries by a flat-rate price procedure are given.

<sup>4)</sup> Certain large countries claim landline quotas in respect of calls extended to places at considerable distance from the intercontinental circuit terminal, before division of the balance of revenue.

1.2 Practical methods for implementations in the case of facilities made available by transit countries are given for the following points:

- Procedures for ordering facilities;
- Provision of facilities;
- Determining the period of remuneration;
- Accounting;
- Refunds for outages.

Throughout this Recommendation the term "facilities" embraces individual circuits and groups of circuits, e.g. groups (12 circuits), supergroups (60 circuits), etc.

## 2. *Procedures for ordering facilities*

2.1 After a preliminary enquiry on availability of facilities, price, etc., the terminal Administrations concerned should place an order with the transit Administration(s) for the facilities required. Such orders may be sent preferably by telex, or otherwise by telegram, or mail.

The following information should be given:

- 1) name of the Administration(s) to which the facilities are made available;
- 2) type of service to be provided (telephone, telegraph, telex, data transmission, etc.);
- 3) facilities to be made available (supergroup, group, telephone or telegraph circuit) and the number of such facilities;
- 4) type of transmission system used (submarine cable, satellite, etc.);
- 5) section of circuit or group (for multi-link circuits);
- 6) expected in-service data;
- 7) preliminary technical information, if available, e.g. date and time for testing (to be settled by the technical services);
- 8) the duration required for temporary provision of facilities.

The order for the facilities should be sent well in advance so that the transit Administration(s) will have sufficient time for preparation.

2.2 In case of a change or cancellation of the order, the terminal Administrations should notify the transit Administration(s) of it as promptly as possible by telex, quoting a specific reference to the original order.

## 3. *Provision of facilities*

### 3.1 *Confirmation of order*

The transit Administration(s), when they have received an order, should give confirmation to the terminal Administrations of the availability of the requested facilities, the price per month or per year, and any other terms and conditions.

### 3.2 *Notification of completion of order*

When a telecommunication facility is being made available, the technical services of the Administrations concerned will naturally be in communication with each other as the work progresses. Nevertheless as soon as the facilities ordered are available a formal notification of the date of completion must be sent by the transit Administration(s) to all Administrations concerned.

#### 4. *Determining the period of remuneration*

##### 4.1 *Beginning of the period*

4.1.1 In accordance with the spirit of Recommendation E.250 payment is due when the facilities are made available by the transit Administrations, irrespective of the date on which the terminal Administrations bring the facilities into service.

In cases where the facilities are made available in advance of the ordered date, payment is based on the order date.

4.1.2 For *intercontinental* facilities, payment would be due from the day following that on which the facilities are made available to the terminal Administrations.

Thus for example, a request for the lease of an intercontinental facility for 1 July, would be handled as follows:

*Date of availability:* 24 June

*Charging:* from 2 July

*Date of availability:* 10 July

*Charging:* from 11 July

4.1.3 For *continental* facilities, a simplified method should be utilized for remuneration.

For the month during which the circuit(s) or the group(s) is(are) made available, terminal Administrations should remunerate the transit Administrations which made their facilities available as indicated below:

- for the whole month, if the facilities are made available between the 1st and the 15th;
- from the 1st of the following month if the facilities are made available between the 16th and the end of the calendar month.

However, within continents bilateral agreements may be made to apply the intercontinental method.

4.1.4 Nevertheless, in special circumstances the Administrations concerned may, by special agreement and in keeping with the basic principles, decide in the best interests of each party concerned on the procedure to be followed in selecting the date on which charging should start. Examples of cases where this could apply are:

i) *When there are several transit sections*

If, for example, two transit Administrations C and D do not complete their arrangements for making available the facilities requested by terminal Administrations A and B on the same date, it would be reasonable to select the date on which the entire transit section becomes operational.

ii) *Where the circuit orders relate to major projects, e.g. the opening of a new international exchange*

It is recognized that technical services will have a large circuit provision programme to meet which may extend over a considerable period before the new facility comes into service. The Administrations concerned may agree to the period for remuneration commencing at some later date after the facilities have been furnished.

##### 4.2 *Determination of the duration*

The period during which facilities are made available should be determined as follows:

###### 4.2.1 *Facilities made available on a permanent basis — intercontinental*

In calculating the period during which facilities are made available, one month shall mean one calendar month. Moreover, the day on which the facility is made available shall not be reckoned, whereas the day on which the facility is withdrawn shall be reckoned as a full day. Thus, a period of availability covering one month or more is calculated as follows:

- a) count the number of days beginning on the day following the day on which the facility was made available until the end of the month;

- b) thereafter count the number of full calendar months, if any; and
- c) count the number of service days in the last month, including the day on which the facility was withdrawn.

As regards charging:

- full calendar months are subject to the monthly rental;
- fractions of a month shall be subject to a daily charge equal to 1/30th of the monthly rental.

Examples are given in Table 1/E.252.

TABLE 1/E.252

Duration from the day of availability until the day of withdrawal	Chargeable time	Charge
30 October-15 December 30 October not counted 31 October = 1 day November = 1 month 1-15 December = 15 days	1 month 16 days	1 monthly rental + $\frac{16}{30}$ of this rental
30 November-15 January 30 November not counted December = 1 month 1-15 January = 15 days	1 month 15 days	1 monthly rental + $\frac{15}{30}$ of this rental
4 January-10 February 4 January not counted 5-31 January = 27 days 1-10 February = 10 days	37 days	$\frac{37}{30}$ of monthly rental

#### 4.2.2 *Facilities made available on a permanent basis – continental*

In calculating the period during which facilities are made available, one month shall mean one calendar month. When the facilities are made available between the 1st and 15th of the month, remuneration shall be for the whole month. When the facilities are made available between the 16th and the end of the calendar month, remuneration shall commence from the 1st of the following month.

When the facilities are withdrawn between the 1st and 15th of the month, remuneration shall be made to the end of the previous month. When withdrawn between the 16th and the end of the calendar month, remuneration shall be made for the whole month.

#### 4.2.3 *Facilities made available on a temporary basis*

By agreement between the Administrations concerned, it is possible to make facilities available for a period of less than one month.

In calculating the period during which facilities are made available on a temporary basis, one day shall mean a period of 24 consecutive hours.

The period during which a facility is made available should be calculated in multiples of 24 hours, the period starting from the time at which the facility is made available until the time at which it is withdrawn. If the number of days thus obtained contains a fraction of 24 hours, it should be rounded up to the next whole number.

*Examples:*

Circuit made available on 1 June, at 09.00 hours, cleared on 5 June at 09.00 hours:

4 × 24 hours, i.e. 4 chargeable days.

Circuits made available on 1 June, at 09.00 hours, cleared on 5 June at 11.00 hours:

(4 days + 2/24 day) i.e. 5 chargeable days.

The remuneration shall be equal to 1/30th of the monthly rental for each day of the period of availability<sup>5)</sup>.

#### 4.3 *End of period of availability*

The period during which facilities are made available on a *permanent basis* will be terminated by the advice of the terminal Administrations. The notice of cancellation should normally be given to the transit Administration(s) one month in advance of the effective date of termination.

However, the period of availability for facilities provided on a *temporary* basis will end on the date and time agreed upon in advance.

#### 5. *Accounting*

5.1 The procedure for accounting described in Recommendation E.270 should be applied. In principle the terminal Administrations will credit the transit Administration(s) with the sum due to it through the regular monthly accounts.

5.2 However, an agreement may be made between the Administrations concerned for only one of the terminal Administrations to credit the transit Administration(s) with the total remuneration due by means of regular monthly accounts and to debit the other terminal Administration.

5.3 There may also be specific cases, e.g. facilities made available on a temporary basis, provision of mutual aid facilities, where the Administrations concerned may agree that the country providing the facility should debit the country of origin.

#### 6. *Refunds for outages*

##### 6.1 *Need for rapid restoration of service*

When an outage occurs, the Administrations providing facilities should make every effort to restore interrupted facilities, or to make available at no extra charge the same facilities on an alternative routing, either through its territory or through third countries.

##### 6.2 *Intercontinental outages*

6.2.1 Automatic refunds will not be made. However, when an outage in a transit country exceeds 24 hours and the Administration of that country has not restored the facilities, the terminal Administration is entitled to claim a refund, particularly if it had to provide substitute facilities *at its own expense*.

This refund is calculated on the basis of 1/30th of the monthly rental per day or part of a day for the facilities which were temporarily interrupted.

6.2.2 When a transit Administration provides one or more intercontinental sections and an outage occurs in one of them, it shall refund for all the facilities it provides (including any continental section) and not solely for the section on which the failure occurred.

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<sup>5)</sup> In order to simplify accounting methods and to stimulate mutual assistance among Administrations, the administrative and technical costs of establishing temporary circuits are not included. By special agreements between Administrations, these costs may, however, be recovered through a surcharge or installation charge equivalent to 2/30ths of the monthly rental.

6.2.3 When several countries are involved in making transit facilities available, only the Administration of the transit country in which the outage occurred shall be liable to pay a refund in the conditions set out above. If an outage occurs simultaneously in more than one country, the Administrations of those countries will be liable if a refund is claimed.

6.3 *Continental outages*

There will be no refunds for outages.

However, within continents, bilateral agreements may be made to apply the intercontinental method.

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## SECTION 3

### MEASURING AND RECORDING CALL DURATIONS FOR ACCOUNTING PURPOSES

#### Recommendation E.260

#### BASIC TECHNICAL PROBLEMS CONCERNING THE MEASUREMENT AND RECORDING OF CALL DURATIONS

##### 1. *Recording call duration*

###### 1.1 Technically *call duration* is the interval that elapses between:

- the moment when the reply condition is detected at the point where the recording of the call duration takes place, and
- the moment when the reply condition (clear forward signal) is detected at the same point.

It follows that the apparatus used to record call duration of automatic calls must be capable of detecting the two moments mentioned above and of measuring the interval between them.

1.2 When an Administration using a simplified signalling system has recourse to recording holding times for the establishment of international accounts, it is necessary to have a conversion factor making it possible to obtain the call duration from the holding time. The determination of this conversion factor requires fairly close observation. The ratio of holding time to call duration may not be the same for all the circuits of a single group, so that a fairly large number of circuits must be observed in order to find a reliable conversion factor. Moreover, the holding time also depends on the availability of switching equipment in the incoming country, as well as the reaction of subscribers when they hear ringing tone, busy tone, etc.; the holding time for a given call duration may thus be extremely variable <sup>1)</sup>.

##### 2. *Discrimination between automatic and semi-automatic calls*

Since different accounting procedures are used for automatic and semi-automatic calls, the recording apparatus must be capable of distinguishing between these two types of calls and must record the call duration of automatic calls only.

Discrimination can be effected by one of the following methods:

- a) by connecting the measuring apparatus to a point in the exchange through which only automatic traffic is routed;
- b) by recording call durations only for calls containing the *discriminating* digit 0 used in automatic working (see Recommendation Q.104, 1.4.1).

Method b) may be particularly useful when both automatic and semi-automatic calls originate at exchanges within the national network and are routed to the outgoing international exchange over a common group of circuits.

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<sup>1)</sup> In Recommendation E.250, 4.1.4, holding time is not recommended because of the wide variations between chargeable time and holding time in different relations and in different call types, which makes the use of holding time inappropriate for remunerating Administrations of countries of destination.

### 3. *Omission of international transit traffic from the records of call duration*

All records of call duration will be taken in the outgoing country and will relate to calls originating in that country. It will therefore be necessary, in an international exchange which routes both terminal and international transit traffic, to exclude the call duration of international transit calls passing through the exchange.

It will be difficult to discriminate between originated calls and transit calls on the outgoing international circuits and it may therefore be necessary to segregate this traffic within the exchange and connect the recording apparatus at a point in the exchange where transit traffic is not encountered.

### 4. *Discrimination according to destination*

4.1 The records of call durations obtained by the recording apparatus must be related to particular countries of destination and, if required, to the charging areas of the country of destination; the recording apparatus should therefore be capable of identifying the destination of a call and of associating the measured call duration with this destination.

*Note.* — For drawing up international accounts (apart from frontier relations) it is not necessary to know the origin of the call or the charging zone from which it comes. The difference in quotas resulting from different outgoing charging zones in a given country are kept by that country.

#### 4.2 *Incoming country constituting a single charging zone*

Where the recording apparatus is connected to a circuit group carrying only terminal traffic, no discrimination is required. Where, however, a circuit group carries traffic to more than one country, discrimination between these countries must be effected from an examination of the international code for the country and/or the type of seizing signal (terminal or transit) which is sent over the international circuits.

#### 4.3 *Incoming country consisting of several charging zones*

If the accounting procedure agreed between two countries demands the production of separate records of call durations for calls made to each charging zone in an incoming country, the recording apparatus must be arranged to discriminate between the calls to the different charging zones according to the first one or first two digits of the called station's national (significant) number <sup>2)</sup> (see Recommendation E.161).

#### 4.4 *Special frontier arrangements*

To take account of the special system of charging for frontier relations (reduced charges between neighbouring frontier zones), special steps will have to be taken to discriminate between automatic calls in frontier relations and other automatic calls. This discrimination will be made every time that frontier traffic is routed wholly or partly (overflow) by long-distance international circuits having devices for measuring call duration.

This discrimination will in general necessitate:

- a) further analysis of the national (significant) number of the called subscriber than the one which is quoted in Recommendation E.161, and
- b) the determination of the origin of the call, since frontier charges depend on the distance between the outgoing and the incoming frontier zones.

<sup>2)</sup> See the definition of the national (significant) number in Recommendation E.160.

5. *Discrimination according to route and destination*

In general there will be little difficulty in determining the route taken by a call on leaving the outgoing international exchange. If the recording apparatus is connected to the international circuits, then of course the recordings obtained will be appropriate to the route in question. If, however, the recording apparatus is connected to a point in the exchange remote from the outgoing circuits and the call to a particular country has the choice of more than one route, then information in respect of the actual route taken by the call must be supplied to the recording apparatus.

6. *Distribution of traffic in an international exchange for the purpose of measuring call durations*

By way of example, Figure 1/E.260 is given hereafter showing how traffic should be distributed in an international exchange so as to take account of the provisions above.

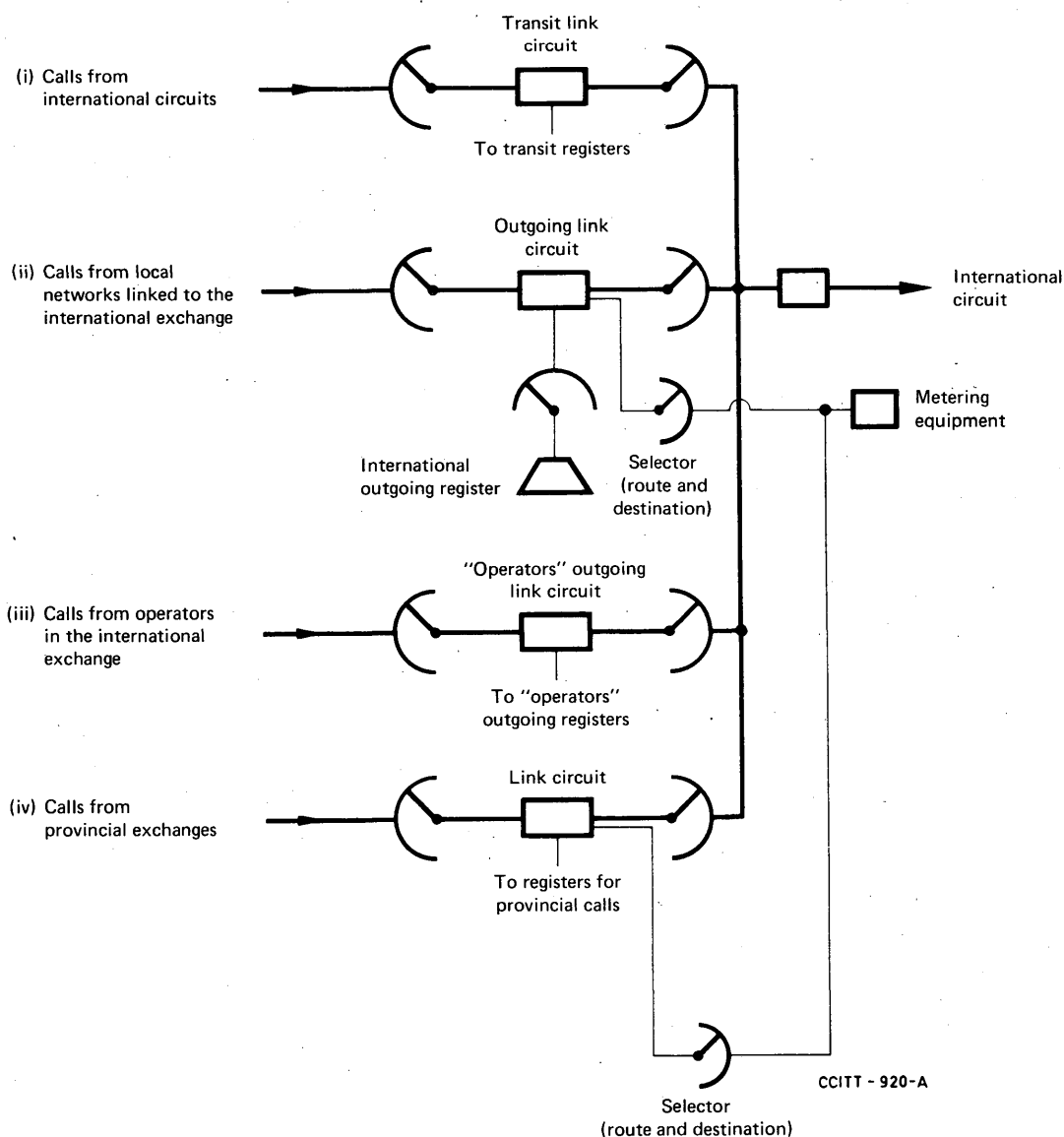


FIGURE 1/E.260 – Diagram giving an example of traffic distribution in an international exchange

The traffic passing through the international exchange is divided into the following four groups, as shown on the figure:

- i) international transit traffic;
- ii) automatic traffic (originated locally);
- iii) semi-automatic traffic (originated locally);
- iv) combined automatic and semi-automatic traffic from provincial exchanges.

These groups would employ independent groups of link circuits and registers. Only group ii) and possibly group iv) would be involved in measuring call duration.

The following auxiliary equipment is envisaged:

- a) for each link circuit in groups ii) and iv), a selecting device capable of dealing with every possible combination of route/country or *charging zone* destination;
- b) for each link circuit in group iv), a device to take care of the discrimination between semi-automatic and automatic traffic;
- c) for registers in groups ii) and iv), equipment for analyzing country codes and if necessary an appropriate number of digits of the national (significant) number of the called subscriber in order to discriminate between charging zones (see Recommendation E.161, 1.2);
- d) for registers in group iv), a device to recognize the discriminating digit 0 used for automatic working;
- e) a means of recording the call duration for each combination of route/country or charging zone destination.

#### Recommendation E.261

#### DEVICES FOR MEASURING AND RECORDING CALL DURATIONS

There are three main methods used for measuring call duration:

1. *Use of apparatus of the type which meters the quantity of electricity (ampere-hour meter or coulomb-meter)*

This type of meter is permanently connected to the circuits or equipment under observation; for the measurements in question, the current strength in the meter is at all times proportional to the number of circuits or units of equipment in the speech position. With this type of apparatus the accuracy of the measurements depends on:

- a) errors in the meter (shunt included) itself; in any case, in the absence of special arrangements, the accuracy of the latter is not so good for intensities which are only a small fraction of the nominal intensity for which the apparatus is designed;
- b) the accuracy and possibly the variations with time of the resistors inserted in the circuits to be observed;
- c) the ohmic resistance of the connections between the measuring equipment and the circuits to be observed;
- d) voltage variations in the supply battery used.

Obviously, the longer the period of observation, the greater are the chances that partial compensations will occur between the various causes of error. With such apparatus it seems unlikely that more than a 2% accuracy of measurements can be obtained for measurements made over an adequate period of time which includes hours of varying load; measurements made only at times when there is very little traffic might involve a considerably greater error.

## 2. *Use of pulse-counting meters*

With this method, the circuits or equipment under observation are connected, for the duration of a call, to pulse-counting meters which receive pulses from a common timing mechanism at suitable intervals, for example every six seconds. The call duration is deduced from the meter readings.

## 3. *Use of a device for periodically scanning circuits or equipment*

These devices can be based on either the conventional type of equipment (relays, crossbar switch, etc.) or some form of electronic equipment. (See also Annex to Recommendation E.501.)

## 4. *Degree of accuracy of methods 2. and 3.*

With the two last-named methods, the degree of accuracy of measurements depends on:

- the average call duration and the statistical distribution of call durations;
- the number of calls observed;
- the interval between the sending of pulses (method 2.) or the scanning interval (method 3.).

It is also possible to assess mathematically, as a function of these factors, the anticipated degree of accuracy. Errors may also arise from the operation of the meter in method 3., or from accidental variations in the pulsing or scanning interval.

There is no doubt that if the number of calls observed is sufficiently high it is possible, using these methods and without reducing the pulse-sending interval or the scanning interval to such a small value that operation difficulties would arise with classic-type apparatus, to obtain greater accuracy than could be obtained with the method described in 1. above.

## 5. *Fault indication*

It is recommended that provision should be made for indicating faults in the measuring and recording device. There are two possibilities:

- a) to design the measuring and recording apparatus so that there is a permanent check on its operation, with an alarm system to indicate faults;
- b) to provide special equipment to make a routine check of the operation of the measuring equipment.

## 6. *Equipment design*

The design of equipment for measuring and recording call durations is left to Administrations. Some information will be found in the Annex hereafter.

# ANNEX

(to Recommendation E.261)

## Measuring call duration

1. The technique to be adopted for recording call durations of automatic traffic will depend on the accounting arrangements agreed between Administrations and particularly on whether recordings are to be made:

- by country of destination alone;
- by route and country of destination;
- by route, country of destination and charging zone.

In all cases it will be necessary to discriminate between automatic and semi-automatic traffic and possibly transit traffic.

2. Assuming that it is possible to identify automatic calls on the outgoing international circuit and that the circuits carry only terminal traffic, the measurement of call durations could be effected by connecting a measuring and recording device to each international circuit. The disadvantage of this scheme is the large number of recorders to be provided and read daily.

A single recorder could be made to serve a group of international circuits by arranging for the recorder to be connected to each circuit of a group in turn, say every six seconds, and for the recorder to operate each time that an international circuit in the answered condition is encountered. The recorder would then show the total call duration of the circuit group.

3. Where transit routings are involved and the recordings are required on the basis of route and country of destination, separate totals of call durations will be required for each country served by the route in question. In other words, it will be necessary to determine the destination of each call and record the call duration on the appropriate recorder.

This may be found to be a complicated process and it may be more convenient to connect the recorder at a point remote from the international circuit, for example at the register access relay set, where information in respect of the destination and routing of the call can be obtained from the outgoing international register. Figure 1 illustrates an arrangement in which the selector A is positioned under the control of the register to connect the appropriate route and destination recorder to the register access relay set.

The recorder could be an ampere-hour meter or it could consist of a meter and a selector arranged to scan all the register access relay sets which have been connected to this particular route and destination recorder.

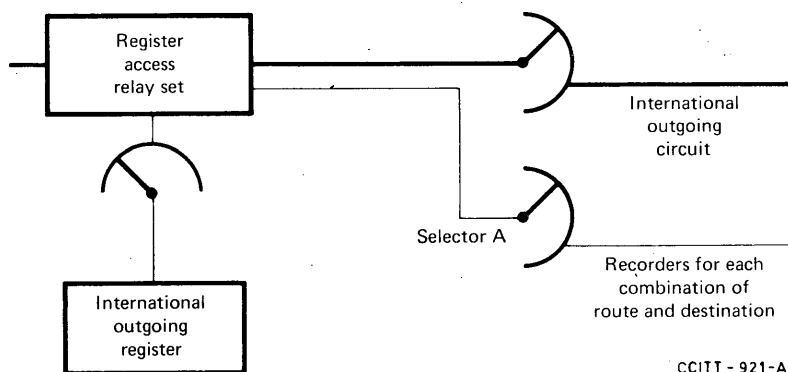


FIGURE 1

4. A similar arrangement to Figure 1 can be employed where recordings are required on the basis of route, country of destination and charging zone. The additional complications introduced in determining the charging zone mainly concern the outgoing register but it should be noted that a greater number of separate call duration recorders will then be needed.

5. The number of recorders or separate records of call durations is equal to the summation, for all destinations, of the product of number of routes by number of charging zones for each country of destination. The capacity of selector A in Figure 1 must be sufficient to permit access to any recorder and the economics of this scheme will be determined by the number of separate recordings required and the total volume of international traffic originated at the exchange concerned.

6. For a large number of separate recordings, Administrations might consider whether it would be cheaper to use electronic methods for recording call durations. In this connection Administrations might take into account the possible future introduction of cheap rates which could double the number of separate records required.

## SECTION 4

### ESTABLISHMENT AND EXCHANGE OF INTERNATIONAL ACCOUNTS

#### Recommendation E.270

##### MONTHLY TELEPHONE ACCOUNTS

The following arrangements are recommended for the drawing up, exchange and acceptance of monthly telephone accounts between Administrations.

1. Each Administration of origin (and of transit where appropriate, e.g. in the case of 3.1.4 below) shall prepare and forward monthly accounts. These should be drawn up separately on forms of the types shown below as specimens for:

- a) telephone traffic proper — Forms 1 or 2;
- b) sound- and television-programme and phototelegraph transmissions — Forms 1 or 2, suitably adapted.

The choice of form to be used for the accounts should be decided by the Administration which prepares the accounts, after consultation with the other Administration concerned. It may be convenient to use separate forms for originated and transit traffic.

The traffic details which must be included in the account are only those which are necessary for the purpose of international accounting. However, by agreement between the Administrations concerned, traffic information which is not essential for the accounts (e.g. the number of calls where this does not affect the accounting) may be included on the account forms.

In accordance with Article 8 of the *Telephone Regulations*, monthly accounts should be sent as promptly as possible but in any case before the end of the third month following that to which they relate.

#### 2. *Accounts in international relations where Recommendation E.250 applies*

The preparation of the monthly telephone accounts shall be as follows, using as an example the Figure 1/E.270 which is a reproduction from Annex 3 to Recommendation E.250. This diagram relates to the traffic from terminals A to B.

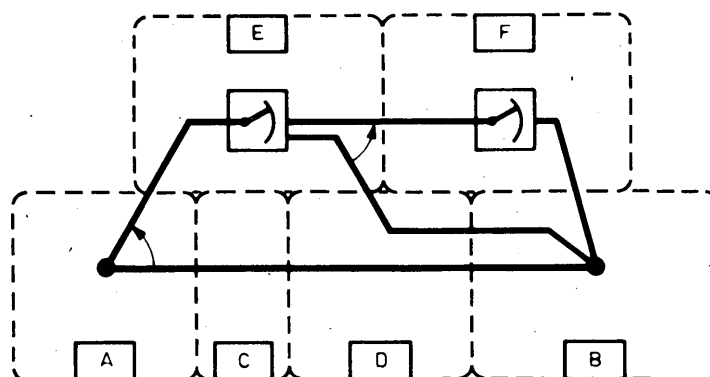


FIGURE 1/E.270 — Typical pattern of circuit interconnections between various countries

**2.1 When the accounting revenue division procedure is applied for accounting between A and B**

**2.1.1 For traffic on the direct route, A to B**

A shall prepare and forward to B a monthly account crediting B with one-half of the net revenue (accounting revenue), after deduction of the amounts due from A to C and D. A shall also account with C and D, either by including their remuneration in the monthly accounts for traffic from A which terminates in each of these countries, or by sending them a copy of the monthly account prepared for B, showing in it the amounts due to C and D.

**2.1.2 For traffic on the route, A to B via E**

There are two possibilities:

**2.1.2.1 When the rate quoted by E includes an amount due to B**

A shall prepare and forward to E a monthly account crediting E for A's traffic to B via E at the rate quoted by E to cover the transit of E and of D or F and also for the destination country B.

In principle A should include in its monthly account to B an amount crediting B with the appropriate share (normally one-half) of the gross revenue from this stream of traffic minus:

- a) the appropriate share, (normally one-half) of the amount due from A to E for the transit of E and of D or F and
- b) the whole of the amount due from A to E for the destination country B.

(For a better understanding of these procedures, see Recommendation E.250 and Annex 3 thereto, in particular.)

**2.1.2.2 When the rate quoted by E does not include an amount due to B**

A shall prepare and forward to E a monthly account crediting E for A's traffic to B via E at the rate quoted by E to cover the transit of E and of D or F.

A shall also include in its monthly account to B an amount crediting B with the appropriate share (normally one-half) of the net revenue after deduction of the amounts due from A to E (including D or F) regardless of whether D or F are remunerated by the flat-rate or traffic-unit price procedure.

**2.2 When the accounting revenue division procedure is not applied for the accounting between A and B**

**2.2.1 For traffic on the direct route A to B**

A shall prepare and forward to B, C and D respectively a monthly account crediting the amounts due from A to each of them under whatever accounting procedure has been agreed with each of them (i.e. either the traffic-unit price or the flat-rate price procedure).

If the country of destination is remunerated under the traffic-unit price procedure, the flat-rate amounts for direct-transit countries should be divided in appropriate shares (normally equal) between the two terminal countries and the traffic-unit per minute price for passage through those transit countries should be divided in the same proportion between the two terminal countries. The application of this rule is necessary if the traffic accounting between the two terminal countries is to be fair, as this traffic-unit per minute price should be used by each terminal Administration as a factor to be multiplied by the volume of outgoing traffic, which may not be the same in the two directions. Thus A will credit to B the traffic-unit price of B plus (normally one-half) of the traffic-unit price attributable to the transit of C and D.

**2.2.2 For traffic on the route A to B via E**

A shall prepare and forward to E a monthly account crediting E for all A's traffic to B via E, at the rate quoted by E to cover both:

- a) the transit of E and of D or F respectively,
- b) the remuneration due to B.

A shall not include this traffic in its monthly account with B.



### 2.3 *Accounting to be done by E in the cases described in 2.1.2 and 2.2.2 above*

E shall prepare and forward to D, F and B respectively a monthly account crediting to each of them the amounts due to them in respect of traffic originating in E, and shall include in these accounts the amounts due to them for traffic from A (and any other countries transited by E). However, if the method of remuneration from E to either D, F or B is flat-rate price procedure, then E shall in principle retain the amount received from A (or any other countries upstream from E) relating to the section through the country being remunerated by the flat-rate price procedure.

### 3. *Preparation of accounts for relations to which Recommendation E.250 does not apply*

3.1 The following provisions apply to certain international relations to which Recommendation E.250 does not apply.

3.1.1 In direct relations the Administration of origin shall prepare and send a monthly account to the Administration of destination.

3.1.2 Where transit relations within the continent of origin are concerned, the Administration of origin shall prepare and send the monthly account to the Administration controlling the intercontinental circuit in the outgoing direction. At the same time a copy of the account shall be sent to each of the Administrations of transit countries concerned. The account shall show the share accruing to each of the Administrations of transit countries and in addition, in one amount the share due to the Administration controlling the intercontinental circuit in the outgoing direction and the Administrations beyond its territory.

3.1.3 The Administration controlling the intercontinental circuit in the outgoing direction shall prepare and forward a monthly account, both for traffic which originates in its own country, and for that which passes in transit through its own territory, showing in one amount the share due to the Administration operating the other end of the intercontinental circuit, and, where applicable, the shares accruing to the Administrations beyond its territory.

3.1.4 The Administration, operating the other end of the intercontinental circuit shall, where applicable, prepare a new account for each Administration concerned beyond its territory showing the share due to each.

3.2 In continental relations, except those covered by 2.1 above, the Administration of origin shall prepare and send a monthly account to the Administration of destination and, where appropriate, a copy to each of the transit Administrations concerned showing the amount due to each of these Administrations.

### 4. *General remarks on the preparation of accounts*

In the preparation of monthly accounts, the following should be taken into account:

4.1 Separate entries should be made in respect of traffic sent over secondary or emergency routes which involve special remuneration.

4.2 The monthly account should include all special charges for telephone calls and except when the traffic-unit price procedure as in Recommendation E.250 is applied or where there is agreement to the contrary, these special charges should be shared between the Administrations concerned in the same proportion as the charges for calls.

4.3 Collect calls should be included in the monthly account by the Administration of origin.

4.3.1 The Administration which collects the charge from the customer should credit to the Administration of origin the whole of the agreed accounting rate for this type of call under a transferred charge procedure on a separate entry in the monthly international accounts. Exceptions to this rule may be made for those relations in which the terminal Administrations apply the accounting revenue division procedure (as in Recommendation E.250) in which case it is possible to transfer only that share of the revenue which is due to the country of origin.

4.3.2 When the delay operator in the country of destination sets up a collect call (Article 164, 3.3 of the *Instructions for the International Telephone Service*, January 1973), the two terminal Administrations may agree that the Administration of destination will retain the charges collected from the called party and consider the call as originating in its own country for the establishment of international accounts.

4.4 The rules for the preparation and submission of accounts for phototelegraph transmissions shall be the same as for telephone traffic proper.

4.5 The rules for the preparation and submission of accounts for sound- and television-programme transmissions shall be the same as for telephone traffic proper, except that the accounts shall be prepared by the Administration responsible for collecting the charge. Unless otherwise agreed these accounts should be accompanied by supplementary documents in which each sound or television programme transmission shall be separately identifiable.

4.6 Amounts in payment for telephone directories may be included in the monthly telephone account, or may, by arrangement, be the subject of a separate account which should be established at least once a year.

4.7 In relations in which a relatively large volume of transit traffic is routed through one (or more) transit country(ies), and in particular in relations in which direct circuits exist between two terminal Administrations, the terminal Administration of arrival may, on occasion, request the terminal Administration of origin to send it directly, *for information*, a copy of the monthly account (or an extract from this account) relating to the transit traffic routes through a transit Administration, in order to know without delay the volume of the monthly traffic thus routed in transit.

## 5. *Queries relating to monthly accounts*

In the absence of a specific agreement, it is recommended that queries relating to monthly accounts should not be made unless the differences involved exceed those shown in the following table (where references to gold francs should be read as applying equally to other accounting units):

<i>Amount of the account</i>	<i>Difference exceeding</i>
a) less than 10 000 gold francs	a) 100 gold francs
b) from 10 000 to 300 000 gold francs	b) 1% of the sum of the accounts
c) more than 300 000 gold francs	c) 3000 gold francs

These limits shall apply separately to each of Forms 1 and 2 and separately also to:

- a) telephone traffic proper,
- b) sound- and television-programme and phototelegraph transmissions.

Queries shall not be further pursued once the difference involved no longer exceeds these limits.

A query may be justified, however, where a difference that does not qualify for query in an individual month appears to recur in subsequent months. In the case of a difference of opinion regarding the chargeable duration of a call or calls, the opinion of the Administration of origin shall prevail. Nevertheless, each Administration shall have the right to advise the Administration of origin of obvious errors in the monthly account.

## 6. *Adjustments and refunds*

For the accounting procedure in the case of adjustments and refunds see Recommendation E.271.

## 7. *Checks of accounting data*

Data relating to Forms 1 or 2 can be subject to sampling checks if the Administration of destination considers it desirable.

These traffic samples will be taken as follows:

On a given day the Administration of destination has observations made of a number of conversations chosen at random. For each of these, a determination is made of the route concerned, the time, the called subscriber's number, and on occasion the identity of the caller. (The first three factors can be obtained in semi-automatic service as well as in manual service.) Before noon on the following day the Administration of destination asks the Administration of origin to indicate the chargeable duration shown on the tickets for each of these calls.

An accounting check may also be made. In particular cases, where justified by the volume of traffic and by special agreement between Administrations, an official of the Administration receiving the account can visit the Administration which draws up the account, to see how the accounts are drawn up and to verify that the details of these calculations are as accurate as possible.

#### 8. *Keeping of vouchers*

The vouchers which have served for the establishment of accounts should be preserved until those accounts have been settled, or in any case for at least six months.

#### Monthly telephone account

##### FORM 1

Traffic from ..... To ..... For ..... 19.....

Month	Item	Number of minutes	Credit of B		Credit of C		Credit of D	
			Share of rate per minute	Total	Share of rate per minute	Total	Share of rate per minute	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		1405	2.40	3372.00	1.40	1967.00	1.20	1686.00
Totals. ....			—		—		—	

#### *Explanatory notes for Form 1*

1. In the heading, the Administration initiating the account in respect of transit traffic should insert the word "transiting" in place of "from".
2. If the account does not relate strictly to a calendar month (e.g. because of the arrangements for reading traffic meters in the automatic service), the period covered by the account should be shown.
3. Column (1), "Month" should contain the calendar month to which the data relates (e.g. in the case of transit traffic particularly, this would usually be earlier than the month of the account).
4. The form should have a "Credit of" column for each country to be remunerated.
5. Column (2) "Item" should be used and possibly sub-divided to specify any distinction required for international accounting purposes between zones of origin or destination, number of calls or call classification, special charges, etc. It may also be used to draw notice to the use of column (3) for recording number of calls or special charges rather than number of minutes.
6. Column (3), "Number of minutes", may be used to record either *a*/ minutes of conversation time or *b*/ minutes of charged time, according to the accounting procedure used. When minutes of charged time are recorded, any special charges equal to the charge for one minute or multiples thereof may be included.
7. Columns (4), (6) and (8) "Share of rate per minute" should show the amount for one minute payable to the Administration concerned.
8. Columns (5), (7) and (9), the "Total" should be obtained by multiplying the amount in columns (4), (6) and (8) respectively by the number of minutes in column (3).

## FORM 2

Traffic from ..... To ..... For ..... 19.....

Month	From	To	Classification	Number of		Gross accounting revenue	Share of rate per minute of call	Amount due to the "to" Administration
				Calls	Minutes			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Personal fee	100	—	450.00	2.25	225.00
			Full rate		400	800.00	1.0	400.00
Totals. ....								

## Explanatory notes for Form 2

1. In the heading, the name of the Administration initiating the account should be shown as the "From" country and the name of the Administration to whom the account is directed should be shown as the "To" Administration.
2. If the account does not relate strictly to a calendar month (e.g. because of the arrangements for reading traffic meters in the automatic service), the period covered by the account should be shown.
3. Column (1), "Month" should contain the calendar month to which the data relates.
4. Columns (2) and (3). These should contain a separate entry for each different combination of "from" Administration (or area), "to" Administration (or area) and call classification. Terminating and transit traffic should be grouped separately, and the latter should be further sub-divided between direct transit and switched transit if different accounting rates apply to each of these categories.
5. Column (4), "Classification" should contain the applicable classification used to determine the accounting rate. The terms used in this column may be abbreviated; e.g. "Personal fee" to "PF" or "*taxes afférentes aux conversations personnelles*" to "TCP".
6. Column (5), "Number of calls" may be used to show the number of calls where this is necessary for international accounting purposes and may also be used to report the number of special charges or other individual charge items that may be necessary.
7. Column (6), "Number of minutes", may be used to record either *a)* minutes of conversation time or *b)* minutes of charged time, according to the accounting procedure used. When minutes of charged time are recorded, any special charges equal to the charge for one minute or multiples thereof may be included.
8. Column (7) "Gross accounting revenue" should show the gross amount available for distribution where reporting of such data is agreed between Administrations concerned.
9. Column (8), "Share of rate per minute of call" indicates the share due to the "to" Administration and, where applicable, the Administrations beyond.
10. Column (9), "Amount due to the "to" Administration" should include the amount due to the "to" Administration and, where transit traffic is reported, amounts due to other Administrations for traffic routes to countries beyond the "to" Administrations.

**Recommendation E.271****ADJUSTMENTS AND REFUNDS**

The CCITT recommends that the following procedure for adjustments and refunds should be used in the international telephone service.

1. Any complaint made after the completion of an international telephone call which cannot be dealt with by operators shall be investigated by the international exchange of origin. According to circumstances, the other international exchange or exchanges concerned shall communicate direct to the international exchange of origin the information which may be necessary for the inquiry.
2. When a refund is granted, the international exchange responsible for charging is entitled to modify the entries in the documents used for the establishment of international accounts, if necessary after agreement with the other international exchanges concerned.
3. Any refunds granted to a subscriber which it has not been possible to deduct from the international accounts before they were sent out shall be borne by the Administration which levied the charge for the call in question. This provision does not cover the case of a collect call when the subscriber to whom it is charged claims that it was an ordinary call or that of an ordinary call when the caller to whom it is charged claims that it was a collect call. In both cases the international accounts may be adjusted subject to the consent of the Administrations concerned.

**Recommendation E.272****ACCOUNTING FOR CALLS CIRCULATED OVER INTERNATIONAL ROUTES  
FOR WHICH ACCOUNTING RATES HAVE NOT BEEN ESTABLISHED**

Normally, when calls are circulated over international routes for which accounting rates have not been established.

- these calls shall be treated in the international accounts as if they had been sent via the primary route, or
- if no relation has been opened between two terminal countries, they shall not be included in the international accounts, provided that the chargeable duration of such calls does not exceed:
  - 25 minutes of call per month in an intercontinental relation,
  - 100 minutes of call per month in a continental relation.

The Administration of origin shall be responsible for keeping check of the total duration of such calls and for arranging to remunerate the Administration concerned if the duration exceeds the above-mentioned limits.

However, if the amount of such traffic becomes significant or if, for any other reasons, any one of the Administrations involved wishes to have a proper accounting rate established, all the Administrations concerned should consult together and establish the accounting rate and divisions thereof to be used for such traffic.

**Recommendation E.273****DEFAULTING SUBSCRIBERS**

1. It is in the interest of Administrations to know of telephone subscribers coming from a country where they have not settled their telephone accounts, and also to render each other assistance in the recovery of amounts due from such debtors.
2. In view of the differences in the law in different countries, it would be very difficult to regulate this assistance.
3. It is therefore recommended that when a telephone subscriber has left the country in which he was a subscriber without settling his telephone account, and has taken up residence in another country which is known, the Administration of the country of origin should advise the Administration in the other country and ask this latter, on a reciprocal basis, to take such steps or make such arrangements as it thinks fit to obtain payment of the accounts outstanding.
4. The minimum amount of unpaid telephone bills, for the recovery of which the assistance of another Administration is requested, should be 100 gold francs. Any such request for assistance should be made within two years from the date on which the unpaid telephone bill was submitted.

One Administration may appeal to another in special cases even when the amount owed is less than 100 gold francs; for example, if a punishable offence is involved and it is considered necessary for reasons of principle to recover the debt.

**Recommendation E.275****TRANSFER IN ENCODED FORM OF MONTHLY INTERNATIONAL****ACCOUNTING INFORMATION****1. Introduction**

1.1 Under the provisions of Recommendations E.270, F.42 and F.67 Administrations engage in international accounting for telephone, telegram and telex traffic handled each month.

1.2 a growing number of Administrations are processing this monthly international accounting data using computer based accounting systems. Information is drawn from traffic history tapes or manually encoded from data such as inward international accounts and statistical summaries prepared by manual abstraction from copies of telegrams and telephone and telex tickets.

1.3 It is usual at present to complete computer processing by producing conventional printed accounts following the specifications described in the various accounting Recommendations (E.270 — telephone; F.67 — telex; F.42 — telegram). Where the receiving Administration also uses computer facilities, however, this information has to be re-encoded for processing through its system.

1.4 Transmission of data in encoded form avoids the decoding/re-encoding step. It also offers a faster transfer of information than by printed forms through the mail. The latter remains true even if the forwarding Administration has prepared the data by manual/mechanical means.

**2. Aim**

2.1 The aim of this Recommendation is:

2.1.1 to enable Administrations using computer based accounting systems to transfer information to each other in encoded form, without the need for decoding into conventional printed form and subsequent encoding into machine-readable form;

2.1.2 to enable other Administrations, if they so desire, to benefit from the greater efficiency of speedier transfer of information to them and to prepare themselves for the introduction of computer working by introducing transmission of data in encoded form in advance of installation of a computer.

2.1.3 facilitate provision of printed output from computer based systems in a format suitable for manual/mechanical processing where it is to be forwarded to Administrations not using computer facilities;

2.1.4 facilitate provision of printed output from manual/mechanical accounting systems in a format suitable for data encoding where it is to be forwarded to Administrations employing computer processing.

### 3. *Method*

#### 3.1 *Data record*

3.1.1 The aim of this Recommendation can be met by use of a standard data record format for the various elements of information to be transferred. The information elements and their sequence must be compatible with the provisions of the various accounting Recommendations so that decoding to and encoding from printed output for exchange of information with Administrations using manual/mechanical systems will be as simple as possible.

3.1.2 Between Administrations operating computer based accounting systems, adherence to the standard data record format for data transmission purposes will ensure that only one interface programme will be needed to enable any one computer installation to generate suitable input for, and accept output from, other computer installations.

#### 3.2 *Data transfer*

3.2.1 Procedures already exist for transfer of data in conventional (printed) form through the mails. Data in encoded form could be transferred by mailing of magnetic or paper tapes, paper tape transmission by telex or data transmission over circuits utilized for this purpose.

3.2.2 While mailing of tapes avoids the encoding task for the receiving Administration there can be delays and loss in transit. In addition, there can be difficulties caused by the fragility of paper tape and incompatibility of various forms of magnetic tape recording.

3.2.3 Transfer of data via the telex service using paper tape transmission and reception can be advantageous for Administrations whether they have computer based accounting systems or manual/mechanical systems. As both page copy and punched paper tape can be generated at the receiving point users of either type of accounting system can benefit. Page copy can be used for checking paper tape, with the latter becoming input to a computer. Page copy can also be used as the incoming international account avoiding the need for use of the postal service.

3.2.4 Where large volumes of data are to be exchanged, transmission over higher speed circuits offers significant benefits. Where suitable data links are in use for service transmissions these could be utilized. Data terminals and modems capable of transmission speeds in the range 600 to 2400 bits per second should be sufficient but higher speeds could be used. For manual/mechanical systems data received on data terminals can be reproduced as page copy representing an incoming international account. For computer based accounting systems data transmission offers the possibility of complete automation of the process by computer-to-computer transfer.

#### 4. *Specific recommendations*

##### 4.1 It is recommended that:

4.1.1 where possible data transferred in printed form should be placed in the order shown in 2. of the Annex to this Recommendation;

4.1.2 for transfer of data in encoded form, the standard data record format detailed in the Annex should be followed;

4.1.3 transmission of data in encoded form be by the following means:

4.1.3.1 use of the telex system;

4.1.3.2 use of data transmission over telephone circuits, dedicated telegraph circuits or special data links;

4.1.4 transmission speeds, operating practices and technical standards should be agreed between the Administrations concerned and should conform with the appropriate CCITT Recommendations.

#### 5. *Code maintenance*

The CCITT Secretariat is responsible for maintenance of the record of codes used for Item 3 of the Batch Header and Items 5, 6, 7, 8 (except F31, tariff indicators), 11 and 12 of the Detail Record shown in the Annex to this Recommendation.

New codes can be allocated by the authority of the Director of the CCITT. Applications should be made through the CCITT Secretariat which will arrange for notification of the new codes in the *Operational Bulletin*.



ANNEX  
(to Recommendation E.275)

**Monthly international accounting information  
Fixed record formats**

*1. Batch header*

Item Number	Contents	Field size	Justification	Fill	Comments
1	Record type identifier	3	—	—	Always <u>HDR</u>
2	Batch sequence number	3	Right	Zero	For a specific combination of two Administrations Reset to 1 after 999
3	Service type	2	Right	Zero	02 – Telephone 03 – Telex 04 – Telegram
4	Accounting month	4	—	—	Year and month of account — YYMM (January 01)
5	Administration sending data	6	Left	Space	Code as agreed bilaterally between the sending and receiving Administrations
6	Creation date	6	—	—	Year, month and day on which data tape created – YYMMDD
7	Administration receiving data	6	Left	Space	As for item 5
8	Filler	35	—	—	Space fill to give fixed size records

*2. Detail record*

Item Number	Contents	Field size	Justification	Fill	Comments
1	Origin	4	Left	Space	F.96 telegram country codes (and city codes if required). Use for telegram, telex and telephone services
2	Destination	4	Left	Space	
3	Route	2	Left	Space	
4	Year and month of service	4	—	—	Calendar year and month (January 01) YYMM
5	Payment indicator	1	—	—	1. Sent paid 2. Reversed charge (telephone)

Item Number	Contents	Field size	Justification	Fill	Comments
6	Service sub-type	1	—	—	1. Telephone, telex, telegram transmission 2. Sound programme 3. Television-video 4. Television-sound 5. Transit rentals 6. Switched Data
7	Rate level 1	1	—	—	For telephone: 1. Personal rate 2. Station rate 3. International subscriber dialling rate For telegram: Recommendation F.31 tariff class indicator
8	Rate level 2	1	—	—	For telephone or telex: 1. Full rate 2. Reduced rate A <sup>a</sup> 3. Reduced rate B <sup>a</sup>
9	Number of messages	8	Right	Zero	If required can also be used in conjunction with item 12 to record number of surcharges, etc.
10	Number of minutes/words	8	Right	Zero	
11	Monetary unit	1	—	—	1. New monetary unit to be selected by CCITT 2. Pound sterling 3. US dollars 4. Gold francs
12	Surcharges and other additional charges	1	—	—	Use this item in conjunction with a separate detail record and with total value recorded in item 13 1. Personal call telephone surcharges or fixed component of binary telegram charges 2. Conference call telephone charges 3. Messenger telephone charges 4. Mobile station charges — all services <sup>b</sup> 5. Reply paid telegram charges
13	Accounting rate	7	Right	Zero	Accounting rate share or other per unit charge due receiving Administration — 2 integer and 5 decimal places
14	Line value	11	Right	Zero	Accounting rate (item 13) × number of units (items 9 or 10) — or lump sum associated with additional charge code in item 12. 9 integer and 2 decimal places
15	Gross accounting revenue	11	Right	Zero	9 integer and 2 decimal places

<sup>a</sup> For telephone only.<sup>b</sup> For use until mobile station charges are abolished.

3. *Batch trailer*

Item Number	Contents	Field size	Justification	Fill	Comments
1	Record type identifier	3	—	—	Always <u>TRL</u>
2-6	(As for Batch header)	23	—	—	
7	Number of detail records in batch	6	Right	Zero	
8	Control total	12	Right	Zero	Hash total of all items 14 in <i>detail records</i> – 10 integer and 2 decimal places
9	Filler	21	—	—	Space fill to give fixed size records

*Notes*

1. New codes can be obtained from the Director of the CCITT. (Refer to 5. of the Recommendation.)
2. Items not used should be space or zero filled as appropriate.
3. In telex transmissions records may be followed by new line function characters. Records may also be terminated at the end of significant data by new line function characters and the remainder of the record will then be interpreted by the Administration receiving the data as space or zero fill as appropriate.

**Recommendation E.276**

**TRANSFER IN ENCODED FORM OF TELEPHONE REVERSED  
CHARGE <sup>1)</sup> BILLING AND ACCOUNTING INFORMATION**

1. *Introduction*

1.1 Under the provisions of Recommendation E.207 where the chargeable duration of a reversed charge telephone call is determined in the outgoing country, the details of the call should be transmitted promptly to the distant Administration to enable it to perform customer billing and in certain circumstances (Recommendation E.270, 4.3) initiate international accounting.

1.2 A growing number of Administrations are processing telephone call data using computer based accounting systems. Information is drawn from traffic history tapes or from manually encoded data such as telephone tickets. It is usual, at present, to convert computer output from this processing to conventional printed accounts for dispatch to other Administrations. Where the receiving Administration also uses computer facilities, however, this information has to be re-encoded for further processing.

<sup>1)</sup> The term "Reversed Charge" is used to mean collect, collect pay phone, credit card and third number paying calls.

1.3 Transmission of data in encoded form avoids the decoding/re-encoding step. It also offers a faster transfer of information than by printed forms through the mail. The latter remains true even if the forwarding Administration has prepared the data by manual/mechanical means.

## 2. *Aim*

2.1 The aim of this Recommendation is:

2.1.1 to enable Administrations using computer based accounting systems to transfer information to each other in encoded form, without the need for decoding into conventional printed form and subsequent encoding into machine-readable form;

2.1.2 to enable other Administrations, if they so desire, to benefit from the greater efficiency of speedier transfer of information to them and to prepare themselves for the introduction of computer working by introducing transmission of data in encoded form in advance of installation of a computer.

2.1.3 to facilitate provision of printed output from computer based systems in a format suitable for manual/mechanical processing where it is to be forwarded to Administrations not using computer facilities;

2.1.4 to facilitate provision of printed output from manual/mechanical accounting systems in a format suitable for data encoding where it is to be forwarded to Administrations employing computer processing.

## 3. *Method*

### 3.1 *Data record*

3.1.1 The aim of this Recommendation can be met by use of a standard data record format for the various elements of information to be transferred. The information elements and their sequence must be compatible with the provisions of Recommendation E.207, so that decoding to and encoding from printed output for exchange of information with Administrations using manual/mechanical systems will be as simple as possible.

3.1.2 Between Administrations operating computer based accounting systems, adherence to the standard data record format for data transmission purposes will ensure that only one interface programme will be needed to enable any one computer installation to generate suitable input for, and accept output from, other computer installations.

### 3.2 *Data transfer*

3.2.1 Procedures already exist for transfer of data in conventional (printed) form through the mails. Data in encoded form could be transferred by mailing of magnetic or paper tapes, paper tape transmission by telex or data transmission over circuits utilised for this purpose.

3.2.2 While mailing of tapes avoids the encoding task for the receiving Administration there can be delays and loss in transit. In addition, there can be difficulties caused by the fragility of paper tape and incompatibility of various forms of magnetic tape recording.

3.2.3 Transfer of data via the telex service using paper tape transmission and reception can be advantageous for Administrations whether they have computer based accounting systems or manual/mechanical systems. As both page copy and punched paper tape can be generated at the receiving point users of either type of accounting system can benefit. Page copy can be used for checking paper tape with the latter becoming input to a computer. Page copy can also be used as the source of information for preparation of customer billing in a manual/mechanical system.

3.2.4 Where large volumes of data are to be exchanged transmission over higher speed circuits offers significant benefits. Where suitable data links are in use for service transmission, these could be utilised. Data terminals and modems capable of transmission speeds in the range 600 to 2400 bits per second should be sufficient but higher speeds could be used. For manual/mechanical systems, data received on data terminals can be reproduced as page copy for the production of customer billing. For computer based accounting systems, data transmission offers the possibility of complete automation of the process by computer-to-computer transfer.

#### 4. *Specific recommendations*

##### 4.1 It is recommended that:

4.1.1 where possible data transferred in printed form should be placed in the order shown in 2. of the Annex to this Recommendation;

4.1.2 for transfer of data in encoded form the standard data record format detailed in the Annex should be followed;

4.1.3 transmission of data in encoded form be by the following means:

4.1.3.1 use of the telex system;

4.1.3.2 use of data transmission over telephone circuits, dedicated telegraph circuits or special data links;

4.1.4 transmission speeds, operating practices and technical standards should be agreed between the Administrations concerned and should conform with the appropriate CCITT Recommendations.

#### 5. *Code maintenance*

The Secretariat of the CCITT is responsible for maintenance of the record of codes used for Items 1, 2, 6 and 7 of the Detail Record shown in the Annex.

New codes can be allocated by the authority of the Director of the CCITT. Applications should be made through the CCITT Secretariat who will arrange for the notification of new codes in the *Operational Bulletin*.

ANNEX  
(to Recommendation E.276)

**Telephone reversed charge billing information  
Fixed record formats**

*1. Batch header*

Item Number	Contents	Field size	Justification	Fill	Comments
1	Record type identification number	3	—	—	Always <u>HDR</u>
2	Batch sequence number	3	Right	Zero	For a specific combination of two Administrations Reset to 1 after 999
3	Service type	2	Right	Zero	Always 01 for telephone reversed charge data
4	Administration sending data	6	Left	Space	Code as agreed bilaterally between the sending and receiving Administrations
5	Creation date	6	—	—	Year, month and day on which data tape was created YYMMDD (January 01)
6	Administration receiving data	6	Left	Space	As for item 4
7	Filler	30	—	—	Space fill to give fixed size records

*2. Detail record*

Item Number	Contents	Field size	Justification	Fill	Comments
1	Reversed charge type code	1	—	—	1. Collect 2. Credit card 3. Third party paying 4. Collect pay phone
2	Service date	4	—	—	Month and day of service in place of origin – MMDD (January 01)
3	Calling party number	11	Left	Space	National (significant) number
4	Called party number	11	Left	Space	National (significant) number
5	Rate level 1	1	—	—	1. Personal rate 2. Station rate
6	Rate level 2	1	—	—	1. Full rate 2. Reduced rate A <sup>a</sup> 3. Reduced rate B <sup>a</sup>
7	Charged duration	3	Right	Zero	Time to be paid for. Individual calls of over 999 minutes to be handled manually
8	Connect time	4	—	—	Time call connected in the place of origin 0000 through 2359

Item Number	Contents	Field size	Justification	Fill	Comments
9	Route	6	Left	Space	To indicate primary route has been used record, no data against this item (space fill still required). To indicate a route other than the primary, use the appropriate country code: – include the 3rd digit for country code 21, – include NPA code (and NPX code, if necessary) for World Numbering Zone 1
10	Charged number/credit card	13	Left	Space	National (significant) number or credit card number – use when charges are not to called number (item 4)
11	Additional charges	1	–	–	Additional charges to be collected: 1. ADC (advice of duration of call)

<sup>a</sup> For telephone only.

### 3. Batch trailer

Item Number	Contents	Field size	Justification	Fill	Comments
1	Record type identification	3	–	–	Always <u>TRL</u>
2-6	(As for Batch header)	23	–	–	
7	Number of detail records in batch	6	Right	Zero	
8	Control total	7	Right	Zero	Total of all items 7 in <i>detail record</i>
9	Filler	17	–	–	Space fill to give fixed size records

#### Notes

1. New codes can be obtained from the Director of the CCITT. (Refer to 5. of this Recommendation.)
2. Items not used should be space or zero-filled as appropriate.
3. In telex transmissions records may be followed by new line function characters. Records may also be terminated at the end of significant data by new line function characters and the remainder of the record will then be interpreted by the Administration receiving the data as space or zero fill as appropriate.

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## DIVISION B

### RECOMMENDATIONS NORMALLY APPLYING ONLY TO EUROPE

#### Recommendation E.290 R

##### ACCOUNTING SYSTEMS IN THE INTERNATIONAL AUTOMATIC TELEPHONE SERVICE

In the international automatic service in Europe, the charge will, in general, be automatically registered on subscribers' meters and Administrations will no longer have tickets available for working out the distribution of charges on the basis of the chargeable duration of calls.

Although technically possible, the recording, for international accounts, of the chargeable duration of each effective call would require the installation of new equipment which does not seem justified with the sole object of establishing international accounts. The various systems used for charging subscribers would also result in different chargeable durations for the same traffic.

In these circumstances, after the question had been studied in the period 1957-1960, the IIInd Plenary Assembly of the CCITT (New Delhi, 1960) recommended the application of certain provisions concerning continental telephone accounts. These provisions, applying only to Europe, were embodied in a Recommendation last published in the *White Book* (Mar del Plata, 1968) as number E.280 (Q.50). In view of the new international accounting system described in Recommendation E.250, former Recommendation E.280 was revised when Volume II.2 of the *Green Book* (Geneva, 1973) was prepared.

The new provisions, revised in the light of Recommendation E.250, read as follows:

1. International accounts for traffic in automatic service should be drawn up on the basis of the total of all call durations measured in the international exchanges of the country of origin on the appropriate meters or equivalent devices. A charge in gold francs per minute of call duration, valid in both directions of the relation, will be fixed by agreement between Administrations on the basis of the international standard tariffs in Recommendations D.200 R (Volume II.1 of the *Orange Book*).

Exceptions to this general rule may occur in the following cases:

- a) When the Administrations concerned agree to dispense with accounts or to adopt lump-sum settlement.
- b) When one or both of the Administrations concerned already possess equipment capable of showing the chargeable durations incurred by the subscribers. The accounts prepared on these bases must give the same result as if the call durations had been measured.
- c) When in automatic international service either or both of the Administrations concerned use a national type of simplified code-signalling system which makes it impossible to assess the call durations without excessive complications, the Administrations shall measure the total holding time of the outgoing international circuits. In that case, a correction factor shall be applied to the measured holding time values in order to obtain the real call duration which should have been measured as a total on the outgoing international circuits. The correction factors to be applied must be determined by agreement between the Administrations concerned.

2. International accounts for semi-automatic traffic shall be established on the same basis as those for automatic traffic (see Recommendation E.250, 2.2).

3. To take account of the special system of charging for frontier relations (reduced charges between neighbouring frontier zones), special steps will have to be taken to discriminate between automatic calls in frontier relations and other automatic calls. This discrimination will be made every time that frontier traffic is routed wholly or partly (overflow) by international circuits having devices for measuring call duration.

This discrimination will, in general, necessitate:

- a) a more complete analysis of the national (significant) number of the called subscriber than the one which is quoted in Recommendations E.161, and
- b) the determination of the origin of the calls, since frontier charges depend on the distance between the outgoing and the incoming frontier zones.

4. Measurement of the call duration on meters shall be made according to country of destination. When the country of destination comprises several charging zones, these measurements will ordinarily be made according to the charging zone.

5. The measurement of call durations made by the international exchange in the country of origin to a given country of destination shall not distinguish between the routes involving different transit countries, provided that the traffic is transmitted over direct circuits which constitute the normal route. For accounting purposes, the total volume of traffic sent by each route is assumed to be proportional to the number of circuits in service on the 15th of each month on each route.

6. The provisions of Recommendation E.250 shall be applied whenever the traffic is routed via a transit exchange in another country.

It is to be noted that when Recommendation E.280 was prepared in 1960 the following rule was permitted to simplify matters and to avoid the need for an analysis of routes actually taken by a call beyond a transit exchange when several routes passing through different countries to the destination in question are possible from the transit exchange:

"The distribution of transit traffic over these different routes shall be taken to be the same as the distribution of traffic originating at the transit exchange for the destination concerned."

7. In international accounts the traffic expressed in minutes relating to test calls, service calls and calls terminating at wrong numbers should not be deducted, since the overall duration of these various types of call is very small in relation to the total traffic.

Nevertheless, when the percentage of wrong numbers due to faults in the equipment in the country of destination is greatly in excess of what is regarded as a reasonable percentage in a service of good quality, the Administration in the country of origin will be entitled to make certain deductions, in agreement with the Administration of the country of destination.

When free calls are allowed, for example during international telecommunication conferences, deductions may be made in the international accounts by the Administrations of the country on whose territory the conferences are held.

8. The arrangements concerning the acceptance of international accounts as defined in the *Telephone Regulations* (Article 8, Accounting) are applicable to automatic traffic.

Accounts shall be drawn up monthly but, to avoid errors which might be serious in the event of the meters being faulty, the call duration meters shall be read every day.

9. It is not essential that call duration meters be read at midnight on the last day of the month: it will suffice if they are read on the last day of the month at the most convenient time. Should the last day of the month not be a working day, these meters can be read the day before or the day after.

The monthly account forwarded to the other Administrations shall show the day on which meters were read. It ought to be possible to arrange for all meters in an exchange to be read on the same day, since there are relatively few circuits on which call duration meters have to be read.

10. The degree of accuracy of the call duration measurement equipment shall be  $\pm 2\%$  with a confidence limit of 95%, on the understanding that the result is obtained for a set of measurements covering an adequate number of calls, which, in light traffic relations, may lead to acceptance of the fact that  $\pm 2\%$  accuracy should be obtained on the overall measurements for the year, but not for each of the partial measurements made during that year (monthly measurements, for example, if the monthly interval is retained for the establishment of international accounts).

**Recommendation E.291 R****CHARGES FOR CALLS CARRIED BY EMERGENCY ROUTES**

1. The call charges for conversations exchanged over emergency routes are the same as for use of the primary route.
2. Calls exchanged over emergency routes always enter into the international accounts for their full chargeable duration.
3. When an emergency route is used, the total charge for the primary route (between first charging zones of the terminal countries) is divided equally between the various Administrations concerned in the emergency route under consideration: that is to say that all these Administrations receive an equal part, whatever the nature or the length of the circuits used. (When the network of destination is beyond the first charging zone, the Administration of the country of origin should carry into the account for the Administration of the country of destination a portion of the charge equal to the difference between that appropriate to the situation of the network of destination and the charge for the first zone.) In order to permit the application of this procedure in the case of a call involving an international transit exchange, it is necessary for the operator at the transit exchange to indicate each time to the operator at the international exchange of the country of origin the emergency route used.

*Examples:*

Service *Netherlands-France*: Emergency route: Amsterdam-Zürich (passing through Belgium and France) and Zürich-Paris.

Total charge for the primary route (between first zones): 2.60 gold francs.

Division when the emergency route is used: Netherlands, Belgium, Switzerland, France:  
each  $2.60/4 = 0.65$  gold franc.

Service *Belgium-Great Britain*: Emergency route: Bruxelles-Amsterdam-London.

Total charge for the primary route (between first zones): 3.00 gold francs.

Division when the emergency route is used: Belgium, Netherlands, Great Britain:  
each  $3.00/3 = 1.00$  gold franc.

4. When it is necessary to use a land or submarine emergency route, because of the interruption of the primary land (or submarine) route providing an extension of an intercontinental circuit the total charge relative to the land (or submarine) route between the terminal of the intercontinental station and the terminal exchange is divided in conformity with the rules outlined in 3. above.

**Recommendation E.292 R****UTILIZATION BY PUBLIC UTILITIES OF CONTINENTAL TELEPHONE CONNECTIONS WHICH ARE THEIR PROPERTY**

(This Recommendation applies to continental telephone connections set up by public utilities for the generation and distribution of electric power and to continental telephone connections set up on railway property, provided that these telephone connections are constructed and operated by the public utilities concerned.)

1. It has been noted:

that private continental telephone connections can be indispensable to certain public services (the term "public service" includes not only state services but also organizations providing services of general interest, such as those generating and distributing electric power, etc.);

that, nevertheless, these continental telephone connections permit the exchange of conversations outside the general public telephone service, which constitutes a certain privilege;

that, in consequence, this justifies some control of the use made of these circuits and also requests for compensation for their use.

2. It is therefore recommended that Administrations which authorize the establishment and use of private continental telephone connections for a public service (connections set up and operated by the public service) should be guided by the following principles:

2.1 The use of private continental telephone connections should be made the subject of an agreement between the proprietors of the different sections of the connections on the one hand, and between the Administrations of the countries over whose territories the sections are constructed, on the other hand.

2.2 The public services authorized to use these private continental telephone connections should agree to exchange over them only messages relating exclusively to their business and never to permit their use by third parties.

2.3 Technical limitations (regulations relating to the installations, authorized types of apparatus) should be imposed in order to prevent such continental telephone connections obtaining access (directly or indirectly) to the lines and circuits of the general telephone network.

2.4 The Administrations concerned reserve the right to exercise, by any suitable means, all technical or other controls which they consider desirable.

2.5 The Administrations concerned always reserve the right to withdraw the authority to use such connections if abuses occur or if a superior interest justifies it.

2.6 In order to compensate Administrations to some extent for the loss of revenue resulting from the privilege granted to the users of such private continental telephone connections, the Administrations concerned will charge a minimum annuity of 12 gold francs per kilometre of circuit used on their own territory, the payment of this annuity falling upon the proprietors of the circuits used. Each Administration will itself determine the length of the circuits to be taken into consideration, taking account of the point where the circuit crosses the frontier and the point or points from which the circuit(s) can be used.

*Note.* — In the event of a case occurring of a group of circuits constituting a real telephone network over an extensive territory, to meet the needs of a particular public service, it is desirable that this service should send to all the Administrations concerned a plan of the network showing the various centres of activity of this public service and the telephone switching exchanges.

## **PART III**

### **Series E Recommendations (E.300 to E.330)**

#### **SPECIAL SERVICES UTILIZING THE INTERNATIONAL TELEPHONE NETWORK (Operating, charging and accounting)**

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## SECTION 1

### GENERAL

#### Recommendation E.300

#### SPECIAL USES OF CIRCUITS NORMALLY EMPLOYED FOR AUTOMATIC TELEPHONE TRAFFIC

The CCITT considers

- a) that special services exist which occasionally require the provision of telephone circuits for uses such as:
  - reserve circuits for v.f. telegraphy,
  - circuits for phototelegraph transmissions,
  - control circuits for programme transmissions,
  - leased circuits (other than permanent full-time leases);
- b) that the international telephone service is becoming more and more automatic, and that only a few manual circuits will be kept to form a reserve network;
- c) that it is therefore necessary to provide automatic circuits for special uses other than telephony;
- d) that telephone circuits assigned for special uses must, when needed, be made available to the special services as rapidly as possible;
- e) that it must be guaranteed that, after the circuits have been used for a special purpose, they will be returned to the telephone service without delay;
- f) that the switching of circuits for special purposes should not disturb the operation of telephone service.

The following provisions are therefore to be observed:

1. In an international telephone relation, the number of automatic circuits assigned for special purposes should be in reasonable proportion to the total number of circuits, so that their occupation will not hamper the flow of automatic telephone traffic.
2. Circuits to be used for special purposes should be passed at the outgoing and incoming ends through transfer panels on which the wanted circuit is disconnected manually from the telephone equipment and connected to the terminal of the special service concerned.

Alternatively, circuits assigned for special uses should be fitted, in the telephone equipment, with a device for automatic switching to the transfer panel of the special service, the operation being commanded by the latter. (This method is preferable because with the first method a telephone call could be interrupted if proper care is not exercised.)

3. The switching operations should take place under the control of the outgoing international maintenance centre (IMC). The IMC may delay or limit the provision of telephone circuits for other purposes, particularly when restrictions are imposed on the telephone traffic.

4. The following arrangements should be followed when special connections are set up and cleared:

4.1 The occupation of a telephone circuit for a special purpose should be marked on the transfer panel at the outgoing end; conversely, if such a circuit is in fact engaged, it must be marked busy in the telephone switching equipment.

4.2 A circuit assigned to a special use may not be taken for the service in question if a telephone call is in progress. However, arrangements should be made to ensure that the circuit cannot be engaged by another telephone call when the call is over (*preliminary blocking*).

4.3 The circuits in a group of telephone circuits that are reserved for special uses should be last-choice circuits, to reduce the risk of finding them busy when required.

4.4 When a circuit is free, the supervisor in charge of the transfer panel at the outgoing end takes the necessary steps to withdraw the circuit from the telephone service. The responsible supervisor at the incoming end is then asked to make the necessary operations if the telephone equipment is not disconnectable by remote control.

4.5 While awaiting notification from the incoming end of completion of transfer to the special service, the outgoing supervisor tests the connection before making it available for its new functions.

4.6 The same procedure is followed at the outgoing end when the circuit is restored to the telephone service. To prevent a subsequent telephone call from being ineffective, care must be taken to clear the special call at the incoming end first.

5. Bookings of leased circuits or order lines for programme transmissions are arranged in advance and are not urgent. The delays required by the connection of two circuits in tandem when a connection is operated entirely in automatic transit give rise to no particular difficulties.

6. Where telegraph systems are concerned, the primary requirement is rapid replacement of the faulty v.f. bearer circuit. In view of the delay which would occur in employing two separate links to form a reserve circuit, it appears that in relations in which automatic transit switching is the normal method of operation, a direct circuit should be retained.

Such a direct circuit could be manual or automatic. An automatic circuit would normally be used to carry the telephone traffic. It should be noted that this will then be used as a first-choice route and will thus carry the heaviest load. The risk of finding it busy, when needed, will therefore be at its maximum.

In such circumstances, preliminary blocking of the wanted circuit should be effected (see 4.2 above). As long as the equipment is unable to perform this operation it will be preferable to keep one manual direct circuit.

7. The delay in establishing phototelegraph calls via an international phototelegraph position transit centre (transit IPP) is not so critical. In this case, application of Recommendation E.320 will speed up the placing of two circuits end to end at the transit centre to establish the connection, and it will not be necessary to keep direct circuits in relations where automatic switching is the method normally used for telephone calls in transit.

8. The same circuit should not be assigned to more than one special service, so that the various transfer panels for such services may be placed separate from one another should the terminal country so wish.



## SECTION 2

### PHOTOTELEGRAPHY

#### Recommendation E.320

##### SPEEDING UP THE ESTABLISHMENT AND CLEARING OF PHOTOTELEGRAPH CALLS

When international phototelegraph calls are sent over telephone circuits, the total time of occupation of the circuit often greatly exceeds the duration of the phototelegraph call itself.

It is also important that telephone circuits should be held for as short a time as possible.

The CCITT therefore recommends to Administrations to bear the following directives in mind whenever it is technically practicable:

1. Telephone circuits intended for phototelegraph transmissions should, at terminal repeater stations, pass through panels at the international phototelegraph position (IPP) enabling these circuits to be disconnected from the telephone service equipment and interconnected or connected to phototelegraph stations. Before switching on this circuit, it must be ensured that no telephone calls are in progress <sup>1)</sup>. If there are calls, the circuit must be blocked as soon as the telephone call is over (*preliminary blocking*).
2. The calling phototelegraph position must be ready to call the corresponding phototelegraph position over the telephone circuit as soon as it notes that the chosen circuit has been cleared. The calling signal should automatically disconnect the telephone equipment from the circuit at the called end. The circuit is thus immediately available for the establishment of a phototelegraph call.
3. If the called phototelegraph position has to be obtained through a transit phototelegraph position, the procedure outlined above is applied successively to the two circuits which are to be interconnected.
4. The same signal (see 2. above) can also be used to invite the incoming, and possibly the transit, IPP to enter the line:
  - if there are difficulties, or
  - to signal the end of transmission.

*Note.* — The calling frequency  $f_2$  used for phototelegraphy should be different from that used for telephone signalling  $f_1$ . In the case of automatic or semi-automatic telephone circuits, frequency 500/20 Hz will be adopted as the signalling  $f_2$  frequency for phototelegraphy.

#### Recommendation E.321

##### RATES FOR PHOTOTELEGRAMS AND PRIVATE PHOTOTELEGRAPH CALLS

(See Recommendation F.83 in Volume II.3, Section 6)

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<sup>1)</sup> At the time agreed upon with the telephone service, if such a previous agreement is considered to be necessary by the telephone operating services.

**Recommendation E.322**

**PROVISIONS RELATING TO PRIVATE PHOTOTELEGRAPH CALLS**

(See Recommendation F.80 *bis* in Volume II.3, Section 6)

**Recommendation E.323**

**RULES FOR PHOTOTELEGRAPH COMMUNICATIONS SET UP  
OVER CIRCUITS NORMALLY USED FOR TELEPHONE TRAFFIC**

(See Recommendation F.82 in Volume II.3, Section 6)

## SECTION 3

### INTERNATIONAL SOUND- AND TELEVISION- PROGRAMME TRANSMISSIONS

#### Recommendation E.330

#### SOUND- AND TELEVISION-PROGRAMME TRANSMISSIONS

##### 1. *General*

In most cases, circuits used for sound- and television-programme transmissions are owned by Administrations although in some countries national broadcasting organizations own all or part of the circuits within national boundaries.

The provision of circuits for transmissions between two or more countries requires the closest cooperation between:

- the broadcasting organizations <sup>1)</sup> concerned in a sound- or television-programme transmission, either as users or owners of sound-programme and television circuits or both, and
- the Administrations concerned.

It is therefore recommended that the following principles for ordering and charging should be observed for international sound- and television-programme transmissions.

This Recommendation is intended to cover the use of facilities for sound- and television-programme transmissions only and not for other types of transmissions.

This Recommendation does not include provisions for the leasing for periods of one day or more of sound- and television-programme circuits, which are subject to the provisions of Recommendation D.4 and Recommendation D.310 R, Volume II.1 of the *Orange Book*.

Provisions governing the technical aspects and maintenance of sound and television programmes and associated circuits are contained in the J, M and N Series Recommendations.

##### 2. *Definitions*

The terms used in connection with sound- and television-programme transmissions, as defined below, apply to all such transmissions.

##### 2.1 programme booking centre (PBC) [formerly known as Controlling Service, in French "Service centralisateur", in Spanish "Centro de reserva de programas (CRP)"]

The office of an Administration (or broadcasting organization where circuits are provided for international service by such an organization) which receives orders for international circuits for sound and/or television programmes from broadcasting organizations in its own country or from a broadcasting organization in another country or from the PBC of another Administration and is charged with the task of making appropriate arrangements for providing the ordered circuits.

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<sup>1)</sup> Any reference to broadcasting organizations in this Recommendation applies equally to other users.

**2.2 international sound programme centre (ISPC)** [in French "Centre radiophonique international (CRI)", in Spanish "Centro radiofónico internacional (CRI)"]

A centre at which at least one international sound programme (audio) circuit terminates and in which international sound-programme connections can be made by the interconnection of international and/or national sound-programme circuits.

The ISPC is responsible for setting up, lining up and maintaining international sound-programme links and for the supervision of the transmissions made on them.

**2.3 international television programme centre (ITPC)** [in French "Centre télévisuel international (CTI)", in Spanish "Centro internacional de television (CIT)"]

A centre at which at least one international television circuit terminates and in which international television connections can be made by the interconnection of international and/or national television circuits.

The ITPC is responsible for setting up and maintaining international television connections and for the supervision of the transmissions made on them.

The centre at the end of a satellite television circuit is sometimes referred to as the satellite international television-programme centre (SITPC).

**2.4 broadcasting organization**

A broadcasting organization is an organization which is concerned with either or both sound and television broadcasting.

Most of the customers ordering facilities for sound- and television-programme transmissions are broadcasting organizations, and for convenience, the term broadcasting organization is used in this Recommendation to denote activity of any user or customer, and where so used, is equally applicable to any other customer requiring sound- or television-programme transmissions.

**2.5 Categories of transmissions**

**2.5.1 regular transmissions** are those which take place at regular intervals, at fixed times between the same points. Some regular transmissions may be subject to special contractual arrangements.

**2.5.2 occasional transmissions** are all those which do not fall within the definition of regular transmissions.

**2.5.3 simple transmissions** are one-way transmissions from a point of origin in one country to a receiving point in another.

**2.5.4 multiple transmissions** are those transmissions which originate in one or more countries, from one or more points of origin, and are transmitted simultaneously to two or more countries.

**2.6 Categories of circuit**

**2.6.1 sound-programme circuit** is a unidirectional circuit, for the transmission of a sound programme or a sound component of a television programme <sup>2)</sup>. The various types of audio circuits are described in 3. below.

**2.6.2 television circuit** is a unidirectional circuit for the transmission of the video component of a television programme.

**2.6.3 control circuit** is a telephone-type circuit which may be used by a broadcasting organization for the supervision and/or coordination of a sound- or television-programme transmission <sup>3)</sup>.

<sup>2)</sup> More than one such audio circuit may be required for association with a single television circuit.

<sup>3)</sup> More than one such control circuit may be required for association with a single television circuit.

## 2.7 Constitution of sound- and television-programme connections

2.7.1 An international sound- or television-programme connection is a unidirectional path between broadcasting organizations and consists of:

- the point to be regarded as that of the origin of the transmission (Point A of Figures 1/E.330 and 2/E.330);
- the outgoing national circuit which connects Point A to the first ISPC or ITPC (Point B);
- an international link comprised of any combination of international or national terrestrial, submarine cable, HF radio or satellite circuits or circuit sections; a satellite circuit consists of a satellite section, including the earth stations, extended by terrestrial means to the ISPCs or ITPCs at the ends of the satellite circuit;
- the incoming national circuit which connects the last ISPC or ITPC (Point C) to Point D;
- the point of destination of the transmission (Point D).

The various parts of international connections are illustrated in Figures 1/E.330 and 2/E.330.

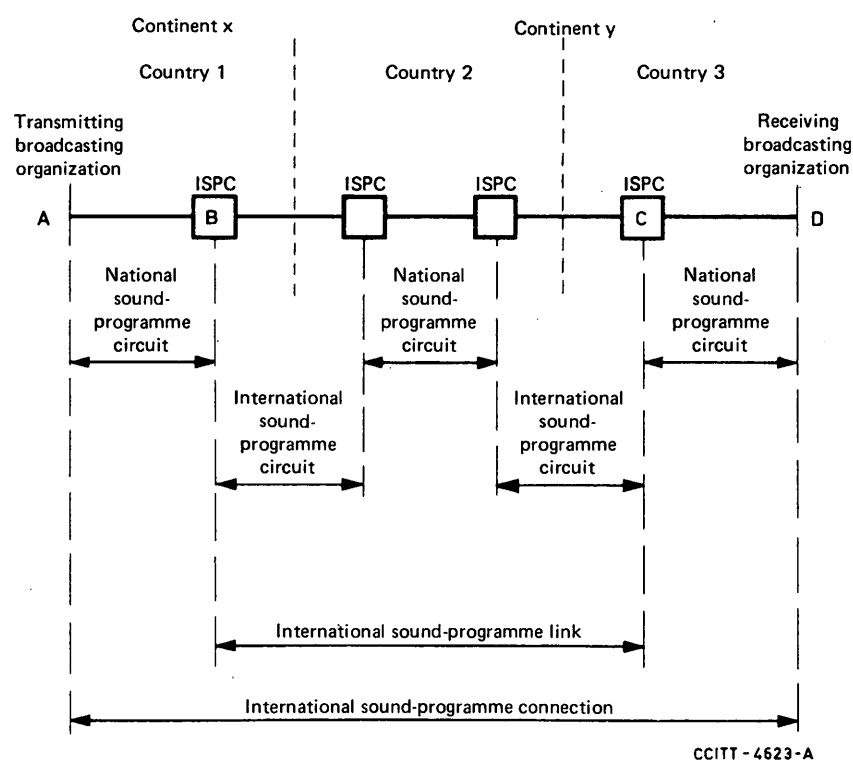


FIGURE 1/E.330 – Example of an international sound-programme connection

2.7.2 The complete chain between A and D, including the international link B-C and the local ends (A-B and C-D) is the *international sound- or television-programme connection*.

2.7.3 Points A and D are, as a general rule, under the control of the originating and receiving broadcasting organizations.

Points B and C are, in principle, under the control of the Administrations of the corresponding countries.

The link B-C is generally under the control of the Administrations but certain of its component parts (which may be national or international circuits) and some ISPCs and ITPCs may be owned or operated by broadcasting organizations.

The local ends A-B and C-D may be under the control of either an Administration or a broadcasting organization, or both jointly, according to the actual arrangements in the countries concerned.



Detailed technical parameters of some types are given in the J and N Series Recommendations (Volumes III and IV.1).

A stereophonic pair consists normally of two very wide-band circuits, which must be carefully matched. Each circuit of a stereophonic pair may also be used separately for monophonic transmissions.

3.2 Narrow-band audio circuits may be ordinary telephone circuits. They are provided in varying forms, but are routed through the ISPC for setting-up and maintenance. When provided on a 4-wire basis, the return path may be used as a unidirectional control circuit.

3.3 The five types of circuit in 3.1 above provide for the continued use of existing facilities (e.g. circuits with a top nominal transmitted frequency of 6.4 kHz, both "old" and "new" types, would be medium-band circuits as well as those with a top nominal frequency of 5 kHz) as well as future requirements, and apply equally:

- for both sound- and television-programme transmissions, and
- for terrestrial, submarine cable, HF radio and satellite circuits.

3.4 Administrations may decide to provide only those sound circuits of the five types for which sufficient customer demand is indicated.

3.5 When an Administration cannot provide the type of circuit that is ordered, if time permits, it will inform the broadcasting organization of the type of circuit that can be made available. When time does not permit consultation with the broadcasting organization, the Administration should provide a circuit of the nearest suitable type available.

#### 4. *Ordering of circuits and conditions of acceptance*

##### 4.1 *Orders*

4.1.1 Orders for the use of circuits for sound- and television-programme transmissions should normally be addressed by a broadcasting organization to the Administration of its country. The broadcasting organizations concerned should coordinate their arrangements before placing orders for circuits. Orders for all the circuits to be established should usually be placed by the broadcasting organization which is to receive the transmission.

4.1.2 With prior agreement of the broadcasting organizations concerned, and particularly for some multiple transmissions, orders may be placed with the Administration of the country in which the transmission will originate or of any intermediate transit country.

4.1.3 When agreement has been reached on the orders to be placed, the originating broadcasting organization should provide its Administration with a list, for information purposes, of all the circuits to be established. Provision of this list does not constitute an order for circuits. In addition, if the broadcasting organizations concerned have appointed a coordinating centre for a transmission, it should send a list of all circuits to be established to the Administrations concerned (see Recommendation N.52).

4.1.4 Each order, which should be clearly identified as such, carries with it an undertaking to pay all the charges relating to the use of the facilities ordered, including any cancellation fee or special expenses which may be incurred in connection with the order.

If time permits after an order has been placed, an estimate of any special expenses which are likely to be a major part of the total should be given to the broadcasting organization.

4.1.5 Orders for the use of circuits will be met subject to availability of facilities. The programme booking centre (PBC) receiving orders should confirm acceptance and availability of circuit as soon as possible unless special arrangements have been made nationally between the Administration and the broadcasting organization which has placed the order. When time permits, orders and confirmations should normally be in written form (e.g. telex).

4.1.6 It is in the interest of both broadcasting organizations and Administrations that orders should be placed as soon as possible, preferably at least 24 hours before the transmission is scheduled to take place. Administrations should always do their best to provide circuits at shorter notice. Broadcasting organizations should always do their best to place orders as early as possible, particularly in those cases where special construction of facilities will be required.

#### 4.2 *Handling of orders received by Administrations*

4.2.1 The Administration receiving an order is responsible for passing the order to all other Administrations concerned and for obtaining from them confirmation of the availability of the circuits and facilities required.

4.2.2 Facilities for sound- and television-programme transmissions should be allocated in the sequence in which orders are received.

4.2.3 For television-programme transmissions via satellite:

- a) the Administration receiving the order is responsible for arranging the circuits between the broadcasting organization and the appropriate ITPC at the end of the satellite circuit (SITPC);
- b) the Administration operating this ITPC is responsible for confirming the availability of the satellite circuit and for ordering its portion of that circuit; and
- c) the Administration operating the ITPC at the other end of the satellite circuit is responsible for ordering its portion of the satellite circuit and for arranging the circuits between its ITPC and the other broadcasting organization.

This procedure normally applies also to sound and control circuits provided by means of satellite channels specially assigned for use in association with television transmissions but not necessarily to other sound circuits provided via the satellite or to sound circuits provided by any other means, e.g. submarine cable.

#### 4.3 *Cancellations*

4.3.1 A cancellation fee may be charged by Administrations if, for reasons not within their control, the order is cancelled:

- a) less than 24 hours, but more than 2 hours, before the time scheduled for the beginning of the transmission (see 4.3.2 below); or
- b) less than 2 hours before the time scheduled for the beginning of the transmission (see 4.3.3 below).

The time to be considered in determining these limits is the time at which the broadcasting organization submits its cancellation request to the PBC which received the original order.

4.3.2 The fee with regard to a) above should be such as to cover the administrative expenses already incurred by Administrations following receipt of the order. This should provide some incentive to broadcasting organizations to cancel orders in sufficient time for the circuits concerned to be made available to another customer. This fee should not be charged unless the order has been accepted and confirmed by the Administration concerned.

4.3.3 The fee with regard to b) above should be such as to cover, in addition to the expenses referred to in 4.3.2, any additional preparation for the transmission, and to compensate in part for loss of revenue which might have been obtained by making the circuit available to another customer. This fee may be charged whether or not the order has been confirmed by the Administration concerned.

4.3.4 In all cases, Administrations may require reimbursement of any documented special expenses incurred, e.g. in the provision of specially engineered circuits, even when the transmission is cancelled with more than 24 hours notice.

#### 4.4 *Alterations in orders*

An alteration to an order for which the Administrations are not responsible should be considered as a new order which cancels the original one. The original order is therefore subject to the cancellation fee referred to in 4.3 above when the alteration request is made within the specified time limit, except that no fee is payable in respect of:



- a) a change of less than a total of 2 hours in the time scheduled for the beginning of the transmission, regardless of the number of individual alterations;
- b) a change in the scheduled time such that the new transmission period overlaps the original period;
- c) a change in the overall duration of the programme;
- d) a change in the routing of circuits beyond the extremities of the international link provided that no alteration whatsoever is requested in the international link.

## 5. *Charging principles*

The total charge for an international programme-transmission is the sum of the charges for the various circuit sections (see 2.7 above and Figures 1/E.330 and 2/E.330).

The international charges should normally have two basic elements:

- 1) a fixed charge designed to cover preparation and operation, and
- 2) a charge based on duration of the connection.

The fixed charge may include a minimum duration of use.

In view of the great disparity in the cost of the various components of, on the one hand, terrestrial circuits of the type used mainly within continents and, on the other hand, satellite and long-distance submarine cable circuits used mainly for intercontinental relations, it is not possible to recommend one single method for developing the charges for each individual section.

Administrations which of necessity operate using more than one method of charging should define the interconnecting points for the application of the different methods. This should normally be an ISPC or an ITPC.

Whenever possible the same method of charging should be used within the same region.

### 5.1 *Charging for sound- and television-programme transmissions except those for transmissions via satellite, HF radio or intercontinental submarine cable circuits*

#### 5.1.1 The charge normally should be made up of the following elements:

- a) a fixed charge for the preparation and operation per transmission and per country having an interconnecting point (whatever the number of interconnecting points within the terminal and transit countries);
- b) a charge per minute of transmission per terminal country, which may be expressed differently for:
  - a sending terminal,
  - a receiving terminal,
  - a branching terminal in a multiple transmission;
- c) a charge per minute of transmission and per interconnecting point in a transit country;
- d) a charge per minute of transmission based on the length of line;
- e) any special expenses incurred in the setting up of special circuits to connect with existing facilities and any special charges for use of national facilities not covered by the charges of a) and d) above.

5.1.2 The use of a sound circuit established on a sub-carrier of a channel used for television transmission is charged as for a sound circuit provided for an independent sound-programme transmission.

5.1.3 In principle, use of different types of sound circuits to make up an international sound-programme link should be avoided. However, if it is necessary to use different types of circuits for any section of link, the charge applicable to all sections would be that for the lowest quality type used. The sharing of charges between Administrations should be on the basis of the lowest charges applied.

If a broadcasting organization orders a higher quality audio circuit for a particular section of the link, the charges for that higher quality type would apply to that section.

5.1.4 If a sound-type circuit is provided for use as a sound-programme circuit, items *b)*, *c)* and *d)* in 5.1.1 above may be combined in a charge related to the charge for an appropriate telephone call in the relation concerned.

*Note.* — This does not obviate the need to pay the charges at *a)* and *e)* as appropriate.

When a circuit provided on a 4-wire basis is used for programme transmission in one direction and for supervision and/or coordination in the other direction (see 3.2 above) an additional charge may be made.

5.1.5 A multiple transmission, where the programme is routed over an interconnected network of international circuits and is received simultaneously in several countries, is considered, from the charging point of view, as separate transmissions:

- from the point of origin to the first receiving terminal;
- from the first receiving terminal to the next receiving terminal, and so on;
- from a branching point across a circuit between two terminals to the next receiving point.

5.1.6 Broadcasting organizations should arrange among themselves which will pay charges for common sections of circuit in multiple transmissions. The diagram in Figure 3/E.330 illustrates how such arrangements and the principles in 5.1.5 above should be applied.

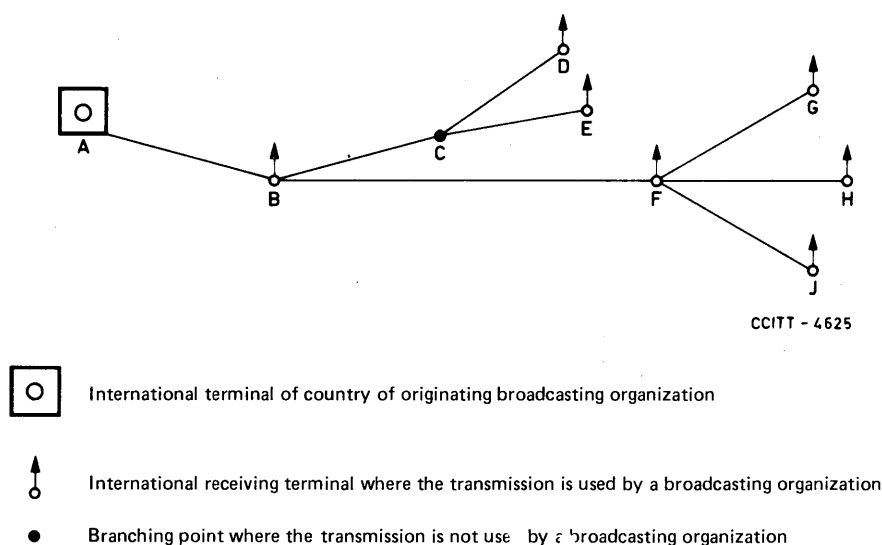


FIGURE 3/E.330 — Example of a multiple transmission

In Figure 3/E.330, it is assumed that the broadcasting organization in B, which broadcasts the transmission coming from A, pays the charge for the circuit A-B, that the broadcasting organization in F pays the charge for the circuit B-F, while the broadcasting organizations in G, H and J pay for the circuits F-G, F-H and F-J respectively.

As C is not broadcasting the transmission, the broadcasting organizations in D and E should arrange in advance which of them will pay the charge for the circuit B-C. If for example, the broadcasting organization in D agrees to pay the charge for the circuit B-C, the charges to be collected in D and in E respectively should be based on a transmission from B to D and a separate transmission from C to E.

If, during a transmission, an additional broadcasting organization is connected to any part of the international link, that broadcasting organization will be responsible for all additional charges concerned in that transmission.

5.1.7 When several different routes exist in any given relation the total charge for each of the routes is the sum of the quotas due to each country for the actual route followed. The choice of route is normally left to the discretion of Administrations. However, a broadcasting organization may request a specific route, which should be provided by the Administration concerned if possible.

In the case of direct transit of a country where the transmission is not broadcast, and when there is more than one route through that country, its Administration should normally fix a uniform transit charge for transit of its country in a given relation.

5.1.8 There is a minimum chargeable duration for sound- and television-programme transmissions of three minutes.

5.1.9 The same charge should apply in principle to both colour and monochrome television transmissions and normally at all times of the day and night.

5.1.10 Where a normal telephone circuit is provided for use as a control circuit, the appropriate telephone charge between the terminal countries should be applied. Where additional facilities are provided in connection with such a circuit, Administrations may make appropriate charges for such facilities.

5.1.11 The clauses applied in certain regions of the world are given in the corresponding regional Recommendations found in the D.x..R Series Recommendations. In regions for which no Recommendation has been adopted, the appropriate clauses of the D.x..R Series Recommendations could possibly be applied.

## 5.2 *Charging for sound- and television-programme transmissions via circuits furnished by means of satellite, HF radio or intercontinental submarine cable*

5.2.1 A minimum charge should be made covering an initial period of 10 minutes hereinafter referred to as the *initial period charge*, plus a per-minute charge for each minute or part minute thereafter.

5.2.2 The charge for a satellite television circuit is made up of an *up part* and a *down part* charge, each including its terrestrial extension to the ITPC.

Each Administration should establish a charge for the part which it controls.

5.2.3 For sound-programme transmissions the charge between international centres shall be established by agreement between the Administrations concerned. This charge may be related to, but not necessarily the same as, the telephone rate and should be shared between Administrations in a similar manner.

5.2.4 For consecutive television transmissions ordered by different broadcasting organizations using the same satellite circuit, only one initial period charge may be made, as though they amounted to a single transmission. The duration of each of the consecutive transmissions should then be considered, for purposes of calculating the charges, at least as long as an initial chargeable period.

5.2.5 For a multiple transmission via satellite involving a satellite circuit with more than one receiving earth station, the satellite circuit is considered, for charging purposes, to have several separate parts:

- one between the point of origin and the satellite (up part);
- others between the satellite and each receiving earth station country (down parts).

The charge for the up part normally should be divided amongst the receiving earth station countries based on the time of usage of each down part. When this charge varies according to the point of destination, the highest charge should be applied.

The Administration providing the up part may levy a surcharge for a multiple transmission to cover the additional costs of preparation. This surcharge should be shared by the receiving countries in proportion to their time of usage.

The same procedure may apply to any charges for circuits earlier in the connection.

5.2.6 For alternate transmissions in which the direction of transmission alternates between two points in a given period, the individual durations may be summed to determine the chargeable duration in each direction.

### 5.3 *Determination of the chargeable duration*

5.3.1 The ISPCs and ITPCs concerned in a transmission should come to an agreement between themselves and broadcasting organizations at the end of each transmission as to the chargeable duration:

- a) the time at which the ordered connection was placed at the disposal of the broadcasting organization (beginning of the chargeable duration) – this is also the beginning of the preparatory period (see Recommendations N.4 and N.54);
- b) the time at which the ordered connection was released by the broadcasting organization (end of chargeable duration) – sometimes referred to as the “goodnight time”;
- c) when necessary, the time and duration of any interruption which may have occurred.

The time at the beginning and end of the chargeable duration, as well as the time of any occurrence and duration of any interruptions are entered on a report. This report should be sent, preferably on the same day, to the office responsible for coordinating all the details necessary for the establishment of international accounts. In addition, details relative to interruptions are noted on the report sent periodically to the technical services concerned.

5.3.2 In case of disagreement, the opinion of the Administration in the receiving country on the duration of transmissions and interruptions shall prevail, except with regard to transmission orders which are placed and paid for at the transmitting end when the opinion of the Administration at that end shall prevail as regards the start and end times (though not as regards the duration of interruptions).

5.3.3 The start time of a transmission is the time scheduled when the order is placed, unless the circuit is handed over to the customer earlier at his request. It may be later than the scheduled time only if the Administrations have failed to provide the circuit in good working order on time.

5.3.4 There should be no obligation upon Administrations to monitor transmissions continuously. Consequently broadcasting organizations should be requested always to report at once if they are not satisfied with the transmission or if there is any interruption; Administrations, however, are not responsible for notifying broadcasting organizations of interruptions.

### 5.4 *Interruptions – allowances*

5.4.1 If during the course of a sound- or television-programme transmission, an interruption, even of short duration, occurs:

- whether on the connection, or
- in a section of that connection, or
- on one or more of the sound circuits associated with a television-programme transmission, or
- in the video circuit only of a television-programme transmission,

it is necessary to consider whether the broadcasting organizations affected by the interruption should be given a credit allowance.

5.4.2 The general test of whether an allowance is in order should be: Was the transmission used?

This implies that broadcasting organizations must decide on the spot whether to use or refuse an ordered connection.

In general, if a broadcasting organization continues to broadcast or record the programme transmission, the charges in respect of any circuits it uses remain payable in full. If, however, as a result of a fault or interruption on the circuit, no signals or faulty signals are received by one or more participating broadcasting organizations, an allowance in respect of the circuits serving each of these broadcasting organizations may be given. Each circuit used by any broadcasting organization which continues to broadcast or record the transmission remains payable in full.

Similarly, if in such circumstances broadcasting or recording of either the video or sound components of the programme (but not both) is discontinued by any broadcasting organization, an allowance in respect of the television or sound circuit concerned (but not both) may be given (see also 5.4.6 below).

5.4.3 Any interruption should be reported by the broadcasting organization; however, in cases of facility failures known to the Administration, such reports may not be required. While broadcasting organizations are normally required specifically to request allowances for interruptions, such requirement may be waived at the discretion of and according to the national practices of Administrations.

5.4.4 It will be for the Administration of the country of the receiving broadcasting organization to assess the validity of any claim for allowances and to assess the allowance to be made, where necessary, in consultation with the other Administrations concerned. In the event of disagreement, the opinion of the Administration of the country of the receiving broadcasting organization shall prevail over that of the other Administrations concerned.

5.4.5 Credit for interruptions should be allowed on any transmission, regardless of the interval between the receipt of the order and start of the transmission.

5.4.6 It is accepted that interruption of a sound circuit associated with a television-programme transmission may render the whole transmission valueless to the customer. However, the charges for the video circuit remain payable if the video transmission is broadcast or recorded by the broadcasting organization in accordance with 5.4.2 above.

5.4.7 All Administrations concerned in a transmission should make the allowances for interruptions, regardless of where they took place.

5.4.8 No allowance will be given when the interruption is due to the negligence of the broadcasting organization or the failure of facilities provided by the broadcasting organization.

5.4.9 When a circuit failure makes it impossible to provide a transmission on the planned route, or causes an interruption in a transmission, an alternative routing should be established whenever possible provided that the broadcasting organization undertakes to pay additional charges that may apply. However, for those sound-programme circuits which can be readily rerouted, the broadcasting organization should pay the same total charge that would have applied if no failure had occurred.

## 5.5 *Measurement of distances for terrestrial circuits*

5.5.1 When part or all of the charge for a transmission is based on the length of circuit, the distance is normally taken as:

- in the case of the terminal country, the crowflight distance between the ISPC or ITPC and the point where the circuit crosses the frontier;
- in the case of the transit country, the crowflight distance between the points of crossing the frontier by the circuit;
- in both cases, in order to take better account of the cost actually incurred with a radio-relay link, the point midway between the two stations on either side of the frontier may be used instead of the actual point of crossing of the section of the link straddling the frontier.

5.5.2 However, the relatively high cost of television circuits and the wide disparity in many relations between crowflight and actual distances could make it desirable to base distance measurement for television circuits on the actual distance.

Similarly, it might be appropriate to round up the actual distance in small rather than large steps (in some regions, actual distances are rounded up to the next 10 km).

It is recommended that regions should decide whether to use actual distance within their region or whether to retain the system of measurement described in 5.5.1 above for terrestrial television circuits.

## 6. *Accounting*

### 6.1 *Collection of charges*

In principle, the Administration with which the order was placed is responsible for collecting the charge for a transmission from the broadcasting organization which placed the order.

## 6.2 *Remuneration of Administrations*

The Administration with which the order for a transmission is placed is responsible for ensuring that the remuneration to other Administrations is entered into the international accounts in accordance with the provisions of Recommendation E.270. Unless otherwise agreed, the consolidated monthly accounts should be accompanied by supporting documents which will allow each transmission to be separately identified.

## 7. *Directory for handling orders for international sound- and television-programme transmissions*

To ensure speedy and reliable arrangements for international sound- and television-programme transmissions, it is essential that detailed information regarding the PBCs all over the world which handle orders for such transmissions should be readily available to those concerned. This also applies to appropriate technical services and to the broadcasting organizations themselves.

A directory of this information has been established and kept up to date by the General Secretariat of the ITU, to which a request can be sent to obtain the necessary copies. In order that this directory be kept up to date and complete, each Administration should draw up an information sheet for every programme booking centre (PBC) international sound-programme centre (ISPC) and international television-programme centre (ITPC) under its control. It is recommended that broadcasting organizations which handle orders for international transmissions should also draw up information sheets.

To this end, up-to-date information sheets should be sent to the General Secretariat of the ITU.

The information sheets should include, where applicable, the following basic particulars:

- Name of country;
- Name of office for which information is given (PBC, ISPC, broadcasting organization, etc.);
- Name of Administration or broadcasting organization;
- Postal address;
- Telephone number(s);
- Telex number and answer-back;
- Telegraphic address;
- Office hours (GMT);
- Languages spoken;
- Senior staff and deputies;
- Contact outside office hours and on holidays;
- Office handling orders for leased circuits (if not PBC);
- Earth station;
- Local time reference GMT;
- Name(s) of customer(s) for which orders are normally handled.

## **PART IV**

### **Series E Recommendations (E.401 to E.425)**

#### **STATISTICS, NETWORK MANAGEMENT AND CHECKING OF SERVICE QUALITY IN INTERNATIONAL TELEPHONY**

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## SECTION 1

### INTERNATIONAL SERVICE STATISTICS

#### Recommendation E.401

##### STATISTICS FOR THE INTERNATIONAL TELEPHONE SERVICE (NUMBER OF CIRCUITS IN OPERATION AND VOLUME OF TRAFFIC)

(Statistics exchanged by Administrations)

Administrations exchange each year, *in February*, statistics showing the number of circuits used and the volume of traffic monitored in the preceding year, as well as estimates of the number of circuits which will be required three years and five years later. These statistics shall be drawn up in the form indicated below.

A copy of the statistics shall be sent to the CCITT Secretariat for information.

#### ANNEX

(to Recommendation E.401)

##### How to fill in the table on international telephone traffic statistics

- |                  |   |
|------------------|---|
| Column 1.        | Designation of the connection by giving the name of the outgoing exchange first and then the name of the incoming exchange. Two-way connections will be shown in alphabetical order.                                  |
| Columns 2 and 3. | Number of circuits in operation as on <i>31 December</i> of the year of the statistics. The number will be shown in column 2 when it refers to outgoing circuits and in column 3 when it refers to both-way circuits. |
| Columns 4 and 5. | Number of circuits which would have been required during the year of the statistics.  |
| Column 6.        | Method of operation.<br><br>The following abbreviations will be used:<br><br>A        for automatic,<br>SA       for semi-automatic,<br>M        for manual,<br>A + SA   for automatic and semi-automatic.            |

## Column 7.

## Destination of traffic.

Each relation will be shown in this column on a separate line. In the example given, the traffic routed over the Zürich-København circuits is destined for Denmark (terminal), Sweden, Norway and Finland (transit). In this case, the data for each destination will be shown in columns, 8, 9, 10 and 11. The total traffic figure, however, should not be omitted. These data will be bracketed together. If the connection handles traffic only to the country in which the incoming exchange is situated, only the word "terminal" will appear in column 7.

## Columns 8 and 9.

Busy-hour traffic, expressed in *erlangs*. (See Recommendation E.100.)

The traffic measured during the busiest month of the year of the statistics is given in column 9. For two-way circuit groups the total amount of incoming and outgoing traffic should be given. In column 8 the month of the year during which the traffic was measured should be indicated in roman numerals.

## Column 10.

Busy hour (G.M.T.).

This refers to the busy hour as defined in Recommendation E.100.

## Column 11.

Annual increase, in %. Each Administration should insert in this column the annual traffic increase rate with respect to the previous year.

## Columns 12 and 13.

Columns 12 and 13 should show the estimated number of circuits required to route traffic in three and five years' time, respectively. For example, if the statistics relating to 1974 are drawn up in February 1975, column 12 will give the estimated number of circuits required in 1978 and column 13 those required in 1980.

## International telephone traffic statistics

Year: .....

Circuits	Number of circuits in service		Number of circuits required		Method of operation	Destination of traffic	Busy-hour traffic		Start of busy-hour (GMT)	Annual traffic increase	Estimated number of circuits		Observations
	Out-going	Both-way	Out-going	Both-way			Month	Erlangs			In three years	In five years	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
(Examples)													
Zürich-København	24	—	20	—	SA	Terminal	X	8	10.00	15 %			<sup>a</sup> Overflow traffic on Zürich-Stockholm connection
						Sweden <sup>a</sup>	X	4	10.15	12 %			
						Norway	X	2	09.45	13 %			
						Finland	X	1	10.30	7 %			
						Total	X	15	10.00	14 %	28	32	
Zürich-Stockholm	12	—	11	—	SA	Terminal	IX	5.5	10.15	12 %	13	15	

**Recommendation E.402****PUBLICATION BY THE ITU GENERAL SECRETARIAT  
OF THE "LIST OF INTERNATIONAL TELEPHONE ROUTES"**

1. The General Secretariat of the ITU establishes and keeps up to date the *List of international telephone routes* showing, for the various services:
  - the primary routes,
  - the secondary routes,
  - the emergency routes.
2. By referring to the *List of routes*, the Administration responsible for the presentation of the accounts may ascertain via what country(ies) the call diverted to an emergency route has been established.

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## SECTION 2

### INTERNATIONAL NETWORK MANAGEMENT

#### Recommendation E.410

#### INTERNATIONAL NETWORK MANAGEMENT. RECOMMENDATIONS FOR PLANNING AND OPERATING PROCEDURES

##### 1. *General considerations*

In recent years the demand for international telephone service has increased substantially. This demand has been met by advances in both technology and operating techniques. The growth of traffic has also required the development of larger transmission systems to provide economically the capacity to meet the recommended grades of service.

Now, with the continuing increase of automatic service, control over traffic offered to the international network will decrease, since an operator will no longer be involved in establishing the connection. When abnormal traffic peaks occur, or there are interruptions and failures of switching or transmission systems, the capability to manage the traffic flow must be available. Traffic congestion at one office, if uncontrolled, can spread and degrade the level of service throughout the international telephone network.

It may ultimately be desirable to have international network management on a worldwide basis. However, at this time there are reservations about the creation of a new international body to establish international network management. For the present it is suggested that it would be best left to the discretion of Administrations to agree bilaterally or multilaterally on the degree to which they would like to cooperate in introducing network management. The methods used, the experiences encountered and the benefits derived would then be of considerable value in developing more advanced international network management.

##### 2. *Definition of network management*

Network management is the function of supervising a communications network to ensure maximum utilization of the network under all conditions. Supervision requires monitoring, measuring and, when necessary, action to control the flow of traffic.

##### 3. *Objective of network management*

The objective of network management is to provide service protection and maximize the number of paid conversations by fully utilizing available equipment and facilities during normal and abnormal periods.

Network management still requires that the network in operation should be adequately engineered to meet normal volumes of traffic, the requirement for which is described in CCITT Recommendations E.171, E.510, E.520, E.521, E.522, E.540 and E.541.

#### 4. *Gains that can be derived from network management*

- 4.1 Best possible service to the subscriber during abnormal periods by limiting the spread of congestion.
- 4.2 Continuity of essential services during breakdown and abnormal periods.
- 4.3 Maximum utilization of serviceable equipment under normal and breakdown conditions.
- 4.4 Improvement of traffic flow information.

#### 5. *Classification of network management actions*

##### 5.1 The need for the control of traffic may be generated by:

- a) the failure of an international or national transmission system (see note following),
- b) congestion in a CT,
- c) the failure of a CT,
- d) congestion in a national network,
- e) heavy traffic caused by any unusual condition.

*Note.* — All appropriate actions to restore a failed transmission system should be considered concurrently with traffic control actions. Under certain circumstances it may also be possible as an exception to augment trunks or circuits between switching centres by use of special facility arrangements such as the expansion of circuits in TASI systems or the use of two satellite links in tandem.

##### 5.2 Network management actions fall into one of two broad categories:

- *Protective actions*, designed to remove from the network those calls having a low probability of successful completion. Such calls should be cancelled as close to their origin as possible, thus making more of the network available to calls with a higher probability of success. A correlated principle underlying protective actions is to improve the probability of completion for those calls which have progressed furthest into the network. This type of action would be taken in response to congestion in common-control switching systems on final routes, or both.
- *Expansive actions* are those actions which are taken to make available lightly loaded facilities to traffic experiencing congestion on its normal routes.

Examples of *protective actions* are:

- a) Cancellation of alternate routing via congested common-control switching machine. This action must be taken in response to machine (common control) load indications which are transmitted to the switching centres involved.
- b) Directionalization of international two-way trunk groups to favour traffic leaving the international network over that which is entering. This action is taken in response to network-congestion indications and is a function of trunk-group loads.
- c) Partial cancellation of first-routed traffic in congested switching machines. This action is similar to item a) where the machine is loaded with first-routed traffic.
- d) Cancellation of alternate routing via congested final routes. This action could be taken in response to trunk and/or machine load information.
- e) Recorded announcements to subscribers and special operator instructions. A recorded announcement may be provided at the originating end to advise operators (or subscribers) to take appropriate action during serious overloading of a segment of the network. A recorded announcement might be initiated at the originating CT upon receipt of a network-management

signal and the languages of the originating country may be used (see note following). The local management of the traffic operating personnel may also provide special instructions by means of locally generated announcements and/or verbal instructions. (Local switchboard indicators are sometimes used to request operators to listen to pertinent announcements.)

*Note.* — The attention of the "Human Factors" Working Party of Study Group II is directed to this proposal to recommend the use of locally applied recorded announcements as a means of notifying subscribers of difficulties in the use of the international service. Realizing that studies are being conducted on announcement methods and their effect on the use of the international services by foreign visitors, this Working Party is requested:

- to consider the use of recorded announcements as compared to tone indications, or other methods;
- to consider the types of recorded announcement which may be employed.

*Expansive actions* are principally rerouting from routes that are congested to others having spare capacity. Therefore, it may be desirable to alter normal routing procedure in response to abnormal traffic loads. This action requires extensive trunk-load information. To ensure that the quality of transmission is maintained when rerouting is required, the provisions of Recommendation E.171 should apply.

Protective or expansive actions may fall into one of the following categories:

- 1) Pre-arranged by mutual agreement.
- 2) Initiated by the outgoing Administration at the time, e.g. reduction of traffic.
- 3) Negotiated by the Administrations involved at the time.

## 6. *Criteria*

Data should be available in the network management data base for trouble conditions which can adversely affect engineered service levels. As a minimum requirement the following should be supervised:

6.1 *Switching centre equipment* to permit an exchange of switching centre status information between directly connected switching centres and, as a second priority, between any other centres where such information would be useful.

6.2 *All final routes.*

6.3 *Selected high-usage routes:* High-usage routes whose overflow traffic in case of overload would seriously congest the final route.

Bid <sup>1)</sup> counters and overflow bid counters should be provided to determine the amount of circuit group congestion. These counters should be read during periods of heavy traffic previously established by office trends and during periods of abnormal conditions. In addition, visual indications — such as *all trunks busy* — on final and selected high-usage routes should initiate the reading of bid and overflow bid counters. To attain uniformity in the reporting and analysis of data, bid and overflow readings can be computed into the following relationships:

- a) *Percentage overflow* indicates the relationship, in a specified period of time, between the number of bids not finding a free circuit and overflowing and the total number of bids offered to a circuit group.

$$\frac{\text{Overflow bids}}{\text{Total number of bids}} \times 100 = \text{Percentage overflow}$$

<sup>1)</sup> A *bid* is an attempt to obtain a circuit in a circuit group. A bid may be successful or unsuccessful in seizing a circuit in that group.

- b) *Bids per circuit per hour (BCH)*: BCH is an indication of the average number of bids per circuit at each end of an international circuit group. Its purpose is to quickly identify the direction of the traffic pressure in a form that is easily discernible.

$$\frac{\text{Bids per hour}}{\text{Number of working circuits}} = \text{BCH}$$

- c) *Seizures<sup>2)</sup> per circuit per hour (SCH)*: SCH is an indication of the number of times, in a specific time interval, that each circuit in an international circuit group is seized. This information, when compared with coincident percent overflow and bids per circuit per hour (BCH) data, provides an indication of the reasonableness of the seizure rate, i.e. the proportion of bids which result in seizures. Circuit-group seizure rate can be pre-established by examining average holding time and other pertinent engineering data.

$$\frac{\text{Seizures per hour}}{\text{Number of working circuits}} = \text{SCH}$$

6.4 Decisions to initiate a network management action should be based on a system of continuous measurement of sufficiently rapid sampling and combinations of the above relationship. A data-collection system could function as frequently as every second on common control equipment. There is no apparent reason to record all of these data when conditions are normal and normal practice could be to record the *n*th sample. However, if a possible approach to a congestion condition was indicated, it is suggested that the sample be recorded and made available to the network management centre. The criteria defining the possible start of a congestion can be:

- i) *final circuit groups*, when the traffic intensity on the group reaches the prescribed figure for the specified grade of service on the route.

Data from bid and overflow bid counters taken at intervals of one quarter hour can be used for this determination.

- ii) *selected high-usage circuit groups*, when the proportion of overflow reaches the prescribed level.

Data from bid and overflow bid counters taken at intervals of one quarter hour can also be used for this determination.

- iii) *switching equipment*, where possible, the length of the queue waiting for access to common control equipment should be sampled in preference to straight-forward equipment occupancy. Other equipment should be supervised on the basis of equipment occupancy or the number of call arrivals per unit of time.

The actions or negotiations leading to traffic controls may be taken upon the receipt of appropriate network management signals (or notification by other means of communication) at the outgoing end. It is expected that these network management signals will normally be transmitted from the incoming end (at which point the congestion manifests itself) to the outgoing end but possibly in the reverse direction as well. Such actions may include the possibility of appropriate recorded announcements at the outgoing end to control the flow of traffic.

Administrations should give consideration to the assignment of responsibility for negotiated traffic controls to a single location for a given international relationship.

## 7. Network management signals

A variety of network management signals may be transmitted to centres which may apply traffic controls to alleviate congestions or react to failures. The signals involved need only be transmitted to a selection of centres with CT status. Further retransmission within the national network should be at the discretion of Administrations. These signals may be transmitted on a common channel-signalling system, but may also be provided by other means of communication, to indicate the need or desirability of a traffic-control action. The

<sup>2)</sup> A seizure is a bid for a circuit group which succeeds in obtaining a circuit in that group.



network management signal involved could be arranged to indicate degrees and types of difficulties so as to communicate the need for one or more automatic traffic control actions or the possibility of one or more negotiated traffic-control actions. The specific number of signals to be used must depend on their availability and the additional development of network management.

The transfer of the initial message and the subsequent message which cancels the initial message should each be suitably acknowledged.

Typical network management signals may include the following information:

- 1) codes to identify the origin and destination points involved;
- 2) date and time of the data;
- 3) trunk group occupancy, bid and overflow data: This information is used principally for the rerouting contemplated as the principal expansive action in 5. above. It may also be used for the protective actions, but in this case it is used locally and need not necessarily be transmitted anywhere;
- 4) common control equipment occupancy or queue length indications: This information is used for both protective actions and expansive controls described in 5. above;
- 5) measurement of seizure rate (proportion of attempts which result in seizures). Estimates of their magnitudes can be obtained from realizable measurements such as bids per circuit per hour (BCH) and seizures per circuit per hour (SCH) described in 6. above. These data can be used for protective actions.

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## SECTION 3

### CHECKING THE QUALITY OF THE INTERNATIONAL TELEPHONE SERVICE

#### Recommendation E.420

#### CHECKING THE QUALITY OF THE INTERNATIONAL TELEPHONE SERVICE GENERAL CONSIDERATIONS

The methods of measuring the quality of service are as follows:

1. Service observations;
2. Test calls (simulated traffic);
3. Customer interviews.

Administrations are recommended to draw up a programme for observations and tests designed for assessment of circuits and equipment, supervision of operators and evaluation of the quality of service given to subscribers. It would be desirable if telephone Administrations were to exchange statistics on quality of service directly, and immediately after they have been made out, in accordance with Tables 1/E.422, 1/E.423 and 1/E.424.

Table 1/E.422 relates to the observations of outgoing calls on the quality of international automatic and semi-automatic service. It provides in particular a check of the percentage of unsuccessful calls due to technical faults (equipment shortages or failures).

Table 1/E.423 relates to observations on traffic set up by operators. It provides, in manual and semi-automatic service, a means of determining the efficiency of international circuits, of assessing the work of operators and the quality of transmission.

Table 1/E.424 is used to record the results of test calls undertaken especially when the observations shown in Table 1/E.422 make it clear that the percentage of faults is too high.

The use of customer interviews as a method of measuring telephone service quality is the subject of Recommendation E.425.

#### Recommendation E.421

#### SERVICE QUALITY OBSERVATIONS

##### 1. *Definitions*

##### 1.1 service observation

Monitoring to obtain a complete or partial assessment of the quality of telephone calls, excluding test calls.

**1.2 manual observation**

Monitoring of telephone calls by an observer without using any automatic data-recording machine.

**1.3 automatic observation**

Monitoring of telephone calls without an observer.

**1.4 semi-automatic observation**

Monitoring of telephone calls using equipment which records some data automatically. For example, equipment in which information such as exchange being observed, number dialled by the subscriber, metering pulses and time of call are recorded automatically on some means suitable for data processing. The observer merely has to key in a code indicating the condition observed.

**2. *Relative merits of manual, automatic and semi-automatic observations***

2.1 The three methods mentioned above in 1.2, 1.3 and 1.4 are not exclusive, for example: automatic observations may be used to supplement observations taken by an operator. It was considered in 1968 that the need for automatic observations would increase in view of the heavy cost associated with manual or semi-automatic observations on the rapidly expanding international network. It was also considered that automatic observations would not entirely supersede observations taken by an observer within the foreseeable future.

The relative merits of the three methods can be assessed as follows:

**2.2 *Manual observation***

Provides all the data required in Tables 1/E.422 and 1/E.423.

Observations can be carried out with a minimum of equipment.

Observations can permit the detection of a number of abnormalities which cannot be detected automatically, e.g. very poor speech transmission (item 5.2 of Table 1/E.422), or difficulty with audible tones encountered in the international service item 6.4 of Table 1/E.422).

**2.3 *Automatic observation***

Operating cost is minimum (staff reduction).

Continuous observation is possible.

It is possible to have a larger sample.

Human error is eliminated.

Automatic processing of data is facilitated.

Conversational privacy is ensured.

Control of the time at which observations are made is facilitated.

**2.4 *Semi-automatic observation***

Provides all the data required in Tables 1/E.422 and 1/E.423.

There is a saving in staffing costs compared with manual observation.

Greater accuracy compared with manual observation is possible due to the fact that there is an automatic recording of the number dialled, the time of the call, etc.

It is possible for the observer to give more attention to the more critical conditions being checked during observations of calls.

The results are produced in a form suitable for subsequent mechanized analysis.

Owing to the reduction of costs it is possible to obtain a larger sample for the same expenditure.

Semi-automatic equipment may be converted, during certain hours of the day, to automatic operation.

### 3. *Time of observations*

The results of all observations taken over the whole day should be recorded in Table 1/E.422.

In the case where observations are not taken over the whole day the observation period is recorded under the heading "Time of observations" and should include the three busiest hours of the day.

### 4. *Observation access points*

4.1 Observations for Table 1/E.422 should be carried out from access points as close as possible to the outgoing international exchange.

The following access points can be considered:

- i) outgoing relay set of an international circuit ("exchange" side), i.e. *international circuit access point*<sup>1)</sup>;
- ii) incoming relay set of a national circuit;
- iii) link circuits of the international exchange..

Observations will be made only while the call is being set up, and a few seconds after the called subscriber's reply.

When the *circuit access point*<sup>1)</sup> is used for observation of international calls it is possible that the service quality of the international exchange may not be checked by either international or national observation programmes.

Preferably, and where technically feasible for the most complete results, observations for Table 1/E.422 should be carried out as close as possible to the international exchange on the national side. This would be more representative of service to the subscriber, and allows observation of call failure at the outgoing international exchange. Where it is not possible to make the distinction between failures in the outgoing international exchange, and failures beyond this exchange, or where there is a meaningful advantage in doing so, observations should be taken on the outgoing side.

It is necessary to state in Table 1/E.422 the access point where the observations have been made, as observations obtained at each one of the three access points mentioned above are not comparable.

4.2 Observations for Table 1/E.423 must be carried out from access points on the operators' positions.

### 5. *Number of observations*

5.1 Service observing programmes should be established in such a manner that statistical results obtained be as reliable as practicable bearing in mind the cost of obtaining large samples.

5.2 According to the studies carried out by the CCITT in 1964-1968, the quantities shown below are considered the *minimum* quantities to provide a general indication of the quality of service.

#### 5.2.1 *Table 1/E.422*

The minimum number of observations per outgoing circuit group for Table 1/E.422 should be 200 per month when more than 20 circuits are included in a group, 200 per quarter when there are between 10 and 20 circuits in a group and 200 per year if there are less than 10 circuits in a group.

<sup>1)</sup> For definitions of test access points see Recommendation M.700. See also Recommendation M.110.

### 5.2.2 Table 1/E.423

The minimum number of observations for Table 1/E.423 should be 200 per quarter when there are more than 20 circuits in the group, 200 per semester when there are between 10 and 20 circuits and 200 per year when there are less than 10 circuits in the group.

### 5.2.3 Transit traffic

Where an outgoing circuit group also carries transit traffic it is desirable to obtain data for each destination country reached via this circuit group. In principle, the number of observations for each destination should be obtained as indicated above. To accomplish this, one should use for each destination country its corresponding number of erlangs and derive from these erlangs a theoretical number of circuits.

However, where only a very small amount of traffic is handled, e.g. less than 5 erlangs, each Administration may wish either to make a smaller number of observations or (e.g. in case of no complaints) no observations at all and rely on the information obtained at the transit exchange.

5.3 The number of observations specified above will provide a general indication of results on quality of service in certain broad categories. Administrations may desire more accurate results especially for the individual categories in Table 1/E.422.

Attention is drawn to Table 1/E.421 which gives the number of observations required to obtain a certain degree of accuracy.

TABLE 1/E.421

Expected percentage rate of failure	Number of observations of a random sample required to predict with 95 % confidence the true percentage of failure with an accuracy of:					
	± 25 %	± 30 %	± 35 %	± 40 %	± 45 %	± 50 %
2	3136	2178	1600	1225	1030	880
4	1536	1067	784	600	500	440
6	1003	696	512	392	330	290
8	736	511	376	288	245	215
10	576	400	294	225	195	170
12	469	326	239	183	150	132
14	393	273	201	154	128	112
16	336	233	171	131	112	98
18	292	202	149	114	95	80
20	256	178	131	100	85	70
30	149	104	76	60	50	42
40	96	67	50	38	30	24
50	64	44	33	25	20	16

### Annex to Table 1/E.421

#### Examples of use of Table 1/E.421

1. It is estimated from previous results that a particular type of failure occurs on about 4% of calls. If it is required to confirm, with 95% confidence, that the existing failure rate is between 3% and 5% (i.e.  $\pm 25\%$  of 4%), then observations must be made on a random sample of 1536 calls.
2. For an expected failure rate of 2%, observations must be made on a random sample of about 1200 calls (1225 in the table) to predict, with 95% confidence, that the true percentage is between 1.2% and 2.8% (i.e.  $\pm 40\%$  of 2%). This means that when 200 observations are taken over a period it is necessary to take the "rolling average" of conditions over six periods. The rate of failure for a number of categories important from the maintenance point of view is expected to be about 2%.

3. After observations have been taken and the rate of failure in the sample has been calculated, the table may be used in a "backward" direction to give a rough indication of the accuracy of the result.

Suppose that out of a sample of 1000 observations, there were 29 failures due to cause "X" and 15 failures due to cause "Y". The rates of failure in the sample due to X and Y, respectively, are then 2.9% and 1.5%. From the table, it is apparent from this sample of 1000 calls that the true rate of failure due to X has an accuracy of about  $\pm 35\%$  (i.e. is between 1.9% and 3.9%), and that due to Y has an accuracy of about  $\pm 50\%$  (i.e. is between 0.8% and 2.3%).

## 6. *Exchange and analysis of the results of observations*

### 6.1 *Exchange of the results of observations*

The following periodicities are proposed for the exchange of results between Administrations:

Table 1/E.422 — a monthly exchange is desirable;

Table 1/E.423 — a quarterly exchange is desirable.

Nevertheless, in the case of small groups of circuits (less than 20 circuits) the information should be exchanged after 200 observations have been made but never later than one year in any case; attention is drawn to Table 1/E.421, which shows that less than 200 observations are of little value.

Results of observations will be reported without delay:

- to the Administrations and the network analysis point of the country where observations are carried out;
- to the Administrations and the network analysis point of the other country (including transit Administrations and their network analysis point when involved).

The benefits to be derived from service observations tend to decrease if there is any increase in the time taken to make the results available to those who can take action to bring about an improvement. The results of service observations according to Tables 1/E.422 and 1/E.423 should therefore be made available to the Administration in the countries of destination as soon as possible after completion of the observation period and in any case within six weeks and when possible to the CCITT Secretariat for centralized processing.

### 6.2 *Analysis of observation results*

An analysis of the results should be carried out in the country of origin. However, analysis may also be performed in the country of destination or on a centralized basis.

Some Administrations have found it useful to distribute to other Administrations concerned, service observation statistics in the form of graphs.

Statistics are also available on an anonymous basis from the CCITT Secretariat as a result of centralized processing.

## 7. *Centralized processing of service observation results*

A manual processing of the service observation results was carried out, in 1968-1972, and the conclusions of this first series of field trials were that:

"The results achieved are both useful and helpful. The first series of field trials have provided service observation data not heretofore available and, in the absence of automatic methods of monitoring the quality of international telephone service, enables more effective use to be made of the rather small samples available from manual service observations. The participating Administrations also see the trials as an important means of hastening the standardization of quality of service observation procedures and definitions."

These field trials were continued in study period 1973-1976. In view of the results obtained centralized processing has become permanent.

Centralized processing is expected to provide the participating Administrations with better information, enabling each of them, for the matters which concern it, to have consistent and sustained information on the performance of the worldwide telephone network and the degree to which it satisfies users.

The results of centralized processing, presented in synoptic form (see 5.4 at the end of the Annex to the Recommendation) may also be of interest to the World Plan Committee.

Administrations are urged to take an active part in the centralized processing of observation results for this service. The following Annex describes the processing method to be applied.

## ANNEX

(to Recommendation E.421)

### Instructions for processing the service observation results

#### 1. *General*

To simplify the work of Administrations, it is suggested that observations [recorded in accordance with Recommendation E.422 (Table 1/E.422)] should be sent to the CCITT. The observations should be submitted quarterly for centralized processing. Observations should be received by the CCITT not later than four weeks after the observation period. Processing the observations within the CCITT should be completed within two weeks.

#### 2. *Confidentiality of the processing procedures*

The names of participating Administrations will be kept confidential to avoid any possibility of a leak to persons not directly concerned in the supervision of service quality in international traffic.

The following procedure will be followed:

- each country will be designated by a key letter;
- these letters will be communicated to each official personally appointed by a participating country and will be kept secret by him in any way he thinks fit. No official documents mentioning a country will be distributed by the CCITT.

#### 3. *Sending of data to the CCITT Secretariat*

##### 3.1 The observation results should be sent to:

CCITT Secretariat  
2, rue de Varembe  
1211 — Geneva 20, Switzerland.

3.2 An information directory of the names of the officials appointed by participating Administrations will be published as a contribution of Study Group II at the beginning of each new study period.

#### 4. *Processing by the CCITT of data contained in Table 1/E.422*

##### 4.1 *Assembly of information recorded in Table 1/E.422*

If the observations relating to a particular incoming CT are taken at several outgoing CTs in one country, the observations should be summed by the CCITT to give the total observations of the particular outgoing country with respect to the incoming CT, providing the same signalling system is used.



The information received for Table 1/E.422 should be *assembled* in accordance with the categories of that table.

- Category 1 – Successful calls
- Category 2 – No answer
- Category 3 – Busy or congestion
- Category 4 – Unsuccessful calls indicated by visual signal, tone or recorded announcement
- Category 5 – Other unsuccessful calls
- Category 6 – Incorrect handling by the caller
- Category 7 – Number of calls monitored
- Category 9 – Successful calls with defects

#### 4.2 *Signalling systems*

Administrations will have advised the CCITT of the signalling system used for each relationship for which service observation results are being submitted. This information must be correlated with the observations received for Table 1/E.422.

#### 4.3 *Processing of assembled information for Table 1/E.422*

In each incoming international switching centre the total observations for each of the categories 1-7 of 4.1 above should be obtained for each relationship and for each of the CCITT signalling systems used. 1-6 should then be calculated as a percentage of category 7. No calculation is made for item 9 of Table 1/E.422.

The use of the ITU computer will not be justified unless the volume of data to be processed is sufficient.

#### 5. *Results of processing*

The information resulting from the processing described in 4.1 and 4.3 above will be presented in the following combinations:

- 5.1 On a country basis:
  - a) without reference to signalling system;
  - b) for each signalling system used.
- 5.2 In each incoming CT:
  - a) without reference to signalling system;
  - b) for each signalling system used.
- 5.3 In tabular form for all countries:
  - a) without reference to signalling system;
  - b) for each signalling system used.
- 5.4 The processing described above will be completed by establishing a synoptic table showing the overall quarterly results weighted for the different headings listed in 4.1 of this Annex.

#### 6. *Dissemination of results*

6.1 The CCITT should send the information detailed in 5.1 and 5.2 above to the country to which the observations relate. The information detailed in 5.3 and 5.4 above should be sent to each of the countries participating in the centralized processing and should be available also at every Study Group II meeting and at every Working Party meeting dealing with quality control of the international telephone service.

6.2 The information processed will be communicated to the officials appointed by participating Administrations.

## Recommendation E.422

OBSERVATIONS ON INTERNATIONAL OUTGOING TELEPHONE CALLS  
FOR QUALITY OF SERVICE

TABLE 1/E.422 – Observations of international outgoing telephone calls for quality of service

Country of origin ..... Point of access: .....

Outgoing international exchange ..... National side .....

Group of circuits ..... Link circuits .....

Service { automatic<sup>a</sup> ..... Outgoing side .....

          { semi-automatic<sup>a</sup> .....

Period: from ..... to ..... Time of observations .....

Category	Number		Percentage	
	Sub-total	Total	Sub-total	Total
1. Calls successfully put through (see note 1) .....		...		...
2. Ring tone received but no answer .....		...		...
3. Unsuccessful calls: <i>Positive</i> indication of congestion, including subscriber busy, from beyond the outgoing international exchange. Visual signal, tone or recorded announcement .....		...		...
3.1 Subscriber busy/congestion indicated by visual signal .....	...		...	
3.2 Subscriber busy/congestion indicated by busy/congestion tone .....	...		...	
3.3 Congestion indicated by a recorded announcement .....	...		...	
4. Unsuccessful calls: Other visual signals, tones or recorded announcements, not positively identified as category 3 or 8 .....		...		...
4.1 Visual signal received .....	...		...	
4.2 Tone received .....	...		...	
4.3 Recorded announcement received .....	...		...	
5. Unsuccessful calls for other technical reasons .....		...		...
5.1 Wrong number obtained .....	...		...	
5.2 Abandoned due to very poor speech transmission .....	...		...	
5.3 No tone, no answer after waiting ..... seconds .....	...		...	
5.4 Reception of answer signal when the called party does not reply .....	...		...	
5.5 Other failures of a technical kind .....	...		...	
6. Unsuccessful calls due to incorrect handling by the calling party ..		...		...
6.1 Wrong number dialled .....	...		...	
6.2 Incomplete number .....	...		...	
6.3 Call prematurely abandoned before receipt of signal, tone or announcement (within less than ..... seconds) .....	...		...	
6.4 Call prematurely abandoned after receipt of ring tone (within less than 30 seconds) .....	...		...	
6.5 Other failures due to incorrect handling .....	...		...	

<sup>a</sup> Delete whatever is inapplicable.

Category	Number		Percentage	
	Sub-total	Total	Sub-total	Total
7. Total calls monitored (categories 1-6) . . . . .	...		100	
8 Unsuccessful calls : <i>Positive</i> indication of failure from outgoing international exchange . . . . .	...			
8.1 Congestion on outgoing international circuits. . . . .	...			
8.2 All other indications . . . . .	...			
9. Successful calls with defects. These calls are included in category 1 . . . . .	...			
9.1 Non-reception of answer signal on chargeable calls . . . . .	...			
9.2 Call with impaired intelligibility but not abandoned . . . . .	...			
9.3 Other calls with defects but not abandoned . . . . .	...			

*Note 1.* – A successful call is one that reaches the wanted number and allows conversation to proceed. All successful calls are entered in category 1. However, a successful call may or may not have noticeable defects. Successful calls with noticeable defects should also be entered in category 9.

*Note 2.* – With the exception noted above for categories 1 and 9, the results of one call observation should be entered under one category only, namely the most appropriate one from (1) to (6).

*Note 3.* – Administrations should periodically exchange necessary information to interpret the observation data recorded under categories 4.1, 4.2 and 4.3.

#### OBJECTIVES CONCERNING TABLE 1/E.422

- a) The purpose of service observation in the international service, is to assess the quality of service obtained by the calling subscriber. Consequently, it is essential to have factual or objective recording of observations (that is, successful and unsuccessful calls), and to present them in the form of a table (see Table 1/E.422). The table should be constructed so as to avoid the necessity of the observer having to interpret the meaning of the indications obtained through the observing equipment.
- b) The table should be capable of being completed through the use of a wide range of observation facilities, i.e. from the simple to the sophisticated.
- c) Specialized training of observers should be kept to a minimum.
- d) The table should be self-explanatory so that reference to detailed how-to-complete instructions is unnecessary.
- e) The major categories should be selected so that they:
  - identify the major factors adversely affecting the quality of service;
  - are suitable for the centralized processing of observation results.

#### COMMENTS CONCERNING THE USE OF TABLE 1/E.422

- a) The Table 1/E.422 summarizes observations made on outgoing automatic and semi-automatic traffic, on a country of origin to a country of destination basis. A separate form should be used for each country of destination, and if required, for each group of circuits to which traffic to the country of destination has access at the outgoing international exchange (or exchanges).
- b) For an explanation of the point of access, see Recommendation E.421, 4.1.
- c) The result of each call observed should be entered only under the most appropriate category. In the case of several faults on one call, the most significant cause of failure should be entered.
- d) In completing Table 1/E.422 reference should be made to the following explanations.

## HOW TO FILL IN TABLE 1/E.422

*Category*

1. To ensure objective recording and to avoid producing a biased sample resulting from the exclusion of calls which require subjective assessment, the successful call is defined as a call that reaches the wanted number and allows conversation to proceed. All non-abandoned calls are entered into category 1 and of these calls those which are subjectively adjudged to be defective are also entered into category 9. Thus it is required of the observer to make *two* entries for successful calls with noticeable defects.

Enter in category 1 then, calls successfully put through. If it is observed that the caller has dialled a wrong number, the call will be entered under 6.1. Category 1 will also include calls put through correctly to operator positions, information services, or to machines replying in place of the subscriber or to their equivalents.

2. Enter in category 2 calls on which ring tone was heard but the subscriber did not answer before the attempt was abandoned, the caller having waited at least 30 seconds after commencement of ring tone before clearing forward. (See category 6.4 if the call was abandoned *less* than 30 seconds after ring tone commenced.)

3. Enter in category 3 all unsuccessful calls in which a *positive* indication of subscriber busy or congestion beyond the outgoing international exchange had been encountered, either by visual signal, tone or recorded announcement. Where a positive indication of these conditions has *not* been received, enter in category 4.

Categories 3.1, 3.2 and 3.3 are entered for the specific indication received.

When more than one indication is received, for example visual signal and audible tone, only one entry should be made. In this case, the preferred order of entry should be tone, announcement, visual signal.

4. Enter in category 4 all other indications on unsuccessful calls whether by visual signal, tone or recorded announcement that cannot be positively identified and entered in category 3 or 8.

Categories 4.1, 4.2 and 4.3 are entered for the specific indication received.

When more than one indication is received, for example visual signal and audible tone, only one entry should be made. In this case, the preferred order of entry should be tone, announcement, visual signal.

5. Enter in category 5 those calls which fail for technical reasons not included in categories 3, 4 and 8. Category 5 subdivides as follows:

5.1 Calls on which the wrong number was obtained, although the caller dialled correctly.

5.2 Calls abandoned by the caller because of very poor speech transmission, although the answer signal was received. (See category 9.2 if speech transmission is poor but the call is not abandoned.) In some countries observers may be required to cease listening immediately after conversation is established thus reducing the number of calls that would be reported in this category.

5.3 Calls on which the dialling information was correctly and completely sent, but the caller received no signal, tone or announcement before abandoning the call, having waited for at least the specified period before clearing forward.

The value of this time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is, however, recommended to limit the number of such different quoted periods to a maximum of three values (e.g. 10, 20 or 30 seconds or any other value considered pertinent by the Administrations concerned).

5.4 Calls on which an answer signal was received, although the called subscriber did not answer.

5.5 Call failures due to technical reasons which are unable to be entered in categories 5.1 to 5.4. These should be very few, if any, and this category is provided in case they do arise. All possible information about these failures should be supplied as an attachment to the summary of the table.

6. Enter in category 6 all unsuccessful calls which have failed due to incorrect handling by the caller (subscriber or operator). Category 6 subdivides as follows:

6.1 Calls on which it was determined that the number which should have been dialled was different from the number actually dialled.

6.2 Calls on which it was determined that the number dialled had insufficient digits to be successful.

6.3 Calls on which the digital information was correctly and completely sent, but the caller abandoned the call without receiving any signal, tone or announcement, and without waiting for at least the specified period.

The value of the time period left open under this category should be filled in by the Administrations of the originating country according to its experience in this matter. The prescribed value may differ depending on the international destination. It is, however, recommended to limit the number of such different quoted periods to a maximum of three values (e.g. 10, 20 or 30 seconds or any other value considered pertinent by the Administration concerned).

The value quoted under category 6 must be the same as that quoted under category 5.

6.4 Calls prematurely abandoned after receipt of the ringing tone on which the caller disconnected less than 30 seconds after the ringing tone commenced. (See category 2 if the call was abandoned after more than 30 seconds had elapsed from the time of commencement of ringing tone.)

6.5 Calls which failed due to incorrect handling by the caller which cannot be classified under categories 6.1 to 6.4. All possible information about these failures should be supplied as an attachment to the summary of the table. As in categories 5.5, these should be very few, if any.

7. Enter in category 7 the number of calls monitored (categories 1-6).

8. Category 8 will be useful for those Administrations which observe on the national side of the outgoing international exchange. (See Recommendation E.421 4.1.) Positive indications of failure, congestion or other, are to be entered here. They are not to be included with categories 1-6, which give the data for calls monitored for category 7.

Thus, when category 8 is viewed with categories 3 and 4 a more complete picture is provided of quality of service received by the caller.

9. Entries in category 9 are for successful calls (entered in category 1) which encountered defects, but which were not abandoned. They are thus automatically included in the total of category 7.

9.1 Enter here chargeable calls for which no answer signal was received. If abandonment should be detected on such calls, enter in category 5.5.

9.2 Enter here calls on which poor speech transmission was observed, but the call was not abandoned. (See category 5.2 if the call was abandoned.) All possible information about these calls should be supplied as an attachment to the summary of the table. Note that in some countries observers may be required to cease listening immediately after conversation was established thus reducing the number of calls that would be reported under this category.

9.3 Enter here calls encountering switching, signalling or transmission defects, but which were not abandoned and which cannot be classified under categories 9.1 or 9.2.

## Recommendation E.423

## OBSERVATIONS ON TRAFFIC SET UP BY OPERATORS

TABLE 1/E.423 – Observations on traffic set up by operators

International outgoing exchange: .....

Circuit group: .....

Service { semi-automatic<sup>a</sup>  
manual<sup>a</sup>

Period from ..... to .....

Category	Type of call <sup>b</sup>			
	Ordinary	Personal		
1. Mean call duration – in seconds				
2. Mean chargeable duration – in seconds				
3. Mean holding time of circuits for manoeuvres and preparation of calls – in seconds				
4. Number of effective calls observed				
5. Mean number of times the international circuit was seized per effective call				
6. Mean number of “attempts” per effective call				
7. Percentage of calls set up at the first “attempt”				

8. Time-to-answer by operators	Total number of calls answered and unanswered		Calls answered						Calls unanswered (abandoned calls)			
	Num-ber	Mean waiting time in seconds	under 15 seconds		in 15 to 30 seconds		after 30 seconds		within 30 seconds		after 30 seconds	
			No.	%	No.	%	No.	%	No.	%	No.	%
Operators :												
– incoming operator (code 11)												
– delay operator (code 12)												
assistance operator												
– information operator												
9. Quality of transmission from the subscriber's viewpoint:			Number		%		10. Comments					
– good												
– defective												
Total					100							

<sup>a</sup> Delete whichever is inapplicable.<sup>b</sup> In accordance with b under Comments.

## COMMENTS CONCERNING THE USE OF TABLE 1/E.423

- a) This table summarizes observations relating to manual and semi-automatic outgoing traffic originated by operators. These observations will be made, if possible, during the whole call duration.
- b) Administrations should, if possible, make a distinction between the different types of call, e.g. station-to-station, personal and collect calls; they should use a separate column for each under the heading "Type of call".
- c) For collect calls, the times to be recorded will be those observed in the country where the call request was made.
- d) It is recommended that these observations be spread over the whole day.
- e) Each outgoing Administration will select the international circuit groups on which observations should be carried out.
- f) In completing this table, reference should be made to the following explanations:

## HOW TO FILL IN TABLE 1/E.423

*Traffic observations determined by the operators**Category*

- 1. This category should show the mean duration of calls observed which are successful and have been charged for ("effective" calls).
- 2. This category will show the mean *chargeable* duration of all effective calls observed.
- 3. This category will show, for each type of observed call, the average time per effective call during which the international circuit has been occupied for manoeuvres or for call preparation.

This average should be based on the time during which the international circuit is held:

- a) to obtain information concerning the called number;
- b) to obtain information about routing and trunk codes;
- c) to call operators, in the incoming international exchange;
- d) to exchange information on how to set up the call;
- e) to (or attempt to) obtain the called number even when it is engaged or does not reply;
- f) to (or attempt to) obtain the called person (in personal calls);
- g) between replacement of the receiver by the called person and release of the circuit;
- h) because the operator is holding the circuit (whether she is on the line or not) and for any other reasons for which the circuit is engaged.

The times listed above, which exclude the conversation time, should be added together. This total should be divided by the number of effective calls observed during the period in question to obtain the value to be entered in Table 1/E.423.

- 4. The number of effective calls observed considered in category 1.
- 5. The mean number of times the international circuit was seized per effective call (see category 3). This number is usually obtained by meter recordings.
- 6. The mean number of *attempts* (as specifically defined hereafter from the operating point of view to set up a call. Should the operator try several times to set up a call while continuously occupied on that call, all these operations must be considered as being one attempt. Similarly, if the operator makes several tries to set up a call and each time encounters a congestion or busy condition and if, after the last try, she informs the caller, only one attempt must be entered. Calls to information services or to obtain routing particulars, and all calls not directly related to the establishment of a call or to information required by the caller, should not be considered as attempts and should not be included.

The total number of attempts during the period of observation should be divided by the number of effective calls observed in the same period to obtain the mean number of attempts per call.

The total number of attempts is usually determined from markings or notations on call tickets.

7. The data for this category will be taken from all tickets prepared for the relation concerned, during the period of observation or a comparable period.

8. The mean waiting time for outgoing operators to receive an answer will be indicated in seconds. This average will include both answered and unanswered calls.

An outgoing operator waits on the circuit (waiting time) for the period:

- a) until the incoming operator answers, or
- b) until she abandons the attempt, should the incoming operator not answer.

Thus while mean waiting time relates to the outgoing operator it is also a measure of the performance of the incoming operators.

9. It will be difficult to obtain absolutely comparable results from all observers for this category. However, the observer should consider the quality of transmission from the subscribers' viewpoint, taking into account comments made in this respect by subscribers and the number of requests for conversation to be repeated.

10. This category should include any comments likely to explain the probable cause of difficulties frequently noted during the observations.

#### Recommendation E.424

### TEST CALLS

#### 1. *General*

Test calls carried out manually or automatically to assess the functioning of international circuits or connections are of four types:

##### a) *Type 1 test call*

A test call conducted between two directly connected international centres to verify that the transmission and signalling on an international circuit of a given group are satisfactory.

##### b) *Type 2 test call*

A test call conducted between two international centres not directly connected to verify transit operational facilities of an intermediate international centre.

##### c) *Type 3 test call*

A test call from an international centre to a subscriber type number in the national network of the distant country, generally as a result of a particular kind of fault.

##### d) *Subscriber-to-subscriber type test call*

A subscriber-to-subscriber type test call is a test call from a test equipment having the characteristics of an average subscriber line in one national network to a similar equipment in the national network of a distant country.

Test calls types 1, 2, 3 and subscriber-to-subscriber test calls must not interfere with customer traffic. If, however, test calls contributing a significant load on a part of a network are to be made, prior advice should be given to the other Administration(s) concerned. Types 1 and 2 test calls for preventive maintenance should be conducted during light load periods. Types 1 and 2 test calls should be conducted as and when required for the investigation and clearance of faults.



Type 3 test calls should be conducted only after adequate testing has been done by means of type 1 or 2 test calls and after the distant Administration has made the necessary check in its national network. Type 3 test calls should be conducted during light load periods.

In order to find faults in last-choice equipment, it may be necessary for tests to be carried out at the time when the traffic load approaches the full capacity of the route under test. The agreement of the distant network analysis point will be necessary before this test is carried out.

Subscriber-to-subscriber type test calls can be made by agreement of the network analysis point in the countries concerned.

Normally, unless there is a specific agreement between the Administrations concerned, subscriber-to-subscriber type test calls would be considered for fault location after:

- 1) verifying that there are no evident faults in the international switching centres involved that would cause the poor quality of service or subscriber complaint being investigated;
- 2) verifying that type 1 or type 2 test calls have been made on the international circuits that might have been involved;
- 3) verifying that there are no evident faults in the national network from the outgoing exchange to the international centre in the originating country;
- 4) verifying that there are no evident faults in the national network in the distant country, from the international centre to the called exchange.

When subscriber-to-subscriber type test calls are made, the network analysis point in the two countries should consider such factors as:

- 1) the expected nature of the fault;
- 2) international accounting agreements;
- 3) the need for making the test calls in the busy hour;
- 4) the possibility of causing or aggravating congestion at the time the calls are made.

The responding equipments used for subscriber-to-subscriber type test calls could be those used for maintenance of the national network.

## 2. *Results of test calls* (see Table 1/E.424)

### COMMENTS CONCERNING THE USE OF TABLE 1/E.424

- a) Table 1/E.424 summarizes tests carried out manually or automatically to assess the functioning of the international circuit or connection.
- b) It is essential to indicate clearly the way in which the tests have been carried out and to give full information about the testing apparatus used.
- c) Administrations may insert additional categories in Table 1/E.424 as they see fit.

TABLE 1/E.424 – Results of test calls

International outgoing exchange : .....

Circuit group : .....

Service { semi-automatic<sup>a</sup>  
automatic<sup>a</sup>

Type of test call :

Type 1<sup>a</sup>Type 2<sup>a</sup>Type 3<sup>a</sup>Sub-to-Sub<sup>a</sup>

Period from ..... to .....

Category	Number		%	
	Sub-total	Total	Sub-total	Total
1. Satisfactory tests .....		...		...
2. Signalling and charging faults .....		...		...
2.1 Wrong number .....	...		...	
2.2 No tone, no answer .....	...		...	
2.3 Absence of a backward line signal .....	...		...	
2.4 Other faults .....	...		...	
3. Transmission faults .....		...		...
3.1 Conversation impossible .....	...		...	
3.2 Call overamplified or underamplified .....	...		...	
3.3 Noise .....	...		...	
3.4 Fading .....	...		...	
3.5 Crosstalk .....	...		...	
4. Congestion .....		...		...
5. Other faults .....		...		...
	...		...	
	...		...	
	...		...	
Tests carried out .....		...		100
Test procedure followed (apparatus used, destination of calls, etc.)				

<sup>a</sup> Delete whichever is inapplicable.

**Recommendation E.425****INQUIRIES AMONG USERS OF THE INTERNATIONAL TELEPHONE SERVICE***Preamble*

1. One method of measuring telephone service quality is to conduct inquiries among users to ascertain their opinions of and actual experience with various aspects of the service they use. These inquiries are usually made by means of questionnaires, which are designed to determine the basic sources of user difficulty which may arise when making a call. The difficulty could be the means of obtaining the dialling information, setting up the call and any subsequent aspect, e.g. transmission quality.

To permit comparison and studies of the findings of these inquiries at the international level, it is considered desirable that all countries should use the same types of questionnaire.

2. It is therefore recommended that the following two types of questionnaire should be used:

- a) questionnaire for national subscribers dialling international calls (see Annex 1),
- b) questionnaire for visitors from other countries dialling national or international calls (see Annex 2).

It is intended that the questionnaires will be completed by staff specially instructed for the interview and not by the telephone user being interviewed. To ensure that this practice will be followed, together with others designed to secure uniformity of use, notes on the intended use are associated with the questionnaires.

The Questionnaire for Foreign Visitors has been arranged so that it can be used for either *national* or *international* calls. It has been specifically related to the *last call* made by the visitor in order to obtain reasonably precise information; only the last few questions relate to the more general or cumulative experience of the telephone user. This does not preclude the use of the form for obtaining the same information on a general experience basis providing the interviewer is suitably instructed and completed questionnaires are annotated in a distinct manner and separated from the *last call* questionnaires.

As the main object of the questionnaires is to provide data which can be compared on an international basis, and used to resolve human factor difficulties, the questions asked will not completely meet the service and marketing department requirements of all Administrations. Administrations are asked to accept this limitation and to use the questionnaires as presented.

Experience in using the Questionnaire for National Subscribers has shown that it is difficult to be highly selective in the choice of class of subjects, e.g. residential/business, frequent user/infrequent user. Generally, however, for the purpose of study of user behaviour and difficulties a cross section of results is most useful *as long as very small samples of any one class of user are avoided*. When an Administration is able to stage a survey with roughly the same number of residential and business users (say a minimum of 200 each), a sufficiently representative breakdown of frequent/infrequent users usually follows without special steps being taken. Care must however be taken with the business section of this sample to balance the interviews reasonably well between PBX operators and extension users.

The Questionnaire is designed to cover all these circumstances save for situations where a person sets up a call for another person and does not participate in the subsequent conversation. In such cases the action to be taken by the interviewer is as shown in the "Notes on the Intended Use of Questionnaires". Similar action may be needed when the Questionnaire for Foreign Visitors is used. If the incidence of such cases is large (say greater

than 10%) then Administrations may need to selectively increase the size of the main sample if they wish to obtain a reasonable balance between the number of interviews on the different classes listed above, i.e. residential/business, etc.

Separation and identification of the results for different classes, including the more unusual form where one person sets up the call and another person talks, will be covered in the processing of survey results.

3. It is recommended that data resulting from surveys carried out by Administrations be processed by the ITU computer through the CCITT Secretariat. To simplify this process, Administrations are requested to provide the data in a standardized punched card form, details of which can be supplied on request by the CCITT Secretariat.

4. Notes on the intended use of Questionnaires follow the list of actual Questionnaires.

*Note.* — The data arising from replies to certain questions in these forms are also essential to the works of Study Group XII (Assessment of service transmission quality).

ANNEX 1  
(to Recommendation E.425)

**INQUIRIES AMONGST USERS**

**Questionnaire for national subscribers dialling international calls**

(For details of use, see associated notes following the two questionnaires)

Originating Country .....	Special code (2 digits) <div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; text-align: center; vertical-align: middle;">1 2</div>	
		Card Serial Number (4 digits) <div style="display: inline-block; border: 1px solid black; width: 40px; height: 20px; text-align: center; vertical-align: middle;">3 4 5 6</div>
Interviewed by    Visit    1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>		
Telephone    2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>		
Code		
1.0 Do you ever dial international calls to other countries yourself?	YES	NO
	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
(If no) – ask why not and after answer terminate interview		NO with reason given
		3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
Reason (specify) .....		
(If yes) – proceed to questions below.		
In regard to the last international call you dialled:		
	Special code 2 digits	
2.0 What country did you dial direct?	<div style="display: inline-block; border: 1px solid black; width: 20px; height: 20px; text-align: center; vertical-align: middle;">9 10</div>	
3.0 Can you give me the town or telephone number you dialled?		
Insert information .....	YES	NO
a) Was the call to a private number?	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div> 11
b) Was the call to a company? (Business subscriber)	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div> 12
c) Did you dial direct to an extension in a PBX?	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div> 13
4.0 How long ago?		
4.1 – less than 24 hours	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	
4.2 – one to seven days	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	
4.3 – more than seven days	3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	
5.0 Did you have any difficulty in obtaining the telephone number for this call?		1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div> 2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div> 15
5.1 Where did you get the number?	International prefix	Country code
5.2 – official telephone directory	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.3 – special (pre-printed) telephone directory	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.4 – personal list	3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.5 – letterhead	4 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	4 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.6 – information operator	5 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	5 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.7 – friends or business associates	6 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	6 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.8 – memory	7 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	7 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
5.9 – other (specify) .....	8 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	8 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	Trunk code	Subscriber number
	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	1 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	2 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	3 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	4 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	4 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	5 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	5 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	6 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	6 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	7 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	7 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>
	8 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>	8 <div style="display: inline-block; border: 1px solid black; width: 30px; height: 20px; vertical-align: middle;"></div>

## Code

6.0 Did you have any difficulty in knowing how to make the international call?

YES NO  
1 ☐ 2 ☐ 20  
If no, go to 7.0

(If yes) – What difficulty?

- 6.1 – knowing the procedure for making a call 1 ☐ 21  
6.2 – knowing the international prefix 1 ☐ 22  
6.3 – knowing the country code 1 ☐ 23  
6.4 – knowing the trunk code 1 ☐ 24  
6.5 – knowing whether the addressee's number can be dialled 1 ☐ 25  
6.6 – trunk prefix wrongly included 1 ☐ 26  
6.7 – other (specify) ..... ← 1 ☐ 27

7.0 a) Did you have to dial the international number more than once?

YES NO  
1 ☐ 2 ☐ 28  
If no, go to 8.0

(If yes) – Why?

- 7.1 Could not understand or was unsure of the tone or voice announcement received 1 ☐ 29  
(If this item is marked, proceed to 7.7 below)  
7.2 – dialled incorrectly 1 ☐ 30  
7.3 – busy tone; engaged 1 ☐ 31  
7.4 – no reply; no answer 1 ☐ 32  
7.5 – heard nothing after dialling (for ..... seconds) 1 ☐ 33  
7.6 – other (specify) ..... ← 1 ☐ 34

(If any of items 7.2 - 7.6 are marked, omit 7.7 - 7.18 and go to 7.19)

7.7 b) Did you hear:

- 7.8 – a tone? 1 ☐  
7.9 – a voice announcement? 2 ☐ 41  
7.10 – both? 3 ☐

7.11 c) Did the tone and/or announcement come in

- 7.12 – during dialling? 1 ☐  
7.13 – after dialling? 2 ☐ 42

7.14 d) Could you describe the tone or tell me what the announcement said? .....

No  
Comment comment  
← 1 ☐ 2 ☐ 43

7.15 e) What did you decide to do when you heard that tone and/or voice announcement?

- 7.16 – dialled again 1 ☐  
7.17 – called the operator 2 ☐ 44  
7.18 – other (specify) ..... ← 3 ☐

If marked go to 8.0

7.19 f) How long did you wait before dialling again?

- 7.20 – less than one minute 1 ☐  
7.21 – one to five minutes 2 ☐ 45  
7.22 – more than five minutes 3 ☐

## Code

8.0 Did the person who answered use a language you did not understand?

YES NO  
1 ☐ 2 ☐ 46 ←

(If yes) — What did you do about it?

- |     |   |                            |      |
|-----|---|----------------------------|------|
| 8.1 | — disconnected and dialled the operator | 1 <input type="checkbox"/> | } 47 |
| 8.2 | — flashed the operator                  | 2 <input type="checkbox"/> |      |
| 8.3 | — dialled again later                   | 3 <input type="checkbox"/> |      |
| 8.4 | — other (specify) .....                 | 4 <input type="checkbox"/> |      |

9.0 In addition to setting-up the call did you converse over the connection?

If reply is "yes" then ask:

Which of these four words comes closest to describing the quality of the connection during conversation?

- |     |             |                            |      |
|-----|-------------|----------------------------|------|
| 9.1 | — excellent | 1 <input type="checkbox"/> | } 48 |
| 9.2 | — good      | 2 <input type="checkbox"/> |      |
| 9.3 | — fair      | 3 <input type="checkbox"/> |      |
| 9.4 | — poor      | 4 <input type="checkbox"/> |      |

If reply to 9.0 is "no" go to 11.0

10.0 Did you or the person you were talking to have any difficulty in talking or hearing over that connection?

YES NO  
1 ☐ 2 ☐ 49

(If answer is "yes") probe for nature of difficulty, but without suggesting possible types of difficulty, and copy down answers verbatim: e.g. "Could you describe the difficulty a little more?"

.....  
.....

At end of interview, categorize the answers in terms of the items below:

- |      |   |                            |    |
|------|---|----------------------------|----|
| 10.1 | — low volume                              | 1 <input type="checkbox"/> | 50 |
| 10.2 | — noise or hum                            | 1 <input type="checkbox"/> | 51 |
| 10.3 | — distortion                              | 1 <input type="checkbox"/> | 52 |
| 10.4 | — variations in level, cutting on and off | 1 <input type="checkbox"/> | 53 |
| 10.5 | — crosstalk                               | 1 <input type="checkbox"/> | 54 |
| 10.6 | — echo                                    | 1 <input type="checkbox"/> | 55 |
| 10.7 | — complete cut off                        | 1 <input type="checkbox"/> | 56 |
| 10.8 | — other (specify) .....                   | 1 <input type="checkbox"/> | 57 |

Could you give the following additional information

11.0 What type of telephone set did you use for that call?

- |      |                                  |                            |    |
|------|----------------------------------|----------------------------|----|
| 11.1 | — rotary dial                    | 1 <input type="checkbox"/> | 58 |
| 11.2 | — push button                    | 1 <input type="checkbox"/> | 59 |
| 11.3 | — repertory dialler (type) ..... | 1 <input type="checkbox"/> | 60 |
| 11.4 | — coin box                       | 1 <input type="checkbox"/> | 61 |
| 11.5 | — loud-speaking telephone        | 1 <input type="checkbox"/> | 62 |

## Code

12.0 *Approximately how many international calls do you make per month?*

12.1 — 1 or less

12.2 — 2 to 5

12.3 — 6 to 10

12.4 — 11 or more

1	
2	
3	
4	

63

13.0 *How many different countries did you call during the preceding month?*

2 digits

--	--

64 65

(Insert leading zero if number less than 10)

13.1 *Approximately how many different international numbers do you call?*

13.2 — 1 to 5

13.3 — 6 to 10

13.4 — 11 to 19

13.5 — 20 or more

1	
2	
3	
4	

66

14.0 *Are there any other comments you would like to make about international subscriber dialling?*  
(Specify) .....

		No
		Comment comment
← 1		2

67

15.0 *What do you find most difficult in dialling international calls?*  
(Specify) .....

← 1		2	
-----	--	---	--

68

16.0 *Are you:*

16.1 a) *a business subscriber?*

		YES	NO
1		2	

69

(If yes) Are you primarily:

16.2 — *the person mainly responsible for telecommunications in your firm?*

16.3 — *the PBX operator?*

16.4 — *a secretary?*

16.5 — *an extension user? (other than 16.2 or 16.4)*

1	
2	
3	
4	

70

16.6 b) *a residential subscriber?*

		YES	NO
1		2	

71

16.7 c) *other user? (Specify) .....*

		No	
		Comment comment	
← 1		2	

72



ANNEX 2  
(to Recommendation E.425)

**INQUIRIES AMONGST USERS**

**Questionnaire for visitors from other countries dialling national or international calls**

(For details of use see associated notes following the questionnaire)

Originating country .....	Special code (3 digits) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td></tr></table>				1	2	3		
1	2	3							
	Card serial number (4 digits) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>					4	5	6	7
4	5	6	7						

<b>Code</b>	<b>Special code 3 digits</b>												
1.0 <i>In which country do you live?</i> .....	<table border="1" style="display: inline-table;"><tr><td> </td><td> </td><td> </td></tr><tr><td>8</td><td>9</td><td>10</td></tr></table>				8	9	10						
8	9	10											
1.1 <i>In which country do you make most of your telephone calls?</i> .....	<table border="1" style="display: inline-table;"><tr><td> </td><td> </td><td> </td></tr><tr><td>11</td><td>12</td><td>13</td></tr></table>				11	12	13						
11	12	13											
2.0 <i>Have you visited our country before?</i>	<div style="text-align: right;">YES      NO</div> <div>1 <table border="1" style="display: inline-table; width: 40px;"></table> 2 <table border="1" style="display: inline-table; width: 40px;"></table> 14</div> <div style="text-align: right;">If no, go to 3.0 -----</div>												
<i>How many times?</i>													
2.1    — once	1 <table border="1" style="display: inline-table; width: 40px;"></table>												
2.2    — 2 to 5 times	2 <table border="1" style="display: inline-table; width: 40px;"></table> } 15												
2.3    — more than 5 times	3 <table border="1" style="display: inline-table; width: 40px;"></table>												
3.0 <i>Do you understand our languages?</i>													
3.1    — well	1 <table border="1" style="display: inline-table; width: 40px;"></table>												
3.2    — fair	2 <table border="1" style="display: inline-table; width: 40px;"></table> } 16												
3.3    — not at all	3 <table border="1" style="display: inline-table; width: 40px;"></table>												
4.0 <i>Did you yourself dial any telephone calls in this country?</i>	<div style="text-align: right;">YES      NO</div> <div>1 <table border="1" style="display: inline-table; width: 40px;"></table> 2 <table border="1" style="display: inline-table; width: 40px;"></table> 17</div> <div style="text-align: right;">If yes, go to 5.0 -----</div>												
(If no), ask <i>why not</i> and terminate interview, indicate reason below.													
4.1    — did not know how to make a call	1 <table border="1" style="display: inline-table; width: 40px;"></table>												
4.2    — no need to make a call	2 <table border="1" style="display: inline-table; width: 40px;"></table> } 18												
4.3    — my calls were placed by somebody else	3 <table border="1" style="display: inline-table; width: 40px;"></table>												
4.4    — other reasons (specify) .....	4 <table border="1" style="display: inline-table; width: 40px;"></table>												
5.0 <i>Was this visit the first time you had experience with this country's telephone system?</i>	<div style="text-align: right;">YES      NO</div> <div>1 <table border="1" style="display: inline-table; width: 40px;"></table> 2 <table border="1" style="display: inline-table; width: 40px;"></table> 19</div>												
6.0 <i>Approximately how many calls did you dial during this visit?</i>													
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;"><i>National</i></td> <td style="width: 10%;"></td> <td style="width: 40%; text-align: center;"><i>Inter- national</i></td> </tr> <tr> <td>6.1    — 1</td> <td>1 <table border="1" style="display: inline-table; width: 40px;"></table></td> <td><table border="1" style="display: inline-table; width: 40px;"></table></td> </tr> <tr> <td>6.2    — 2 to 5</td> <td>2 <table border="1" style="display: inline-table; width: 40px;"></table> } 20</td> <td><table border="1" style="display: inline-table; width: 40px;"></table> } 21</td> </tr> <tr> <td>6.3    — 6 or more</td> <td>3 <table border="1" style="display: inline-table; width: 40px;"></table></td> <td><table border="1" style="display: inline-table; width: 40px;"></table></td> </tr> </table>	<i>National</i>		<i>Inter- national</i>	6.1    — 1	1 <table border="1" style="display: inline-table; width: 40px;"></table>	<table border="1" style="display: inline-table; width: 40px;"></table>	6.2    — 2 to 5	2 <table border="1" style="display: inline-table; width: 40px;"></table> } 20	<table border="1" style="display: inline-table; width: 40px;"></table> } 21	6.3    — 6 or more	3 <table border="1" style="display: inline-table; width: 40px;"></table>	<table border="1" style="display: inline-table; width: 40px;"></table>
<i>National</i>		<i>Inter- national</i>											
6.1    — 1	1 <table border="1" style="display: inline-table; width: 40px;"></table>	<table border="1" style="display: inline-table; width: 40px;"></table>											
6.2    — 2 to 5	2 <table border="1" style="display: inline-table; width: 40px;"></table> } 20	<table border="1" style="display: inline-table; width: 40px;"></table> } 21											
6.3    — 6 or more	3 <table border="1" style="display: inline-table; width: 40px;"></table>	<table border="1" style="display: inline-table; width: 40px;"></table>											

## Code

7.0 Was the last call you dialled a national or international call? 1  2  22

7.1 (If international) – To which country did you make the call?  
(Specify) ..... ← Special code  
3 digits  
23 24 25

7.2 How long ago is it since you made this call?

7.3 – less than 24 hours 1

7.4 – one to seven days 2  26

7.5 – more than seven days 3

8.0 Where did you get the number?

8.1 – official telephone directory 1

8.2 – special (pre-printed) telephone directory 2

8.3 – personal list 3

8.4 – letterhead 4  27

8.5 – information operator 5

8.6 – friends or business associates 6

8.7 – memory 7

8.8 – other (specify) ..... ← 8

9.0 Did you have any difficulty in knowing how to make a call?

YES NO  
1  2  28  
If no, go to 10.0

(If yes) – What difficulty?

9.1 – knowing the procedure for making the call 1  29

(Go to 9.5 if the call is national)

9.2 – knowing the international prefix 1  30

9.3 – knowing the country code 1  31

9.4 – trunk prefix wrongly included 1  32

9.5 – knowing the trunk code 1  33

9.6 – knowing whether the addressee's number can be dialled 1  34

9.7 – obtaining information for addressee's number 1  35

9.8 – other (specify) ..... ← 1  36

10.0 a) Did you have to dial the number more than once?

YES NO  
1  2  37  
If no, go to 11.0

(If yes) – Why?

10.1 – could not understand or was unsure of the tone or voice announcement received. 1  38

(If this item is marked proceed to 10.7 below.)

10.2 – dialled incorrectly 1  39

10.3 – busy tone; engaged 1  40

10.4 – no reply; no answer 1  41

10.5 – heard nothing after dialling (for . . . . . seconds) 1  42

10.6 – other (specify) ..... ← 1  43

Code

(If any of items 10.2 - 10.6 are marked, omit 10.7 - 10.18 and go to 11.0)

10.7 b) Did you hear:

10.8 — a tone?

1 ☐

10.9 — a voice announcement?

2 ☐

10.10 — both?

3 ☐

50

10.11 c) Did the tone and/or announcement come in:

10.12 — during dialling?

1 ☐

10.13 — after dialling?

2 ☐

51

10.14 d) Could you describe the tone or tell me what the announcement said?

(Specify) .....

No  
Comment comment1 ☐ 2 ☐ 52

10.15 e) What did you decide to do when you heard that tone signal and/or voice announcement?

10.16 — dialled again

1 ☐

10.17 — called operator

2 ☐

10.18 — other (specify) .....

3 ☐

53

11.0 When the call was established, did the person who answered use a language you did not understand?

YES NO  
1 ☐ 2 ☐ 54  
If no, go to 12.0

(If yes) — What did you do about it?

11.1 — disconnected and called the operator

1 ☐

11.2 — flashed the operator

2 ☐

11.3 — dialled again later

3 ☐

11.4 — other (specify) .....

4 ☐

55

12.0 In addition to setting-up the call did you converse over the connection?

If reply is "yes" then ask:

Which of these four words comes closest to describing the quality of the connection during conversation?

12.1 — excellent

1 ☐

12.2 — good

2 ☐

12.3 — fair

3 ☐

12.4 — poor

4 ☐

56

If reply to 12.0 is "no" go to 14.0.

13.0 Did you or the person you were talking to have any difficulty in talking or hearing over that connection?

YES NO  
1 ☐ 2 ☐ 57

## Code

(If answer is "yes") probe for the nature of difficulty, but without suggesting possible types of difficulty and copy down answers verbatim: e.g. "Could you describe the difficulty a little more?"

.....

.....

At end of interview, categorize the answers in terms of the items below:

- |      |   |   |                          |    |
|------|---|---|--------------------------|----|
| 13.1 | — low volume                              | 1 | <input type="checkbox"/> | 58 |
| 13.2 | — noise or hum                            | 1 | <input type="checkbox"/> | 59 |
| 13.3 | — distortion                              | 1 | <input type="checkbox"/> | 60 |
| 13.4 | — variations in level, cutting on and off | 1 | <input type="checkbox"/> | 61 |
| 13.5 | — crosstalk                               | 1 | <input type="checkbox"/> | 62 |
| 13.6 | — echo                                    | 1 | <input type="checkbox"/> | 63 |
| 13.7 | — complete cut off                        | 1 | <input type="checkbox"/> | 64 |
| 13.8 | — other (specify) .....                   | 1 | <input type="checkbox"/> | 65 |

→ 14.0 Have you used a coin telephone in our country?

	YES		NO	
1	<input type="checkbox"/>	2	<input type="checkbox"/>	66

14.1 (If yes) Did you have any difficulty in knowing how to use it?

1	<input type="checkbox"/>	2	<input type="checkbox"/>	67
---	--------------------------	---	--------------------------	----

(If yes, probe non-directively to determine the nature of the difficulty.)

No

Comment comment

(Specify) .....

← 1 ☐ 2 ☐ 68

15.0 Have you used our directory to look up a number or for information on the use of the telephone?

	YES		NO	
1	<input type="checkbox"/>	2	<input type="checkbox"/>	69

15.1 (If yes) Did you have any difficulty finding what you wanted?

1	<input type="checkbox"/>	2	<input type="checkbox"/>	70
---	--------------------------	---	--------------------------	----

(If yes, probe non-directively to determine the nature of the difficulty.)

No

Comment comment

(Specify) .....

← 1 ☐ 2 ☐ 71

16.0 Are there any other comments or suggestions you would like to make about the telephone service in this country?

16.1 — In general? (Specify) .....

← 1 ☐ 2 ☐ 72

16.2 — Based on your first few calls? (Specify) .....

← 1 ☐ 2 ☐ 73

## NOTES ON INTENDED USE OF QUESTIONNAIRES

(Recommendation E.425)

1. *General*

These notes apply to both types of questionnaire, i.e.:

- a) Questionnaire for national subscribers dialling international calls.
- b) Questionnaire for visitors from other countries dialling national or international calls.

Both questionnaires have been designed for face-to-face interviews or for interview by telephone. *They are not a suitable form* to be passed direct to a telephone user by hand or by post for them to fill in personally.

2. *Use of questionnaires*

With the above in mind the following points should be adhered to in order that valid comparisons may be made at an international level.

- 1) The interviews will need to be conducted by a trained interviewer capable of clearly understanding the various technical terms used in the items in order to categorize the interviewee's replies, which may be very simply or vaguely expressed. In certain questions he or she may need to probe for clarity without suggesting or prompting answers.
- 2) In the event of the questionnaire having to be translated *for use by the interviewer* into languages other than English, French or Spanish, i.e. the languages in which the CCITT Secretariat issues copies of the questionnaires, care must be exercised to avoid any change of meaning of the questions.
- 3) In conducting the interview, the order of questions and the precise wording should be followed, i.e. the interviewer should avoid re-expressing a question in his own words.
- 4) It is intended that *only the questions in italics* should be asked by the interviewer. The items in lower case type are to be used by the interviewer to categorize the answers.

In certain questions the number of categories is specifically limited in order to avoid confusion on the part of the interviewer or for other reasons. In such cases a category shown as "-Other (specify) ..." is provided for entry of the infrequent or unusual reply. Examples of replies which would be classified in this manner are:

- a) Under 7.0 (Annex 1) or 10.0 (Annex 2)  
"I dialled correctly but reached a wrong number".
- b) Under 10.0 (Annex 1) or 13.0 (Annex 2)  
"We had a double connection" or "A third party was on the line".  
"The conversation was cut-off in one direction".  
"We experienced transmission delay within our conversation".  
"Our speech was clipped".  
"My own voice (speech) was loud in my telephone receiver".

These latter forms of impairment are some of the many arising from propagation time, echo-suppressors and local sidetone in unusually difficult circumstances, which cannot be individually listed on the questionnaires in view of the frequency of their occurrence.

- 5) When filling in the questionnaires, all answers should be indicated by a mark e.g. a cross in the box provided, and not by manuscript entries except where specifically asked for. Similarly, the interviewer must not use any of the numerical codes associated with the boxes on the questionnaires as an alternative to a simple mark, the numerical codes being provided for simplification of the subsequent coding of responses to questions.

Where manuscript entries are required, these should be written neatly and clearly, bearing in mind the possibility that a person unfamiliar with the language may have to read translate them.

The following boxes should be left blank by the interviewer:

– *Annex 1 Questionnaires*

boxes 1 – 2 (special code <sup>1)</sup> for originating country), 3 – 6 (serial number) and 9 – 10 (special code <sup>1)</sup> of country dialled);

– *Annex 2 Questionnaires*

boxes 1 – 3 (special code <sup>1)</sup> for originating country), 4 – 7 (serial number) and 8 – 10, 11 – 13 and 23 – 25 (special codes <sup>1)</sup>).

The boxes should be subsequently completed within the Administration by a responsible person (Coder) having access to the confidential list of special country codes <sup>1)</sup> and a single block of serial numbers to cover all the questionnaires which may originate from a number of interviewers. The confidential list of special country codes <sup>1)</sup>, together with a set of “coding instructions”, may be obtained from the CCITT Secretariat.

6) As far as possible, all the questions should be asked; however, in the rare event of embarrassment occurring, for example with the use of Question 1.0 and 1.1 on the foreign visitor questionnaire (Annex 2) these should be omitted.

Similarly, under Question 3.0 (Annex 1), where the town or telephone number dialled is requested, unless Administrations need to consider the information for national purposes, the question could be omitted as the responses are not used in subsequent processing for CCITT purposes. Questions 3a, 3b and 3c should however still be asked.

7) If, under Question 7.0 (Annex 1) or 10.0 (Annex 2): “Did you have to dial the international number more than once?” a customer replies “Yes” and on being asked “Why?” he *draws specific attention* to the fact that he had to make several repeated attempts, the number of attempts should be specifically entered under 7.0 as follows:

... attempts, repeated during ... minutes. The subscriber *should not be asked* if he had to make more than one repeated attempt.

8) If, under Question 7.0 (Annex 1) or 10.0 (Annex 2) an interviewee in reply to the sub-question “Why?” used the term “congestion tone” or “equipment engaged tone” this reply should be categorized under item 7.6 (Annex 1) or 10.6 (Annex 2) “-Other (specify)”. His attention should not be drawn to these terms, the distinction between them and the term “busy tone (subscriber engaged)” unless it is the practice in your Administration specifically to encourage subscribers to make such a distinction.

9) If, under Question 7 (Annex 1) or 10.0 (Annex 2), a response from the interviewee has to be categorized under item 7.5 (Annex 1) or 10.5 (Annex 2) – “heard nothing after dialling” he should be asked if he is able to *estimate for how long*. The information should be entered as follows:

7.5 (Annex 1) or 10.5 (Annex 2) – heard nothing after dialling (for ... seconds).

The treatment of responses given under 7) and 9) above is detailed in the “coding instructions”. Gaps in the numbering scheme associated with the questionnaire “boxes”, and usually shown to the right of the boxes, account for codes reserved for this specific purpose.

---

<sup>1)</sup> For security reasons, these special codes differ from the country codes defined in Recommendation E.160.

## **PART V**

### **Series E Recommendations (E.500 to E.542)**

#### **TRAFFIC ENGINEERING**

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## SECTION 1

### MEASUREMENT AND RECORDING OF TRAFFIC

#### Recommendation E.500

##### MEASUREMENT OF TRAFFIC FLOW <sup>1)</sup>

1. Traffic statistics should be measured for the significant period of each day of the whole year by automatic measuring and recording equipment capable of running continuously.

The recording equipment should make a record of the *traffic flow* carried during the *mean busy hour* for at least the 30 days (not necessarily consecutive) of the previous 12 months in which the mean busy-hour traffic flow is the highest. The record should also include the date of such measurements. This method gives traffic information of relatively high accuracy. This method is suitable for circuit groups operated automatically or semi-automatically.

*Note.* — The traffic flow for the busiest days having been recorded in this way, processing means can be employed to calculate values for the average traffic flow for the 30 and for the five busiest days during periods of 12 consecutive months. Such pairs of values can be calculated for a period of 12 months terminating in December and/or periods of 12 months terminating at other times.

It is recommended that the minimum requirement is an annual series of values terminating at the same time each year.

2. A second method which yields information of a lower degree of accuracy may be used by Administrations until they are ready to use the first, which is the preferred method. However, under certain circumstances, for manually operated groups of circuits, the second method is the only one possible.

This second method comprises a measuring period of 10 consecutive normal working days during the busiest season of the year. In the determination of the busiest season of the year it is necessary to bear in mind that a pronounced annual growth may cause the busy season at the end of the year to appear to exceed the busiest season which occurs earlier in the year. Since in most cases the busiest season is not clearly defined and varies from year to year, this method may be improved by taking a consecutive 10-day sample from the results of measurements made over a much longer period, for example 13 weeks covering the busy season(s). This extended period of measurement should provide information about the exceptionally busy days.

3. *Notification of mean busy hour traffic*

Measurements of the mean busy hour traffic, expressed in erlangs and quoting the busy hour on a GMT basis, also the date of measurement or the period for which the estimate is valid, should be communicated to other Administrations concerned in the handling of the traffic.

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<sup>1)</sup> See the definitions of the terms relating to traffic used in Recommendation E.100.

**Recommendation E.501****AUTOMATIC TRAFFIC-RECORDING DEVICES**

Greater use should be made of automatic methods of recording and analyzing traffic data because it would appear inevitable that more information regarding the traffic will be required as the continental and intercontinental networks are expanded. Therefore automatic methods, in addition to being more efficient, may well be the only economical ones to use. It is emphasized that, whilst any automatic equipment should not be unduly complicated, it should nevertheless be able to provide output information in a form which will be readily acceptable to an automatic data processing system.

Attention of Administrations is drawn to the following features given in the Annex for the design of traffic-recording machines; these features cover arrangements which might be made and facilities which might be incorporated.

**ANNEX**

(to Recommendation E.501)

**Features for automatic traffic-recording machines****1. *Basic automatic traffic-recording equipment*****1.1 *Purposes***

The equipment is primarily intended for ordinary traffic-engineering purposes, i.e. to collect the traffic data which are generally desired for the continuous supervision of a network and its long-term planning.

It is the main purpose of the equipment that measurements may be made, sometimes over extended periods, with the minimum of maintenance attention. In consequence, it is envisaged that each measurement will be provided as the result of instructions given to the machine in advance. The results of such measurements should be printed out or recorded on tape. A typical instruction would be to measure the traffic on a group of circuits between, say, 10 a.m. and 11 a.m. and to connect an output circuit at 11 a.m. which would print out and/or record the results on a tape.

**1.2 *Measurement period***

It is required that the traffic-recording equipment should be capable of making traffic comparisons either for a single busy hour or for a number of periods during a day.

Until the traffic characteristics of a group of circuits have been established it will be desirable to make daily measurements throughout the year. Such measurements will indicate the busy seasons and the distribution of the busy days. It is recognized that many of the measurements relating to slack days have no lasting value and it is therefore advantageous to consider whether the traffic-recording equipment cannot be designed with facilities such that the output is inhibited for those days on which the traffic does not exceed some predetermined minimum. As each group would need to have its own predetermined value, the machine would need to have means for storing the reference value for each group.

### 1.3 *Traffic data necessary to plan for a specified grade of service*

The amount of information necessary for planning will not be identical for all groups of circuits and for all relations <sup>2)</sup>, as some groups of circuits will provide for several relations whereas the traffic for some relations may be divided between different routes. It is desirable that the traffic machine should be designed to measure:

- a) carried traffic flow;
- b) number of call attempts <sup>3)</sup> (including repeated attempts and call attempts not gaining access to a group of international circuits);
- c) duration of the periods during which no circuits are available;
- d) number of call attempts experiencing congestion.

It is intended that the holding time when needed could be deduced from items a) and b). For groups with an adequate number of circuits any measurements under c) and d) are likely to be of little value.

As congestion increases, the b), c) and d) measurements become much more important for the following reasons:

- i) Measurements of carried traffic will not include calls experiencing congestion. Repeated attempts may result from such calls.
- ii) Circuits blocked by the maintenance staff may lead to much more serious congestion than might be expected from the carried-traffic flow.
- iii) Although the number of calls experiencing congestion, d), provide more information than the congestion-time measurements, c), complications arise in the case of both-way circuits because the d) measurements have to take place in both terminations, and this may result in delay in obtaining access to the full statistics.

### 1.4 *Traffic measurements for different groups of circuits*

1.4.1 The traffic-recording machine is required particularly to collect carried-traffic statistics as defined in Recommendation E.500. As a general rule, carried-traffic measurements will refer to the whole of a group of circuits between two centres. Such circuits may carry one-way or both-way traffic.

#### 1.4.2 *Measurement of traffic for particular relations (e.g. between two different countries).*

##### 1.4.2.1 *Direct (point-to-point) circuits*

In some cases the traffic for a particular relation will use an independent group of direct circuits (without overflow facilities) and the traffic measurement should be made according to 1.3 above.

##### 1.4.2.2 *High-usage and final routes*

Some relations will be served by direct high-usage circuits and by overflow facilities. In such cases the direct high-usage group of circuits can be measured according to 1.3 above. Such measurements provide only an indication of the traffic flow because the day-to-day fluctuations will be more apparent on the overflow than on the high-usage group.

The arrangement described below indicates means whereby more detailed information can be collected. It should be observed that holding-time statistics are available on the high-usage group, and the traffic machine should be capable of measuring these values directly or by measuring the traffic flow and the corresponding number of calls.

<sup>2)</sup> The word "relations" is used to describe the traffic from one particular country to another particular country.

<sup>3)</sup> Generally, in this Recommendation, the term "call attempts" includes all attempts to establish communication whether successful or not.

#### 1.4.2.3 *No direct or high-usage circuits*

The traffic for many relations may be combined and switched through a transit centre; in such cases the normal form of measurement cannot provide complete information and reference needs to be made to registers or markers which are aware of call destinations. The CCITT signalling systems do not provide facilities to enable transit or incoming calls to be identified according to their country of origin and, therefore, it is possible to make measurements only at the outgoing international exchange. Such measurements should indicate the number of offered calls and the number of calls experiencing congestion. These measurements will not indicate holding time and it does not seem justified to complicate the equipment in order to allow such measurement to be made. It is thought to be sufficient to provide facilities to measure the mean holding time on each group of circuits serving a number of relations. A check can be made of the holding time for any relation by reference to the statistics collected for international accounting.

It is expected that traffic measurements for particular relations can be taken on a non-continuous basis and that it will be unnecessary to provide facilities for measuring many relations simultaneously. Nevertheless, it must be recognized that the determination of the busy season for a relation may not be easy if the traffic for several relations uses the same group of circuits. Full traffic statistics for a relation can always be measured in special cases by routing the traffic through an additional switching stage at the outgoing centre so that independent measurements can be made.

In many cases the need for information about relations with a small amount of traffic will be limited to ascertaining the advisability of introducing high-usage (direct) circuits. This situation will become evident from statistics for international accounting.

### 1.5 *Indication of traffic congestion*

A traffic machine which runs continuously has the valuable asset of being able to indicate abnormal congestion quickly.

As a consequence it is recommended that, besides measuring traffic carried on a group of circuits, the machine should be able to recognize when there is congestion and indicate this fact so that immediate action can be taken.

### 1.6 *Indication of results*

In order that statistics may be collected in respect to both outgoing and incoming calls, and in order to keep the measuring equipment as flexible as possible, the indications to the measuring equipment from the circuits under measurement should be given in the same way for both types of call.

In applications in which it is desired to separate the semi-automatic and automatic call statistics separate indications must be given by the circuits to the measuring equipment.

Facilities should be provided for simultaneous measurement of the four traffic characteristics listed in 1.3 above on any specified group of circuits. It should be possible to give varying instructions to the machine indicating when to make measurements. The individual results should be printed out or recorded on tape.

It should be possible to make measurements on a specified number of routes. As a general rule, traffic carried and congestion time will always be referred to the whole of the circuit group, while the total number of calls and the number of calls experiencing congestion may also be referred to one of several relations served by a circuit group or to a relation served by a number of routes.

The indications for the traffic characteristics in 1.3 above may be given from the individual circuit equipments and/or from common equipment such as markers or registers. It is desirable that the indications follow a given standard.

The number of groups of circuits for which simultaneous measurements are required should be specified separately.

### 1.7 *Examples of measurements which may be provided by the automatic measuring equipment*

Examples of measurements that may be desired are shown in 1.8 below. In order to indicate the importance these different measurements may be expected to have, the different items have been given in signs I or II having the following meanings:

- (I) Measurements expected to be made on all routes for supervision of the network, including its long-term planning.
- (II) Measurements expected to be made occasionally on a few routes at the same time, provided that the inclusion of the facilities does not noticeably increase the cost of the equipment.

### 1.8 *Facilities*

1.8.1 Facilities should be provided for measuring the carried traffic flow for a group for any specified period (I).

1.8.2 Facilities should be provided for measuring the congestion time and/or the number of calls experiencing a congestion condition. It is required that the equipment should allow measurement totals to be made available daily on either a busy-hour, a two-hour or a 24-hour basis. Facilities should be provided for giving an alarm if the congestion exceeds a specified limit (I).

1.8.3 Facilities should be provided for measuring and for printing out or recording on tape the total traffic carried during each 15-minute period, so that the mean busy hour may be determined (I).

*Note.* — As an example, the facilities can be provided by causing the machine to produce an output total at 15-minute intervals from any starting hour to any finishing hour.

1.8.4 Facilities should be provided for measuring both the traffic and the number of call attempts and for printing out or recording on tape the totals for a specified hour or for 24 hours (II).

*Note.* — The results can be used for the calculation of holding times.

1.8.5 Facilities should be provided for counting call attempts in common circuits (such as registers, markers, etc.) for the following purposes:

- i) to identify the sample busy hour by periodically printing out or recording on tape the totals as in 1.8.3 (II) above.
- ii) to determine the number of call attempts to a specified country during the sample busy hour (I).
- iii) to determine the number of call attempts switched over a direct route to a specified country (I or II).
- iv) to determine the number of call attempts switched over one or more overflow routes to a specified country (I or II).
- v) to determine the number of call attempts to a specified country which are ineffective due to equipment or signalling failures. Such failures might upset the accuracy of traffic measurement in a similar way to congestion (I or II).
- vi) to determine the number of call attempts to a specified country which are ineffective due to all direct and overflow circuits being in use (I).
- vii) to determine the number of operator-handled call attempts on a given route (II).
- viii) to determine the number of subscriber-dialled call attempts on a given route (II).

### 1.9 *Control*

It is intended that in principle the recording equipment should be operated in response to processed instructions, for example a message on tape. It is desirable that the arrangement should be of such a form that remote control can easily be arranged.

## 2. *Supplementary traffic-recording equipment*

### 2.1 *Purpose*

The equipment is primarily intended for ordinary traffic-engineering purposes, i.e. to collect the traffic data which are generally desired for the continuous supervision of a network and its long-term planning.

Whereas the features listed in 1. above are generally needed for this equipment also, there is a basic difference. For the supplementary equipment a typical instruction will be to measure whether the traffic characteristics on a group of circuits between, say, 10 a.m. and 11 a.m. exceeds a predetermined value. If there should be an excess, it is required that an output equipment should be connected at 11 a.m. and that this equipment shall then print out and/or record the resulting information.

### 2.2 *Traffic characteristics to be recorded*

These requirements are similar to those in 1. above but differ because an average traffic-flow value is not required for every sample period but the value should be passed to output equipment when it exceeds a predetermined figure.

### 2.3 *Output-recording equipment*

This equipment forms the subject of 3. below. If a common output is used, then the route must be recorded. It is sufficient to insert the date only once per day.

### 2.4 *Measurement period*

Traffic-recording equipment should be capable of making traffic comparisons either for a single busy hour or for a number of periods during a day.

## 3. *Central analyzing equipment*

Central analyzing equipment is required to examine the traffic records which have been accumulated. It is assumed that the necessary measurement statistics have been recorded on some medium which can be read by machine (e.g. paper tape).

For these purposes it is desirable that the analyzing equipment should be capable of identifying the busiest season, the traffic flow at the busiest season, the annual growth of the traffic flow, and the extent to which the busiest season exceeds other seasons.

Furthermore the equipment should be capable of receiving data in respect to both the present number of circuits in operation and the dates on which it is planned that the present facilities will be extended. With this information it should be possible for the machine to estimate when the amount of disturbed traffic may be expected to exceed a specified grade of service.

It is expected that, in addition to the analysis which will be needed when planning an extension period, reviews will be advisable to check the rate of growth; such checks may be satisfied by extracting the busiest season and the mean busy-hour traffic for the five and 30 highest days. For a more complete analysis it would be interesting to extract such averages for each month and to establish any relationship between these averages.

It may prove to be more economical to design the recording equipment to record all days during which the busy-hour traffic exceeds some predetermined value than to design it to ascertain, as a continuous process, which are the 30 highest days. In either case the recording equipment must measure the busy-hour traffic each day, and it is likely to be simpler to make a record of all days which exceed a predetermined value than to have to ascertain whether the value for a particular day will be needed or not.

## SECTION 2

### FORECASTING OF TRAFFIC

#### Recommendation E.502

#### FORECASTING INTERNATIONAL TELEPHONE TRAFFIC

##### 1. *Introduction*

In the operation and administration of the international telephone network, proper and successful development depends to a large degree upon estimates for the future. Accordingly, for the planning of equipment and circuit provision and of telephone plant investments it is necessary that the Administrations forecast the traffic the network will carry. In view of the heavy investments in the international network the economic importance of the most reliable forecast is evident.

##### 2. *Base data for forecasting*

2.1 Forecasts of the traffic flows are needed not only for individual routes, which may carry traffic streams for larger areas, but more importantly on a point-to-point basis (between CTs of terminal countries). The forecasts should be prepared by the country originating the traffic, and should be supplied to the destination country and any other country involved in transit arrangements. It also has to be recognized that certain adjustments between the two ends of a traffic relation may be necessary in arriving at the final forecast.

2.2 The traffic carried for each relation should be regarded as base data in forecasting traffic growth. When the offered traffic is needed for dimensioning purposes it is given by

$$A = y / (1 - B)$$

where  $y$  is the design date traffic carried and  $B$  is the design date point-to-point grade of service.

2.3 Administrations planning installation of traffic measuring equipment are advised to ensure that the equipment records the data in computer-legible form (punched paper tape, magnetic tape, etc.), (see 1.8.3 in the Annex to Recommendation E.501). This greatly facilitates computer processing and makes it easier to analyze more frequent measurements.

##### 3. *Length of forecast period*

For normal extensions of switching equipment and additions of circuits a forecast period of about six years is necessary. However, a longer forecast period may be necessary for the planning of new cables or other transmission media, or for major plant installations. Estimates in the long term would necessarily be less accurate than short-term forecasts but that would be acceptable.

#### 4. *Methods and models appropriate to international forecasting*

4.1 In order to prepare a traffic forecast it is necessary to take into account irregularly recurring features which may have affected past traffic or may affect present traffic. Examples are tariff changes, changes in the signalling system, major changes in the structure of the network and removal of bottlenecks in the network or the substitution of subscriber-to-subscriber dialling methods for manual methods of setting up calls. Changes that affect the environment may introduce discontinuities in the traffic profile and may shorten or lengthen the duration of the peak period to a considerable extent and affect the concentration of traffic in this period. The Administrations should develop means of identifying these factors and evaluating them quantitatively (see examples of discontinuities in the graphs of Figures 2/E.502 and 3/E.502). From such an evaluation it will be possible to make a modified set of values of past traffic from which a future trend may be extrapolated.

4.2 An adapting forecasting system using time as an independent variable is recommended for estimates of the future traffic from the values derived in accordance with 4.1 above. On this basis the traffic trend is extrapolated by calculating the values of the parameters of some function which is expected to characterize the growth of international traffic. The numerical calculations in curve fitting can be performed by using the least squares method. If the traffic values available cannot be expected to yield mathematically reliable values, a rough survey can be obtained by simply plotting a continuation of the curve of available traffic data.

In view of the historical absence of saturation effects in international communications, and the prospects for future expansion, a simple exponential or a parabolic function may be used to represent the growth of international telephone traffic. The equations of these two functions are given below:

$$\text{Exponential: } Y_t = Ae^{Bt}$$

$$\text{Parabolic: } Y_t = A + Bt + Ct^2$$

In the above equations,  $Y_t$  is the traffic after  $t$  time intervals, while  $A$ ,  $B$  and  $C$  are constants (parameters depending on the route observed). It is found that both these functions can be used for forecasts up to, say, six years, whereas the parabolic function can be applied for longer term forecasts. However, care must be applied in the use of the parabolic function if the estimate of  $C$  is negative.

Examples of curve fitting by means of the method of least squares applied to traffic data from some international telephone relations are given in the graphs of Figures 1/E.502 to 3/E.502. In the examples the growth trends are approximated by the exponential and parabolic functions.

4.3 By using a smoothing process in curve fitting, it is possible to calculate the parameters of the model to fit current data very well but not necessarily the data obtained a long time ago.

The best known smoothing process is the moving average. The degree of smoothing is here controlled by the number of most recent observations included in the average. All observations included in the average have the same weight. In the method of exponential smoothing the weight given to previous observations decreases geometrically with age. The speed with which the effect of past observations is reduced is here controlled by the chosen value of a smoothing constant. Use of smoothing methods is appropriate especially for short-term forecasts.

4.4 The historical data for forecasting purposes must be extended into the past far enough to include a sufficient number of observations for estimating the values of the parameters in the fitting curve or regression function. Historical data are needed for a period which is at least as long as the forecast period.

4.5 The forecasting methods recommended are suitable for computer application.

#### 5. *Discontinuities in traffic growth*

It may be difficult to assess in advance the magnitude of a discontinuity. The influence of the factors which cause discontinuities often is spread over a transitional period, the discontinuity is then not so obvious. Furthermore, discontinuities arising from the introduction of, e.g. international subscriber dialling are difficult to identify accurately, because changes in the method of working are usually associated with other changes (e.g. tariff reductions).



An illustration of the bearing of discontinuities on traffic growth can be observed in the graphs of Figures 2/E.502 and 3/E.502.

Discontinuities representing the doubling and even more of traffic flow are known. It may also be noted that changes could occur in the growth trend after discontinuities.

In the Annex the experiences from some Administrations of irregularities in traffic growth are presented.

In short-term forecasts it may be desirable to use the trend of the traffic between discontinuities, but for long-term forecasts it may be desirable to use a trend estimate which is based on long-term observations, including previous discontinuities.

#### 6. *Accuracy in forecasting*

The accuracy of the forecast depends on the completeness of information, the identification of the causes of past and present conditions and the skill of judgement. It is apparent that particularly in forecasting international traffic the forecasts must of necessity contain a high degree of informed judgement (see 5. above).

A forecast made for the total outgoing international traffic of a country is usually more accurate than the sum of individual forecasts made for routes or on a point-to-point basis. However, these individual forecasts are necessary (see 2.2 above). An approach in forecasting both from a "top down" and a "bottom up" concept ensures maximum efficiency and control. If substantial deviations occur between these independently prepared views, the underlying basic assumptions and factors affecting growth should be analyzed and the two views reconciled within a reasonable relationship.

#### 7. *Follow-up of forecasts made*

It is essential to make regular comparisons between forecasts made and subsequent observed growth. Reasons for significant differences should be analyzed and forecasts made should be revised in the light of the result of this analysis. Furthermore, whenever information is received about changes in factors affecting growth, e.g. changes in the tariff structure, forecasts made should be modified.

The foregoing recommendations and observations are intended as a guide and it can be hoped that, with increasing experience, better and more accurate methods will be developed and especially that these can be made, for the most part, suitable for computer implementation. However, some human judgement will always be required in making traffic forecasts.

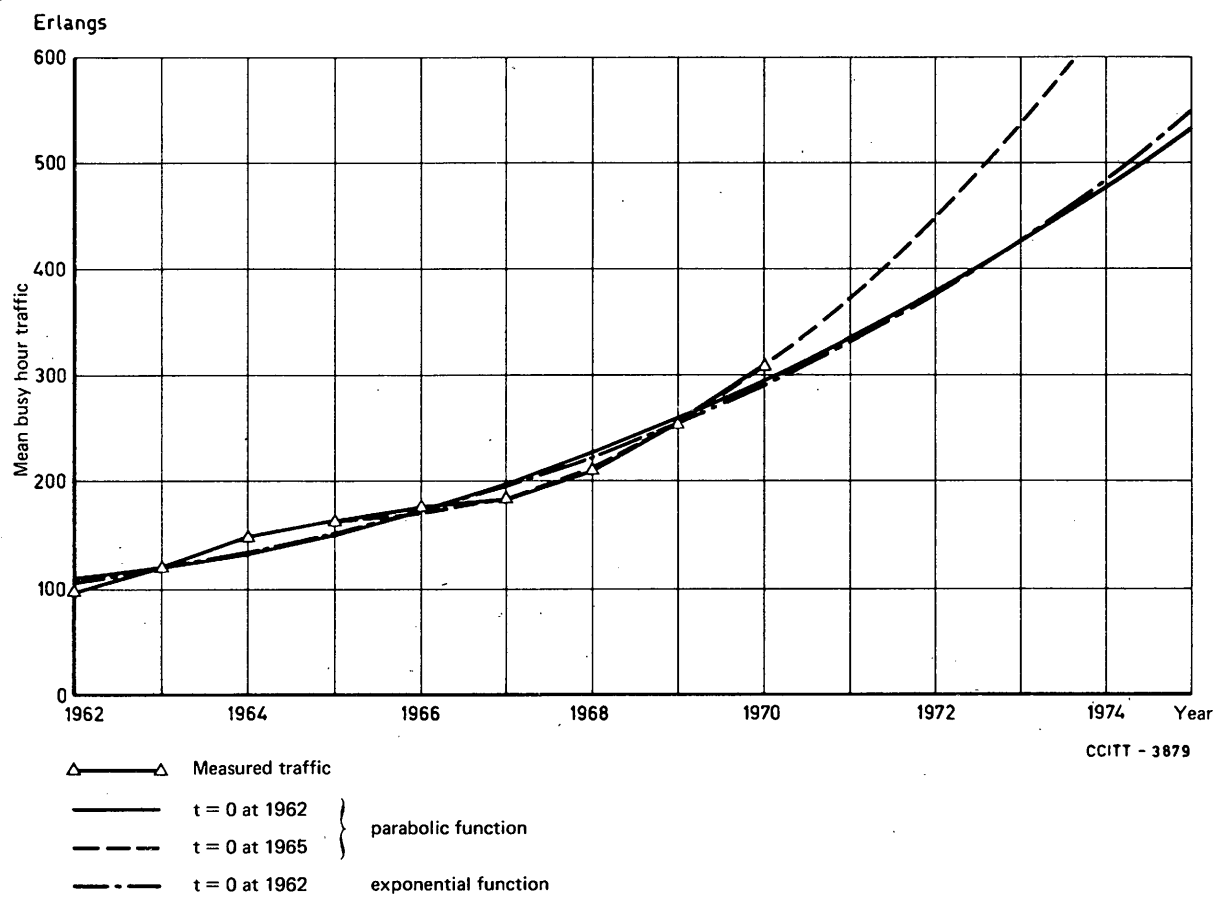
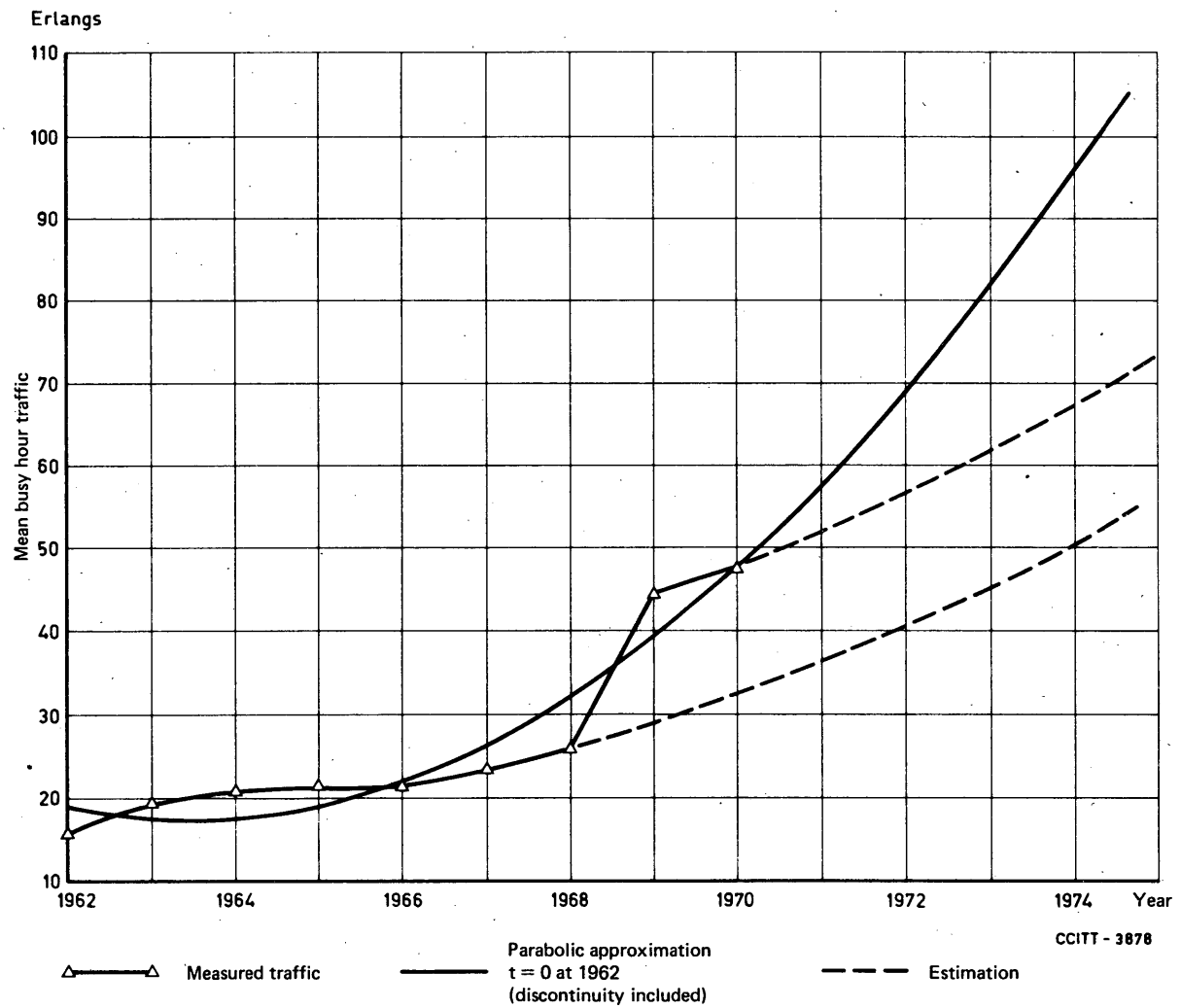
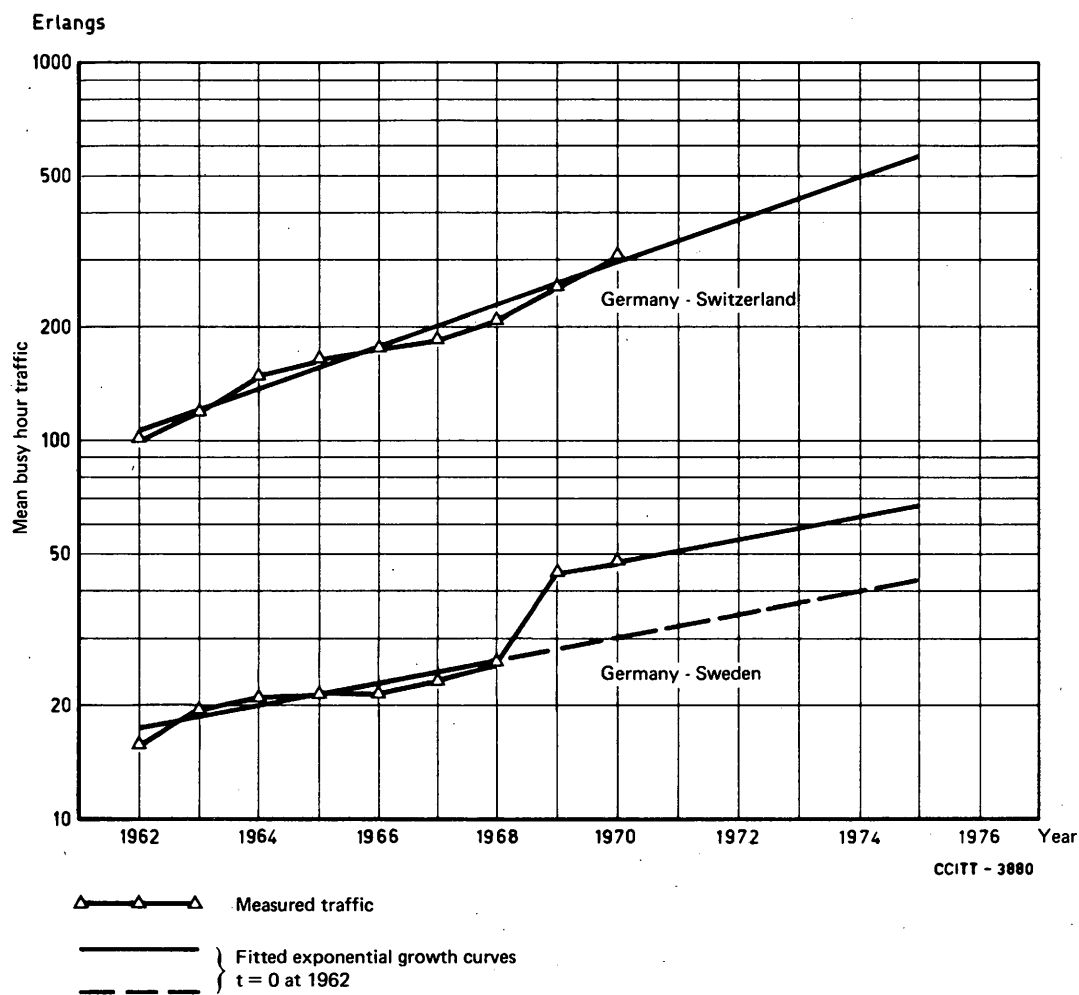


FIGURE 1/E.502 – Germany - Switzerland



Mean busy hour traffic (Erlangs); 10 consecutive working days. Recommendation E.500, 2.

FIGURE 2/E.502 – Germany - Sweden



Mean busy hour traffic (Erlangs); 10 consecutive working days. Recommendation E.500, 2.

FIGURE 3/E.502 – Germany - Switzerland and Germany - Sweden

ANNEX  
(to Recommendation E.502)

**1. Experience of the Australian Administration  
with traffic discontinuities**

*Effects of conversion from HF radio to a high-quality submarine cable  
system (COMPAC cable)*

Stream	Stimulus (%)	Growth rate (%)	
		Before cable	After cable
Australia - New Zealand	84	7.5	28.3
Australia - United Kingdom	168	5.2	30.7
Australia - United States	53	8.5	33.1

*Note 1.* – Cable working to New Zealand commenced in July 1962 and to U.K. and U.S.A. in December 1963.

*Note 2.* – The above figures are based on statistics of outgoing paid minutes over the period 1955-1968 (N.Z., U.S.A.), and 1945-1968 (U.K.).

**2. Examples of Cable and Wireless Ltd. experience on the effects of conversion  
from HF radio to high quality wide-band systems**

Stream	Terminal paid minutes in preceding year	Stimulus %	Growth rate (%)		Type and date of new system
			Before	After	
Hong Kong - U.S.A.					
Outgoing	121 000	116	16	71	} Cable, August 1966
Incoming	212 000	69	72	56	
Hong Kong - Indonesia					
Outgoing	57 000	91	9	25	} Cable/satellite, August 1970
Incoming	45 000	103	22	38	
Bahrain - United Kingdom					
Outgoing	32 400	0	99	59	} Satellite, July 1969
Incoming	13 000	43	56	29	
Bahrain - Dubai					
Outgoing	17 500	60	63	70	} Tropospheric scatter, July 1969
Incoming	17 500	50	40	56	
Barbados - Guyana					
Outgoing	11 600	122	22	11	} Tropospheric scatter, March 1969
Incoming	12 000	182	4	5	
Antigua - U.S.A.					
Outgoing	11 000	117	91	37	} Tropospheric scatter/cable, August 1966
Incoming	15 400	137	84	29	
Mauritius - Reunion					
Outgoing	12 500	140	9	38	} VHF, October 1971
Incoming	22 000	137	12	47	
Fiji - New Zealand					
Outgoing	2 100	290	18	56	} Cable, December 1972
Incoming	2 400	300	5	94	

*Note 1.* – Growth rates represent the trend over the twelve months before and after conversion, calculated at an annual rate.

*Note 2.* – The Bahrain - United Kingdom HF route and the Barbados - Guyana route were equipped with Lincompex.

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## SECTION 3

### DETERMINATION OF THE NUMBER OF CIRCUITS IN MANUAL OPERATION

#### Recommendation E.510 <sup>1)</sup>

#### DETERMINATION OF THE NUMBER OF CIRCUITS IN MANUAL OPERATION

1. The quality of an international manual demand service should be defined as the percentage of call requests which, during the average busy hour (as defined later under 3.) cannot be satisfied immediately because no circuit is free in the relation considered.

By *call requests satisfied immediately* are meant those for which the call is established by the same operator who received the call, and within a period of two minutes from receipt of that call, whether the operator (when she does not immediately find a free circuit) continues observation of the group of circuits, or whether she makes several attempts in the course of this period.

Ultimately, it will be desirable to evolve a corresponding definition based on the *average speed* of establishing calls in the busy hour, that is to say the average time which elapses between the moment when the operator has completed the recording of the call request and the moment when the called subscriber is on the line, or the caller receives the advice *subscriber engaged, no reply*, etc. But for the moment, in the absence of information about the operating time in the European international service, such a definition cannot be established.

2. The number of circuits it is necessary to allocate to an international relation, in order to obtain a given grade of service, should be determined as a function of the *total holding time* of the group in the busy hour.

The total holding time is the product of the number of calls in the busy hour and a factor which is the sum of the average call duration and the average operating time.

These durations will be obtained by means of a large number of observations made during the busy hours, by agreement between the Administrations concerned. If necessary, the particulars entered on the tickets could also serve to determine the average duration of the calls.

The average call duration will be obtained by dividing the total number of minutes of conversation recorded by the recorded number of effective calls.

The average operating time will be obtained by dividing the total number of minutes given to operating (including ineffective calls) by the number of effective calls recorded.

3. The number of calls in the busy hour will be determined from the average of returns taken during the busy hours on a certain number of busy days in the year.

Exceptionally busy days, such as those which occur around certain holidays, etc., will be eliminated from these returns. The Administrations concerned should plan, whenever possible, to put additional circuits into service for these days.

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<sup>1)</sup> This Recommendation dates from the XIIIth Plenary Assembly of the CCIF (London, 1946) and has not been fundamentally revised since. It was studied under Question 13/II in the period 1968-1972 and was found to be still valid.

In principle, these returns will be taken during the working days of two consecutive weeks, or during ten consecutive working days. If the monthly traffic curve shows only small variations, they will be repeated twice a year only. They will be taken three or four times a year or more if there are material seasonal variations, so that the average established is in accordance with all the characteristic periods of traffic flow.

4. The total occupied time thus determined should be increased by a certain amount determined by agreement between the Administrations concerned according to the statistics of traffic growth during earlier years, to take account of the probable growth in traffic and the fact that putting new circuits into service takes place some time after they are first found to be necessary.

5. The total holding time of the circuits thus obtained, in conjunction with a suitable table (see Table 1/E.510), will enable the required number of circuits to be ascertained.

6. In the international manual telephone service, the following Tables A and B should be used as a basis of minimum allocation:

Table A corresponds to about 30% of calls failing at the first attempt because of all circuits being engaged and to about 20% of the calls being deferred.

Table B, corresponding to about 7% of calls deferred, will be used whenever possible.

These tables do not take account of the fact that the possibility of using secondary routes permits, particularly for small groups, an increase in the permissible occupation time.

TABLE 1/E.510 – Capacity of circuit groups  
(See Supplement No. 2)

Number of circuits	Table A		Table B	
	Percentage of circuit usage	Minutes of circuit usage possible in the busy hour	Percentage of circuit usage	Minutes of circuit usage possible in the busy hour
1	65.0	39	—	—
2	76.7	92	46.6	56
3	83.3	150	56.7	102
4	86.7	208	63.3	152
5	88.6	266	68.3	205
6	90.0	324	72.0	259
7	91.0	382	74.5	313
8	91.7	440	76.5	367
9	92.2	498	78.0	421
10	92.6	556	79.2	475
11	93.0	614	80.1	529
12	93.4	672	81.0	583
13	93.6	730	81.7	637
14	93.9	788	82.3	691
15	94.1	846	82.8	745
16	94.2	904	83.2	799
17	94.3	962	83.6	853
18	94.4	1020	83.9	907
19	94.5	1078	84.2	961
20	94.6	1136	84.6	1015

Note. — Tables A and B can be extended for groups comprising more than 20 circuits by using the values given for 20 circuits.



## SECTION 4

### DETERMINATION OF THE NUMBER OF CIRCUITS IN AUTOMATIC AND SEMI-AUTOMATIC OPERATION

#### Recommendation E.520

#### NUMBER OF CIRCUITS TO BE PROVIDED IN AUTOMATIC AND/OR SEMI-AUTOMATIC OPERATION, WITHOUT OVERFLOW FACILITIES

This Recommendation refers to groups of circuits used:

- in automatic operation;
- in semi-automatic operation;
- in both automatic and semi-automatic operations on the same group of circuits.

#### 1. *General method*

1.1 The CCITT recommends that the number of circuits needed for a group should be read from tables or curves based on the classical Erlang B formula (see Supplements Nos. 1 and 2 to this Volume which refers to full availability groups). Recommended methods for traffic determination are indicated in Recommendation E.500.

For *semi-automatic operation* the loss probability  $p$  should be based on 3% during the mean busy hour.

For *automatic operation* the loss probability  $p$  should be based on 1% during the mean busy hour.

Semi-automatic traffic using the same circuits as automatic traffic is to be added to the automatic traffic and the same parameter value of  $p = 1\%$  should be used for the total traffic.

The values of 3% and 1% quoted above refer to the Erlang B formula and derived tables and curves. The 3% value should not be considered as determining a grade of service because with semi-automatic operation there will be some smoothing of the traffic peaks; it is quoted here only to determine the value of the parameter  $p$  (loss probability) to use in the Erlang B tables and curves.

1.2 In order to provide a satisfactory grade of service both for the mean busy-hour traffic and for the traffic on exceptionally busy days, it is recommended that the proposed number of circuits should, if necessary, be increased to ensure that the loss probability shall not exceed 7% during the mean busy hour for the average traffic estimated for *the five busiest days* as specified in Recommendation E.500.

1.3 For *small groups of long intercontinental circuits* with automatic operation some relaxation could be made in respect to loss probability. It is envisaged that such circuits would be operated on a both-way basis and that a reasonable minimum for automatic service would be a group of six circuits. A table providing relaxation is annexed to this Recommendation and is based on a loss probability of 3% for six circuits, with a smooth progression to 1% for 20 circuits. The general provision for exceptional days remains unchanged.

For exceptional circumstances in which very small groups (less than six intercontinental circuits) are used for automatic operation, dimensioning of the group should be based on the loss probability of 3%.

## 2. *Time differences*

Time differences at the two terminations of intercontinental circuits are likely to be much more pronounced than those on continental circuits. In order to allow for differences on groups containing both-way circuits it will be desirable to acquire information in respect to traffic flow both during the mean busy hour for both directions and during the mean busy hour for each direction.

It is possible that in some cases overflow traffic can be accepted without any necessity to increase the number of circuits, in spite of the fact that this overflow traffic is of a peaky nature. Such circumstances may arise if there is no traffic overflowing from high-usage groups during the mean busy hour of the final group.

## 3. *Both-way circuits*

3.1 With the use of both-way circuits there is a danger of simultaneous seizure at both ends; this is particularly the case on circuits with a long propagation time. It is advisable to arrange the sequence of selection at the two ends so that such double seizure can only occur when a single circuit remains free.

When all the circuits of a group are operated on a both-way basis, time differences in the directional mean busy hours may result in a total mean busy hour traffic flow for the group which is not the sum of the mean busy hour traffic loads in each direction. Furthermore, such differences in directional mean busy hour may vary with seasons of the year. However, the available methods of traffic measurement can determine the traffic flow during mean busy hour for this total traffic.

3.2 Some intercontinental groups may include one-way as well as both-way operated circuits. It is recommended that in all cases the one-way circuits should be used, when free, in preference to the both-way circuits. The number of circuits to be provided will depend upon the one-way and total traffic.

The total traffic will need to be determined for:

- a) each direction of traffic;
- b) both-way traffic.

This determination is to be made for the busy hour or the busy hours corresponding to the two cases a) and b) above.

In the cases where the number of one-way circuits is approximately equal for each direction, no special procedure is necessary, and the calculation can be treated as for a simple two-group grading <sup>1)</sup>.

If the number of one-way circuits is quite different for the two directions, some correction may be needed for the difference in randomness of the flow of calls from the two one-way circuit groups to the both-way circuit group. The general techniques for handling cases of this type are quoted in Recommendation E.521.

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<sup>1)</sup> See article by I. Tange: "Optimal use of both-way circuits in cases of unlimited availability", *TELE*, English Edition No. 1, 1956.

## ANNEX

(to Recommendation E.520)

Table 1 may be applied to small groups of long intercontinental circuits. The values in column 2 are suitable for a random offered traffic with full availability access.

TABLE 1

Number of circuits	Traffic flow (in erlangs)		
	Offered	Carried	Encountering congestion
(1)	(2)	(3)	(4)
6	2.54	2.47	0.08
7	3.13	3.05	0.09
8	3.73	3.65	0.09
9	4.35	4.26	0.09
10	4.99	4.90	0.09
11	5.64	5.55	0.10
12	6.31	6.21	0.10
13	6.99	6.88	0.10
14	7.67	7.57	0.10
15	8.37	8.27	0.11
16	9.08	8.96	0.11
17	9.81	9.69	0.11
18	10.54	10.42	0.11
19	11.28	11.16	0.12
20	12.03	11.91	0.12

The table is based on 1% loss probability for 20 circuits and increases progressively to a loss probability of 2% at 9 circuits and 3% at 6 circuits (loss probabilities for these three values being based on the Erlang loss formula: see Supplement No. 1 to this Volume. The traffic flow values obtained from a smoothing curve coincide very nearly with those determined by equal marginal utility theory, i.e. an improvement factor of 0.05 erlang for an additional circuit.

For groups requiring more than 20 circuits the table for loss probability of 1%, mentioned in Supplement No. 1 to this Volume, should be used.

**Recommendation E.521**

**CALCULATION OF THE NUMBER OF CIRCUITS IN A  
GROUP CARRYING OVERFLOW TRAFFIC**

A calculation of the number of circuits in a group carrying overflow traffic should be based on this Recommendation and on Recommendation E.522 dealing with high-usage groups.

The objective grade of service used is that the average blocking during the busy-hour of the 30 busiest days of the year will not exceed 1%.

To determine the number of circuits in a group carrying overflow traffic, three traffic parameters are required; the average traffic offered to the group, the weighted peakedness factor, and the level of day-to-day traffic variations.

The level of day-to-day traffic variations indicates the degree to which the daily busy-hour traffics deviates about the overall mean traffic, and is determined by the sample variance of the 30 busy-hour traffics.

The peakedness factor indicates the degree to which the variability of the traffic deviates from pure chance traffic within a single hour, and in statistical terms is the variance-to-mean ratio of the distribution of simultaneous overflow traffic.

### 1. *Determination of the level of day-to-day traffic variations*

Let  $M_1, M_2, \dots, M_{30}$  denote the 30 busy-hour loads of the traffic offered to the final group. Determine the mean traffic  $M$  of the daily traffics by

$$M = \frac{1}{30} \sum_{j=1}^{30} M_j$$

Determine the sample variance  $V_d$  of the daily traffics by

$$V_d = \frac{1}{29} \sum_{j=1}^{30} (M_j - M)^2$$

Determine the point  $(M, V_d)$  on Figure 1/E.521;  $M$  on the horizontal axis, and  $V_d$  on the vertical axis.

- i) If the point  $(M, V_d)$  is below the bottom curve, the level of variation is *No*.
- ii) If the point is between the lower two curves, the level of variation is *Low*.
- iii) If the point is between the upper two curves, the level of variation is *Medium*.
- iv) If the point is above the highest curve, the level of variation is *High*.

Default procedures: if the data are not available to compute the variance  $V_d$  use the following guidelines:

- i) If no more than 25 per cent of the traffic offered to the final group is overflow from other groups, assume the level of day-to-day variation is *Low*.
- ii) Otherwise, assume a *Medium* level of variation.

### 2. *Determination of peakedness factor $z$*

Peakedness factors depend principally upon the number of high-usage circuits over which random traffic has access. When the number of such high-usage circuits does not exceed 30, the actual peakedness of the traffic overflowing from a high-usage group will be only slightly below the maximum peakedness values<sup>2), 3)</sup>. The maximum peakedness values are given in Table 1/E.521.

<sup>2)</sup> Tables giving:

- the exact mean of the overflow traffic, and
- the difference between variance and mean of the overflow

have been computed and are set out in "Tabellen für die Planung von Fernsprecheinrichtungen", Siemens u. Halske, München, 1961.

<sup>3)</sup> Curves giving the exact mean and variance of overflow traffic are given in Figures 12 and 13 of "Theories for Toll Traffic Engineering in the U.S.A.", by R. I. Wilkinson, Bell System Technical Journal, Volume 35, March 1956. See also by the same author a more detailed description of the method in "Simplified Engineering of Single Stage Alternate Routing Systems", Fourth International Teletraffic Congress, London, 1964; and in "Non-random Traffic Curves and Tables", Bell Telephone Laboratories, 1970.

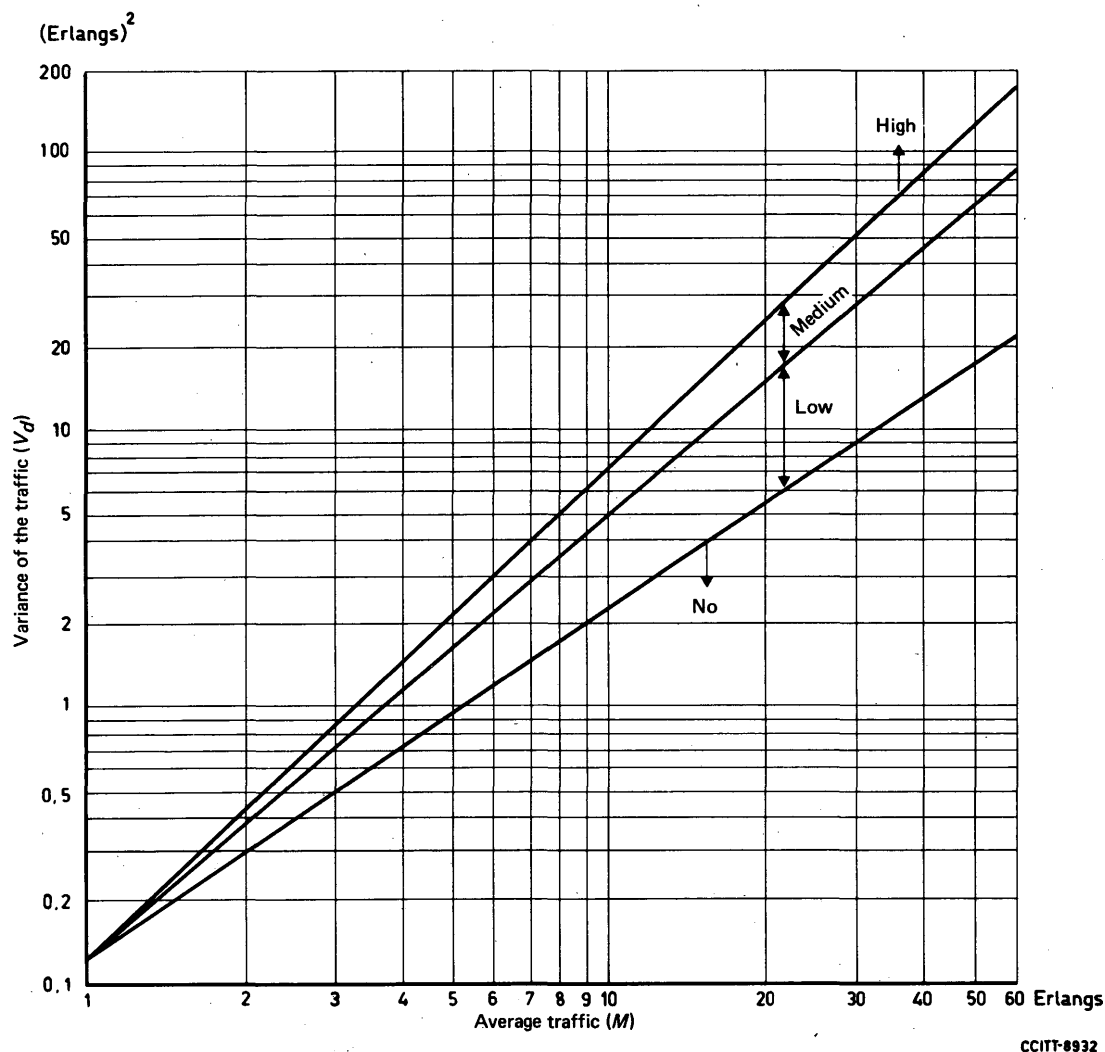


FIGURE 1/E.521 – Determination of the level of day-to-day traffic variation

TABLE 1/E.521 – Maximum peakedness factor  $z_i$ 

Number of high-usage circuits ( $n_i$ )	Peakedness factor ( $z_i$ )	Number of high-usage circuits ( $n_i$ )	Peakedness factor ( $z_i$ )
1	1.17	16	2.44
2	1.31	17	2.49
3	1.43	18	2.55
4	1.54	19	2.61
5	1.64	20	2.66
6	1.73	21	2.71
7	1.82	22	2.76
8	1.90	23	2.81
9	1.98	24	2.86
10	2.05	25	2.91
11	2.12	26	2.96
12	2.19	27	3.00
13	2.26	28	3.05
14	2.32	29	3.09
15	2.38	30	3.14

For more than 30 circuits, the peakedness of the traffic overflowing from a high-usage group  $i$  of  $n_i$  circuits is given by

$$z_i = 1 - \beta_i + \frac{A_i}{n_i + 1 + \beta_i - A_i}$$

where  $A_i$  is the mean (random) traffic offered to the  $n_i$  circuits and  $\beta_i$  is the traffic overflowing. The overflow traffic  $\beta_i$  is found by employing the standard Erlang loss formula

$$E_{1, n_i}(A_i):$$

$$\beta_i = A_i E_{1, n_i}(A_i).$$

The weighted mean peakedness factor  $z$ , is then calculated from:

$$z = \frac{\sum_{i=1}^h \beta_i z_i}{\sum_{i=1}^h \beta_i}$$

for the  $h$  parcels of traffic being offered to the final group.

Note that for the traffic directly offered to the final group, the peakedness factor is  $z_i = 1$ .

### 3. *Determination of the mean traffic offered to the final group and the number of circuits required*

For planning future network requirements, the traffic overflowing to a final group should be determined theoretically from forecasts of traffics offered to the high-usage groups.

The mean traffic overflowing to the final group from a high-usage group is determined in two steps:

- i) the "single-hour" overflow traffic  $\beta_i$  overflowing from  $n_i$  circuits is given as above by

$$\beta_i = A_i E_{1, n_i}(A_i),$$

when  $A_i$  is the forecast of traffic offered to the  $i^{\text{th}}$  high-usage group;

- ii) the average overflow traffic  $\beta_i$  overflowing from the  $n_i$  circuits is then determined by adjusting the single-hour traffic  $\beta_i$  for the effect of day-to-day traffic variations.

$$\beta_i = r_i \beta_i$$

The adjustment factor  $r_i$  is given in Table 2/E.521; it is a function of:

- the offered traffic  $A_p$
- the traffic  $A_i E_{i, n_i-1}(A_i) - \beta_i$  carried by the last trunk  $i$ , and
- the level of day-to-day variations of the traffic offered to the high-usage group  $p$ .

This level can be determined using the method described in 1. above, but applying it to measurements of traffic offered to the high-usage group. If such measurements are not available a *medium* level can be used.

The mean traffic offered to the final group is then the sum of all  $\beta_i$  over the  $h$  parcels of traffic:

$$M = \sum_{i=1}^h \bar{\beta}_i$$

It can be assumed that the level of day-to-day traffic variations on the final group remains constant over the forecast time period.

Using the level of day-to-day traffic variation as determined in 1. above on the final group and the peakedness factor of 2. above, the appropriate Table 3/E.521 is used to derive the number of circuits required.

*Note 1.* – This method of calculation of the mean traffic offered to the final group is valid only if the overflow traffic due to blocking encountered in the exchange in the attempts to connect to a high-usage, is negligible.

*Note 2.* – Table 3.1/E.521 differs slightly from the previous tables published by CCITT, although in Table 3.1/E.521 there is no allowance for day-to-day variations. The new table takes into account a systematic bias in the measurement procedure that is based on a finite period of time (1 hour), instead of an infinite period as was assumed in the previous table [1].

TABLE 2/E.521 – Overflow adjustment for high-usage trunk groups  
Factor  $r_i$

Offered traffic $A_i$	Low day-day variation					Medium day-day variation					High day-day variation				
	Last trunk traffic					Last trunk traffic					Last trunk traffic				
	0.25	0.3	0.4	0.5	0.6	0.25	0.3	0.4	0.5	0.6	0.25	0.3	0.4	0.5	0.6
3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.0	1.0	1.2	1.2	1.1	1.1	1.0
7	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.1	1.1	1.0	1.4	1.3	1.2	1.1	1.1
10	1.1	1.1	1.1	1.0	1.0	1.3	1.2	1.2	1.1	1.1	1.5	1.4	1.3	1.2	1.1
15	1.2	1.1	1.1	1.1	1.0	1.5	1.4	1.2	1.2	1.1	1.8	1.6	1.4	1.3	1.1
20	1.2	1.2	1.1	1.1	1.0	1.6	1.5	1.3	1.2	1.1	2.0	1.8	1.5	1.3	1.2
25	1.3	1.2	1.2	1.1	1.1	1.8	1.6	1.4	1.3	1.1	2.3	2.0	1.7	1.4	1.2
30	1.3	1.3	1.2	1.1	1.1	1.8	1.7	1.4	1.3	1.2	2.4	2.1	1.7	1.5	1.3

TABLE 3.1/E.521 – Single-hour capacity, in erlangs, as a function of the number of trunks and of the peakedness factor

Parameters: – Blockage 0.01;  
 – No allowance for day-to-day variation;  
 – Weighted mean peakedness factor.

Number of trunks required	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.4	3.8	4.0
1	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.53	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.94	0.69	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.42	1.14	0.89	0.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.97	1.64	1.36	1.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.56	2.19	1.86	1.58	1.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	3.19	2.81	2.44	2.11	1.81	1.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	3.83	3.42	3.03	2.67	2.36	2.03	1.75	1.50	0.0	0.0	0.0	0.0	0.0	0.0
10	4.53	4.08	3.67	3.28	2.92	2.58	2.28	2.00	1.75	0.0	0.0	0.0	0.0	0.0
11	5.22	4.75	4.31	3.89	3.53	3.17	2.83	2.53	2.25	1.97	0.0	0.0	0.0	0.0
12	5.94	5.44	4.97	4.56	4.14	3.78	3.42	3.08	2.78	2.47	2.22	0.0	0.0	0.0
13	6.67	6.14	5.64	5.19	4.81	4.39	4.03	3.67	3.33	3.03	2.72	0.0	0.0	0.0
14	7.42	6.86	6.36	5.89	5.44	5.03	4.67	4.28	3.94	3.61	3.28	2.69	0.0	0.0
15	8.17	7.58	7.06	6.58	6.11	5.69	5.31	4.92	4.56	4.19	3.86	3.22	0.0	0.0
16	8.94	8.33	7.78	7.28	6.81	6.36	5.94	5.56	5.17	4.81	4.44	3.81	3.19	0.0
17	9.72	9.08	8.50	8.00	7.50	7.06	6.61	6.19	5.81	5.42	5.06	4.39	3.75	3.44
18	10.50	9.83	9.25	8.72	8.22	7.75	7.31	6.86	6.44	6.06	5.69	4.97	4.31	4.00
19	11.31	10.61	10.00	9.44	8.92	8.44	7.97	7.53	7.11	6.72	6.33	5.58	4.89	4.58
20	12.08	11.39	10.78	10.19	9.67	9.14	8.67	8.22	7.81	7.39	6.97	6.22	5.50	5.17
21	12.89	12.19	11.53	10.94	10.39	9.86	9.39	8.92	8.47	8.06	7.64	6.86	6.11	5.78
22	13.72	13.00	12.31	11.69	11.14	10.61	10.08	9.61	9.17	8.72	8.31	7.50	6.75	6.39
23	14.53	13.78	13.08	12.47	11.89	11.36	10.81	10.33	9.86	9.42	8.97	8.17	7.39	7.00
24	15.36	14.58	13.89	13.22	12.64	12.08	11.56	11.03	10.56	10.11	9.67	8.83	8.03	7.64
25	16.19	15.39	14.67	14.00	13.39	12.83	12.28	11.78	11.28	10.81	10.36	9.50	8.69	8.31
26	17.03	16.22	15.47	14.81	14.17	13.58	13.03	12.50	12.00	11.53	11.06	10.19	9.36	8.94
27	17.86	17.03	16.28	15.58	14.94	14.33	13.78	13.22	12.72	12.22	11.75	10.86	10.03	9.61
28	18.69	17.86	17.08	16.36	15.72	15.11	14.53	13.97	13.44	12.94	12.47	11.56	10.69	10.28
29	19.56	18.69	17.89	17.17	16.50	15.86	15.28	14.72	14.19	13.67	13.19	12.28	11.39	10.94
30	20.39	19.53	18.72	17.97	17.28	16.64	16.06	15.47	14.92	14.42	13.92	12.97	12.08	11.64
31	21.25	20.36	19.53	18.78	18.08	17.42	16.81	16.22	15.67	15.14	14.64	13.69	12.78	12.33
32	22.11	21.19	20.36	19.58	18.89	18.22	17.58	17.00	16.42	15.89	15.36	14.39	13.47	13.03
33	22.97	22.06	21.19	20.39	19.67	19.00	18.36	17.75	17.19	16.64	16.11	15.11	14.17	13.72
34	23.83	22.89	22.00	21.22	20.47	19.81	19.14	18.53	17.94	17.39	16.86	15.86	14.89	14.42
35	24.69	23.75	22.83	22.03	21.28	20.58	19.92	19.31	18.69	18.14	17.61	16.58	15.61	15.14
36	25.58	24.58	23.69	22.86	22.11	21.39	20.72	20.08	19.47	18.89	18.36	17.31	16.31	15.83
37	26.44	25.44	24.53	23.69	22.92	22.19	21.50	20.86	20.25	19.67	19.11	18.06	17.06	16.56
38	27.31	26.31	25.36	24.53	23.72	23.00	22.31	21.64	21.03	20.44	19.86	18.81	17.78	17.28
39	28.19	27.17	26.22	25.36	24.56	23.81	23.11	22.44	21.81	21.19	20.64	19.53	18.50	18.00
40	29.08	28.03	27.06	26.19	25.39	24.61	23.89	23.22	22.58	21.97	21.39	20.28	19.25	18.72
41	29.94	28.89	27.92	27.03	26.19	25.44	24.69	24.03	23.36	22.75	22.17	21.06	19.97	19.47
42	30.83	29.75	28.78	27.86	27.03	26.25	25.53	24.81	24.17	23.53	22.94	21.81	20.72	20.19
43	31.72	30.64	29.61	28.72	27.86	27.08	26.33	25.61	24.94	24.31	23.69	22.56	21.47	20.94
44	32.61	31.50	30.47	29.56	28.69	27.89	27.14	26.42	25.75	25.11	24.50	23.33	22.22	21.69
45	33.50	32.39	31.33	30.42	29.53	28.72	27.94	27.22	26.56	25.89	25.28	24.08	22.97	22.42
46	34.39	33.25	32.19	31.25	30.39	29.56	28.78	28.03	27.33	26.69	26.06	24.86	23.72	23.17
47	35.28	34.14	33.08	32.11	31.22	30.39	29.58	28.86	28.14	27.47	26.83	25.64	24.47	23.92
48	36.17	35.00	33.94	32.97	32.06	31.22	30.42	29.67	28.94	28.28	27.64	26.42	25.25	24.69
49	37.06	35.89	34.81	33.81	32.92	32.06	31.25	30.47	29.75	29.08	28.42	27.19	26.00	25.44
50	37.97	36.78	35.67	34.67	33.75	32.89	32.08	31.31	30.58	29.89	29.22	27.97	26.78	26.19



TABLE 3.2/E.521 – Single-hour capacity, in erlangs, as a function of the number of trunks and of the peakedness factor

Parameters: – Blockage 0.01;  
 – Low day-to-day variation allowance;  
 – Weighted mean peakedness factor.

Number of trunks required	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.4	3.8	4.0
1	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.53	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.94	0.69	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.39	1.14	0.89	0.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.89	1.64	1.36	1.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.44	2.14	1.86	1.58	1.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	3.03	2.69	2.42	2.11	1.81	1.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	3.64	3.28	2.97	2.67	2.36	2.03	1.75	1.50	0.0	0.0	0.0	0.0	0.0	0.0
10	4.25	3.89	3.56	3.22	2.92	2.58	2.28	2.00	1.75	0.0	0.0	0.0	0.0	0.0
11	4.92	4.53	4.17	3.83	3.50	3.17	2.83	2.53	2.25	1.97	0.0	0.0	0.0	0.0
12	5.58	5.17	4.78	4.44	4.08	3.78	3.42	3.08	2.78	2.47	2.22	0.0	0.0	0.0
13	6.25	5.81	5.42	5.06	4.69	4.36	4.03	3.67	3.33	3.03	2.72	0.0	0.0	0.0
14	6.94	6.50	6.08	5.69	5.33	4.97	4.64	4.28	3.94	3.61	3.28	2.69	0.0	0.0
15	7.64	7.17	6.75	6.33	5.97	5.61	5.25	4.92	4.56	4.19	3.86	3.22	0.0	0.0
16	8.33	7.86	7.42	7.00	6.61	6.25	5.89	5.53	5.17	4.81	4.44	3.81	3.19	0.0
17	9.06	8.56	8.11	7.67	7.28	6.89	6.53	6.17	5.81	5.42	5.06	4.39	3.75	3.44
18	9.81	9.28	8.81	8.36	7.94	7.56	7.17	6.81	6.44	6.06	5.69	4.97	4.31	4.00
19	10.53	10.00	9.50	9.06	8.61	8.22	7.83	7.44	7.08	6.72	6.33	5.58	4.89	4.58
20	11.28	10.72	10.22	9.75	9.31	8.89	8.50	8.11	7.72	7.36	6.97	6.22	5.50	5.17
21	12.03	11.44	10.94	10.44	10.00	9.56	9.17	8.78	8.39	8.03	7.64	6.86	6.11	5.78
22	12.78	12.19	11.67	11.17	10.69	10.25	9.83	9.44	9.06	8.67	8.31	7.56	6.75	6.39
23	13.53	12.94	12.39	11.89	11.42	10.94	10.53	10.11	9.72	9.33	8.94	8.19	7.39	7.00
24	14.31	13.69	13.14	12.61	12.11	11.67	11.22	10.81	10.39	10.00	9.61	8.86	8.03	7.64
25	15.08	14.44	13.86	13.33	12.83	12.36	11.92	11.50	11.08	10.67	10.28	9.50	8.67	8.31
26	15.86	15.22	14.61	14.08	13.56	13.08	12.61	12.19	11.75	11.36	10.94	10.17	9.33	8.94
27	16.64	15.97	15.36	14.81	14.28	13.81	13.33	12.89	12.44	12.03	11.64	10.83	10.00	9.61
28	17.42	16.75	16.14	15.56	15.03	14.53	14.06	13.58	13.14	12.72	12.31	11.50	10.67	10.28
29	18.22	17.53	16.89	16.31	15.78	15.25	14.78	14.31	13.86	13.42	13.00	12.19	11.36	10.94
30	19.00	18.31	17.67	17.06	16.50	16.00	15.50	15.03	14.56	14.11	13.69	12.86	12.06	11.64
31	19.81	19.08	18.44	17.83	17.25	16.72	16.22	15.72	15.28	14.83	14.39	13.56	12.75	12.33
32	20.61	19.89	19.19	18.58	18.00	17.47	16.94	16.47	16.00	15.53	15.11	14.25	13.44	13.03
33	21.39	20.67	19.97	19.36	18.78	18.22	17.69	17.19	16.72	16.25	15.81	14.94	14.14	13.72
34	22.22	21.47	20.75	20.11	19.53	18.97	18.42	17.92	17.44	16.97	16.53	15.67	14.83	14.42
35	23.03	22.25	21.56	20.89	20.28	19.72	19.17	18.67	18.17	17.69	17.22	16.36	15.56	15.11
36	23.83	23.06	22.33	21.67	21.06	20.47	19.92	19.39	18.89	18.42	17.94	17.08	16.25	15.81
37	24.64	23.86	23.14	22.44	21.83	21.25	20.67	20.14	19.64	19.14	18.67	17.78	16.94	16.50
38	25.47	24.67	23.92	23.25	22.61	22.00	21.44	20.89	20.36	19.89	19.42	18.50	17.64	17.19
39	26.28	25.47	24.72	24.03	23.39	22.78	22.19	21.64	21.11	20.61	20.14	19.22	18.33	17.89
40	27.11	26.28	25.53	24.81	24.17	23.53	22.94	22.39	21.86	21.36	20.86	19.94	19.06	18.61
41	27.92	27.08	26.31	25.61	24.94	24.31	23.72	23.14	22.61	22.11	21.61	20.67	19.78	19.31
42	28.75	27.92	27.11	26.39	25.72	25.08	24.47	23.92	23.36	22.83	22.33	21.39	20.47	20.03
43	29.58	28.72	27.92	27.19	26.50	25.86	25.25	24.67	24.11	23.58	23.08	22.11	21.19	20.75
44	30.42	29.56	28.75	28.00	27.31	26.64	26.03	25.44	24.89	24.33	23.83	22.86	21.92	21.44
45	31.25	30.36	29.56	28.81	28.08	27.44	26.81	26.22	25.64	25.11	24.58	23.58	22.64	22.17
46	32.08	31.19	30.36	29.61	28.89	28.22	27.58	26.97	26.42	25.86	25.33	24.33	23.36	22.89
47	32.92	32.03	31.17	30.42	29.69	29.00	28.36	27.75	27.17	26.61	26.08	25.06	24.11	23.64
48	33.75	32.83	32.00	31.22	30.47	29.81	29.14	28.53	27.94	27.39	26.83	25.81	24.83	24.36
49	34.58	33.67	32.81	32.03	31.28	30.58	29.94	29.31	28.72	28.14	27.58	26.56	25.56	25.08
50	35.44	34.50	33.64	32.83	32.08	31.39	30.72	30.08	29.50	28.92	28.36	27.31	26.31	25.83

TABLE 3.3/E.521 – Single-hour capacity, in erlangs, as a function of the number of trunks and of the peakedness factor

Parameters: – Blockage 0.01;  
 – Medium day-to-day variation allowance;  
 – Weighted mean peakedness factor.

Number of trunks required	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.4	3.8	4.0
1	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.53	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.94	0.69	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.39	1.14	0.89	0.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.86	1.61	1.36	1.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.39	2.11	1.83	1.58	1.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	2.94	2.64	2.36	2.08	1.81	1.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	3.53	3.19	2.89	2.61	2.33	2.03	1.75	1.50	0.0	0.0	0.0	0.0	0.0	0.0
10	4.11	3.78	3.47	3.17	2.86	2.58	2.28	2.00	1.75	0.0	0.0	0.0	0.0	0.0
11	4.72	4.39	4.03	3.72	3.42	3.14	2.83	2.53	2.25	1.97	0.0	0.0	0.0	0.0
12	5.36	4.97	4.64	4.31	4.00	3.69	3.39	3.08	2.78	2.47	2.22	0.0	0.0	0.0
13	6.00	5.61	5.25	4.89	4.56	4.25	3.94	3.67	3.33	3.03	2.72	0.0	0.0	0.0
14	6.64	6.22	5.86	5.50	5.17	4.83	4.53	4.22	3.92	3.61	3.28	2.69	0.0	0.0
15	7.31	6.89	6.47	6.11	5.78	5.42	5.11	4.78	4.47	4.19	3.86	3.22	0.0	0.0
16	7.97	7.53	7.11	6.75	6.39	6.03	5.69	5.39	5.06	4.75	4.44	3.81	3.19	0.0
17	8.64	8.19	7.78	7.36	7.00	6.64	6.31	5.97	5.64	5.33	5.03	4.39	3.75	3.44
18	9.33	8.86	8.42	8.03	7.64	7.28	6.92	6.58	6.25	5.92	5.61	4.97	4.31	4.00
19	10.03	9.53	9.08	8.67	8.28	7.89	7.53	7.19	6.86	6.53	6.19	5.58	4.89	4.58
20	10.69	10.19	9.75	9.33	8.92	8.53	8.17	7.81	7.47	7.14	6.81	6.17	5.50	5.17
21	11.42	10.89	10.42	9.97	9.56	9.17	8.81	8.44	8.08	7.75	7.42	6.75	6.11	5.78
22	12.11	11.58	11.11	10.64	10.22	9.83	9.44	9.06	8.69	8.36	8.03	7.36	6.72	6.39
23	12.83	12.28	11.78	11.33	10.89	10.47	10.08	9.69	9.33	8.97	8.64	7.97	7.33	7.00
24	13.53	13.00	12.47	12.00	11.56	11.14	10.72	10.36	9.97	9.61	9.25	8.58	7.94	7.61
25	14.25	13.69	13.17	12.69	12.25	11.81	11.39	11.00	10.61	10.25	9.89	9.19	8.56	9.19
26	14.97	14.42	13.86	13.39	12.92	12.47	12.06	11.64	11.28	10.89	10.53	9.83	9.17	8.81
27	15.69	15.11	14.58	14.08	13.61	13.14	12.72	12.31	11.92	11.53	11.17	10.44	9.78	9.42
28	16.44	15.83	15.28	14.78	14.28	13.83	13.39	12.97	12.58	12.19	11.81	11.08	10.39	10.06
29	17.17	16.56	16.00	15.47	14.97	14.53	14.08	13.64	13.25	12.83	12.47	11.72	11.03	10.67
30	17.92	17.28	16.72	16.17	15.67	15.19	14.75	14.31	13.92	13.50	13.11	12.36	11.64	11.31
31	18.64	18.03	17.42	16.89	16.39	15.89	15.44	15.00	14.58	14.17	13.78	13.03	12.28	11.94
32	19.39	18.75	18.14	17.58	17.08	16.58	16.11	15.67	15.25	14.83	14.44	13.67	12.92	12.56
33	20.14	19.47	18.86	18.31	17.78	17.28	16.81	16.36	15.92	15.50	15.11	14.33	13.58	13.19
34	20.89	20.22	19.61	19.03	18.50	18.00	17.50	17.06	16.61	16.17	15.78	14.97	14.22	13.86
35	21.64	20.97	20.33	19.75	19.22	18.69	18.19	17.75	17.28	16.86	16.44	15.64	14.86	14.50
36	22.39	21.69	21.06	20.47	19.92	19.42	18.92	18.44	17.97	17.53	17.11	16.31	15.53	15.14
37	23.14	22.44	21.81	21.19	20.64	20.11	19.61	19.14	18.67	18.22	17.81	16.97	16.19	15.81
38	23.89	23.19	22.53	21.94	21.36	20.83	20.31	19.83	19.36	18.92	18.47	17.64	16.86	16.47
39	24.64	23.94	23.28	22.67	22.08	21.56	21.03	20.53	20.06	19.61	19.17	18.33	17.53	17.11
40	25.42	24.69	24.03	23.39	22.81	22.25	21.75	21.25	20.75	20.31	19.86	19.00	18.19	17.78
41	26.17	25.44	24.78	24.14	23.56	22.97	22.44	21.94	21.47	21.00	20.56	19.69	18.86	18.44
42	26.94	26.19	25.50	24.86	24.28	23.72	23.17	22.67	22.17	21.69	21.25	20.36	19.53	19.11
43	27.72	26.97	26.25	25.61	25.00	24.44	23.89	23.36	22.86	22.39	21.94	21.06	20.19	19.81
44	28.47	27.72	27.00	26.36	25.75	25.17	24.61	24.08	23.58	23.08	22.64	21.75	20.89	20.47
45	29.25	28.47	27.78	27.11	26.47	25.89	25.33	24.81	24.31	23.81	23.33	22.44	21.56	21.14
46	30.03	29.25	28.53	27.86	27.22	26.64	26.06	25.53	25.00	24.50	24.03	23.14	22.25	21.83
47	30.81	30.00	29.28	28.61	27.97	27.36	26.78	26.25	25.72	25.22	24.75	23.83	22.94	22.50
48	31.58	30.78	30.03	29.36	28.72	28.11	27.53	26.97	26.44	25.94	25.44	24.53	23.64	23.19
49	32.36	31.56	30.81	30.11	29.44	28.83	28.25	27.69	27.17	26.64	26.17	25.22	24.33	23.89
50	33.14	32.31	31.56	30.86	30.19	29.58	29.00	28.42	27.89	27.36	26.86	25.92	25.03	24.58

TABLE 3.4/E.521 — Single-hour capacity, in erlangs, as a function of the number of trunks and of the peakedness factor

Parameters: — Blockage 0.01;  
 — High day-to-day variation allowance;  
 — Weighted mean peakedness factor.

Number of trunks required	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.4	3.8	4.0
1	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.53	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.94	0.69	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.36	1.14	0.89	0.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.86	1.61	1.36	1.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.36	2.08	1.83	1.58	1.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	2.89	2.61	2.33	2.06	1.81	1.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	3.44	3.14	2.86	2.58	2.31	2.03	1.75	1.50	0.0	0.0	0.0	0.0	0.0	0.0
10	4.03	3.69	3.39	3.11	2.83	2.56	2.28	2.00	1.75	0.0	0.0	0.0	0.0	0.0
11	4.61	4.25	3.94	3.64	3.36	3.08	2.81	2.53	2.25	1.97	0.0	0.0	0.0	0.0
12	5.19	4.83	4.50	4.19	3.89	3.61	3.33	3.06	2.78	2.47	2.22	0.0	0.0	0.0
13	5.81	5.42	5.08	4.78	4.44	4.17	3.86	3.58	3.31	3.03	2.72	0.0	0.0	0.0
14	6.42	6.03	5.67	5.33	5.03	4.72	4.42	4.14	3.83	3.58	3.28	2.69	0.0	0.0
15	7.03	6.64	6.28	5.92	5.61	5.28	4.97	4.69	4.39	4.11	3.83	3.22	0.0	0.0
16	7.67	7.25	6.86	6.53	6.19	5.86	5.56	5.25	4.94	4.67	4.36	3.81	3.19	0.0
17	8.31	7.86	7.47	7.11	6.78	6.44	6.11	5.81	5.50	5.22	4.92	4.36	3.75	3.44
18	8.94	8.50	8.11	7.72	7.36	7.03	6.69	6.39	6.08	5.78	5.47	4.89	4.31	4.00
19	9.58	9.14	8.72	8.33	7.97	7.64	7.31	6.97	6.64	6.33	6.03	5.44	4.89	4.58
20	10.22	9.78	9.36	8.94	8.58	8.22	7.89	7.56	7.22	6.92	6.61	6.00	5.44	5.14
21	10.89	10.42	9.97	9.58	9.19	8.83	8.50	8.14	7.83	7.50	7.19	6.58	6.00	5.69
22	11.53	11.06	10.61	10.22	9.83	9.44	9.08	8.75	8.42	8.08	7.78	7.17	6.56	6.25
23	12.19	11.72	11.28	10.83	10.44	10.06	9.69	9.36	9.00	8.67	8.36	7.72	7.14	6.83
24	12.86	12.36	11.92	11.47	11.08	10.69	10.31	9.94	9.61	9.28	8.94	8.31	7.69	7.39
25	13.53	13.03	12.56	12.11	11.69	11.31	10.94	10.56	10.22	9.89	9.56	8.92	8.28	7.97
26	14.19	13.69	13.22	12.75	12.33	11.94	11.56	11.19	10.83	10.47	10.14	9.50	8.86	8.56
27	14.89	14.36	13.86	13.42	12.97	12.58	12.19	11.81	11.44	11.08	10.75	10.08	9.44	9.14
28	15.56	15.03	14.53	14.06	13.64	13.22	12.81	12.42	12.06	11.69	11.36	10.69	10.03	9.72
29	16.25	15.69	15.19	14.72	14.28	13.86	13.44	13.06	12.69	12.33	11.97	11.31	10.64	10.31
30	16.92	16.36	15.86	15.36	14.92	14.50	14.08	13.69	13.31	12.94	12.58	11.89	11.22	10.92
31	17.61	17.06	16.53	16.03	15.58	15.14	14.72	14.33	13.94	13.56	13.19	12.50	11.83	11.50
32	18.31	17.72	17.19	16.69	16.22	15.78	15.36	14.94	14.56	14.19	13.83	13.11	12.44	12.11
33	18.97	18.42	17.86	17.36	16.89	16.44	16.00	15.58	15.19	14.81	14.44	13.72	13.06	12.69
34	19.67	19.08	18.53	18.03	17.56	17.08	16.67	16.25	15.83	15.44	15.08	14.36	13.67	13.31
35	20.36	19.78	19.22	18.69	18.22	17.75	17.31	16.89	16.47	16.08	15.69	14.97	14.28	13.92
36	21.06	20.47	19.89	19.36	18.89	18.42	17.97	17.53	17.11	16.72	16.33	15.61	14.89	14.53
37	21.75	21.14	20.58	20.06	19.56	19.08	18.61	18.19	17.78	17.36	16.97	16.22	15.50	15.14
38	22.44	21.83	21.25	20.72	20.22	19.72	19.28	18.83	18.42	18.00	17.61	16.86	16.14	15.78
39	23.17	22.53	21.94	21.39	20.89	20.39	19.94	19.50	19.06	18.64	18.25	17.50	16.75	16.39
40	23.86	23.22	22.64	22.08	21.56	21.06	20.58	20.14	19.72	19.31	18.89	18.11	17.39	17.00
41	24.56	23.92	23.33	22.75	22.22	21.75	21.25	20.81	20.36	19.94	19.53	18.75	18.00	17.64
42	25.28	24.61	24.00	23.44	22.92	22.42	21.92	21.47	21.03	20.58	20.19	19.39	18.64	18.29
43	25.97	25.31	24.69	24.14	23.58	23.08	22.58	22.14	21.67	21.25	20.83	20.03	19.28	18.89
44	26.67	26.03	25.39	24.81	24.28	23.75	23.25	22.78	22.33	21.92	21.47	20.67	19.89	19.53
45	27.39	26.72	26.08	25.50	24.94	24.44	23.94	23.44	23.00	22.56	22.14	21.33	20.53	20.17
46	28.08	27.42	26.78	26.19	25.64	25.11	24.61	24.14	23.67	23.22	22.78	21.97	21.17	20.81
47	28.81	28.14	27.47	26.89	26.33	25.81	25.28	24.81	24.33	23.89	23.44	22.61	21.81	21.44
48	29.53	28.83	28.19	27.58	27.00	26.47	25.97	25.47	25.00	24.56	24.11	23.28	22.47	22.08
49	30.22	29.53	28.89	28.28	27.69	27.17	26.64	26.14	25.67	25.19	24.75	23.92	23.11	22.72
50	30.94	30.25	29.58	28.97	28.39	27.83	27.31	26.81	26.33	25.86	25.42	24.58	23.75	23.36

*Note 3.* — Tables 3.2/E.521, 3.3/E.521 and 3.4/E.521 are based on the calculation of the average blocking from the formula:

$$\bar{\beta} = \int B(m) f(m) dm,$$

where  $B(m)$  is the single-hour expected blocking and  $f(m)$  is the density distribution of day-to-day traffic ( $m$ ), assuming a Pearson Type III distribution:

$$\left[ f(m) = \frac{(M/V)^{(M^2/V_d)}}{\gamma^{(M^2/V_d)}} m^{[(M^2/V_d) - 1]} e^{-M/V_d} \right]$$

$M$  and  $V_d$  are the mean and day-to-day variance of the traffic as calculated [1] in 1. above.

#### *Computer implementation*

When computer facilities are available, it is possible to automate the use of Tables 3/E.521. For that purpose, numerical algorithms have been developed and are described in [1].

### 4. *Example*

#### 4.1 *Level of day-to-day traffic variations*

If the traffics offered to a final group over the 30 busiest days are given ( $M_1$  to  $M_{30}$ ) and if the mean load and variance are calculated to be 10 and 20 respectively, then applying Figure 1/E.521, a *high* level of day-to-day traffic variations should be used.

#### 4.2 *Future traffic offered to the final group and peakedness factor*

If the forecast of future traffics indicates that three parcels of traffic will be offered to the final group:

- the overflow from 6 circuits offered 7.8 erlangs,
- the overflow from 12 circuits offered 10 erlangs,
- 7 erlangs offered directly,

then Table 4/E.521 can be developed.

Note that the values of  $r_i$  are derived from Table 2/E.521 for *medium* level of day-to-day traffic variations; if the 30 busiest day traffics for each of the high-usage groups were available, a more appropriate level could be used for each group.

Now all the information required is available: using the capacity Table 3.4/E.521 for *high* level of day-to-day traffic variations, the average traffic offered to the final group  $M = 11.39$  and a peakedness factor  $z = 1.3$  (from interpolating between  $z = 1.2$  and  $z = 1.4$ ), it is calculated that 23 circuits are required.

Note that if the measurements used in 4.1 above were not available, then to determine the level of day-to-day traffic variations it would have been necessary to use the default procedure of 1. above:

Overflow traffic offered to the final group = 4.15 erlangs.

Total traffic offered to the final group = 11.15 erlangs.

The ratio  $4.15/11.15 = 0.37$  is higher than 0.25 and hence a *medium* level of day-to-day traffic variations would have been used.

TABLE 4/E.521

Number of parcels of traffic $i$	Traffic offered to high-usage groups $A_i$	Number of high-usage circuits $n_i$	Single-hour overflow $\beta_i$	Last trunk traffic	Peakedness factor $z_i$	$\beta_i z_i$	Adjustment factor $r_i$	Average overflow $\bar{\beta}_i = r_i \beta_i$
1	7.8	6	2.95	0.69	1.73	5.1	1.0	2.95
2	10.0	12	1.20	0.44	2.19	2.6	1.2	1.44
3	7.0	0	7.0	—	1.0	7.0	1.0	7.00
			$\sum_{i=1}^h \beta_i = 11.15$			$14.7$		
						$z = \frac{\sum_{i=1}^h \beta_i z_i}{\sum_{i=1}^h \beta_i}$	$M = \sum_{i=1}^h \bar{\beta}_i$ $= 11.39$	
						$= \frac{14.7}{11.15}$		
						$= 1.3$		

The optimum number of high-usage circuits,  $n$ , from one exchange (1) to another exchange (2) is therefore obtained from the following expression when the overflow traffic is routed over a transit exchange T (route 1-T-2).

$$F_n(A) = A \{E_{1,n}(A) - E_{1,(n+1)}(A)\} = M \times \frac{\text{annual charge (1-2)}}{\text{annual charge (1-T-2)}}$$

$A$  is the traffic flow offered, for the relation "1-2", in the Erlang loss formula for a full availability group. The expression  $F_n(A)$  gives the marginal occupancy (improvement function <sup>4)</sup> for the high-usage group, if one more circuit were added.

$M$  is the *marginal utilization factor for the final route "1-T-2"* (which has nothing to do with cost ratio), if one additional circuit were provided. The annual charges are marginal charges for adding one additional circuit to route "1-2" and likewise to route "1-T-2".

Planning of an alternate routing network is described in the literature (see, *inter alia*, the bibliography.)

## 2. Recommended practical method

### 2.1 Field of application

It must be recognized that the conditions applying to alternative routing will vary widely between the continental network and the intercontinental network. Significant differences between the two cases apply to the length and cost of circuits, the traffic flow and the different times at which the busy hours occur. The method described attempts to take account of these factors in so far as it is practicable to do so in any simplified procedure.

### 2.2 Traffic statistics

The importance of reliable traffic estimates should be emphasized. Traffic estimates are required for each of the relations in question, for both the busy hour of the relation and for the busy hour of each link of the routes to which the traffic overflows. Since this may be affected by the high-usage arrangements finally adopted, it will be necessary to have traffic estimates for each relation covering most of the significant hours of the day. This applies particularly to the intercontinental network where the final routes carry traffic components with widely differing busy hours.

### 2.3 Basis of the recommended method

The method is based on a simplification of the economic dimensioning equations described under 1. Introduction. The simplifying assumptions are:

- i) the ratios of the alternative high-usage annual charges are grouped in classes and a single ratio selected as representative for each class. This is acceptable because total network costs are known to be relatively insensitive to changes in the annual charges ratio;
- ii) the marginal utilization factor  $M$  applicable to the overflow routes is regarded as constant within a range of circuit group sizes;

Size of group (number of circuits)	Value of $M$
For less than 10 . . . . .	0.6
For 10 or more . . . . .	0.8

<sup>4)</sup> The values  $F_n(A)$  are tabulated in A. Jensen, *Moe's Principle*, Copenhagen, 1950.

- iii) each high-usage group will be dimensioned against the cheapest alternative route to which traffic overflows. (That is, the effect of parallel alternative routes is ignored.)

Where greater precision is required in either network or individual route dimensioning, more sophisticated methods may be employed. The utility of computers in this work is recognized.

## 2.4 Determination of cost ratio

In continental and intercontinental working, the number of circuits to be provided in high-usage circuit groups depends upon the ratio of the annual charges estimated by the Administrations involved. The annual charge ratio (see Table 1/E.522) is defined as:

$$R = \frac{\text{annual charge of one additional circuit on the alternative route}}{\text{annual charge of one additional circuit on the high-usage route}}$$

The "annual charge of one additional circuit on the alternative route" is calculated by summing:

- the annual charge per circuit of each link comprising the alternative route, and
- the annual charge of switching one circuit at each intermediate switching centre.

The traffic value used should be the value of traffic offered to the high-usage route during the busy hour of the final route. It is likely that some of the busy hours of the circuit groups or links forming an alternative route will not coincide with the busy hour of the relation. Some of these links may therefore receive no overflow necessitating additional circuits and there will be no annual charges for this link of the alternative route. Several hours must be examined to determine the ratio between the annual charges for the alternative and the high-usage route. It is possible that the ratio is less than unity but this case is not shown in the table because the provision of high-usage circuits would then be used for grade of service reasons. Cases of this type can introduce valuable economies but the calculation of the appropriate number of circuits to be provided is best handled by a computer.

The value determined for  $R$  should then be employed to select in Table 1/E.522 the precise (or next higher) value of annual charges ratio for use in traffic tables. The value of annual charges ratios may be grouped in the following general sets:

- a) Within a single continent or other smaller closely connected land mass involving distances up to 1000 miles, high traffic and frequently one-way operation:

$$\text{Annual charges ratio: } R = 1.5; \underline{2.0}; 3.0 \text{ and } 4.$$

- b) Intercontinental working involving long distances, small traffic and usually two-way operation:

$$\text{Annual charges ratio: } R = 1.1; \underline{1.3} \text{ and } 1.5.$$

## 2.5 Use of method

High-usage circuit groups carrying random traffic can be dimensioned from Table 1/E.522.

*Step 1.* — Estimate the annual charges ratio  $R$  as described under 2.4 above. (There is little difference between adjacent ratios.) If this ratio is difficult to estimate, the values underlined in a) and b) of 2.4 above, should be used.

*Step 2.* — Consult Table 1/E.522 to determine the number of high-usage circuits  $N$ .

*Note.* — When two values of  $N$  are given the right-hand figure applies to alternative routes of more than 10 circuits, the left-hand figure applies to smaller groups. The left-hand figure is omitted when it is no longer possible for the alternative route to be small.

TABLE 1/E.522 – Number of high-usage circuits for different values of offered traffic, annual charges ratios and sizes of overflow groups

Traffic offered during network busy hour (erlangs)	Annual charges ratios						Number of circuits if there is no overflow route, for $p = 0.01$
	1.1	1.3	1.5	2.0	3.0	4.0	
	Minimum circuit occupancies for high-usage traffic						
	0.545/0.727	0.46/0.615	0.4/0.53	0.3/0.4	0.2/0.26	0.15/0.2	
	$N$ , number of high-usage circuits $A/B$ , where $A$ is for less than 10 circuits in the overflow group ( $M = 0.6$ ), $B$ is for 10 or more circuits in the overflow group ( $M = 0.8$ )						
1.5	1/0	1/0	2/1	2/2	3/2	3/3	6
1.75	1/0	2/1	2/1	3/2	3/3	4/3	6
2.0	1/0	2/1	2/2	3/2	4/3	4/4	7
2.25	2/0	2/1	3/2	3/3	4/4	5/4	7
2.5	2/0	3/1	3/2	4/3	5/4	5/5	7
2.75	2/1	3/2	3/2	4/3	5/4	5/5	8
3.0	3/1	3/2	4/3	4/4	5/5	6/5	8
3.5	3/1	4/2	4/3	5/4	6/5	7/6	9
4.0	4/2	4/3	5/4	6/5	7/6	7/7	10
4.5	4/2	5/3	6/4	6/6	7/7	8/7	10
5.0	5/3	6/4	6/5	7/6	8/7	9/8	11
5.5	5/3	6/5	7/5	8/7	9/8	9/9	12
6.0	6/3	7/5	7/6	8/7	9/9	10/9	13
7.0	7/4	8/6	8/7	10/8	11/10	11/11	14
8.0	8/5	9/7	10/8	11/10	12/11	13/12	15
9.0	/6	/8	/9	/11	/12	/13	17
10.0	/7	/9	/10	/12	/14	/15	18
12.0	/9	/11	/12	/14	/16	/17	20
15.0	/12	/14	/16	/18	/20	/21	24
20.0	/16	/19	/21	/23	/25	/27	30
25.0	/21	/24	/26	/29	/31	/33	36
30.0	/26	/29	/31	/34	/37	/38	42

### 3. Service considerations

On intercontinental circuits, where both-way operation is employed, a minimum of two circuits may be economical. Service considerations may also favour an increase in the number of direct circuits provided, particularly where the annual charges ratio approaches unity.

Although the dimensioning of high-usage groups is normally determined by traffic flows and annual charges ratios, it is recognized that such groups form part of a network having service requirements relative to the subscriber. The ability to handle the offered traffic with acceptable traffic efficiency should be tempered by the overall network considerations on quality of service.

The quality of service feature, which is of primary importance in a system of high-usage and final circuit groups, is the advantage derived from direct circuits versus multi-link connections. A liberal use of direct high-usage circuit groups, taking into account the economic factors, favours a high quality of service to the subscriber. It is recommended that new high-usage groups should be provided whenever the traffic flow and cost ratios are not conclusive. This practice may result in direct high-usage groups of two circuits or more.

The introduction of high-usage groups improves the overall grade of service and provides better opportunities of handling traffic during surges and breakdown conditions. When high-usage links bypass the main backbone final routes the introduction of high-usage routes can assist in avoiding expenses which might otherwise be incurred in keeping below the maximum number of long-distance links in series. In the future,



more measurements of traffic flows may be necessary for international accounting purposes and high-usage circuits should make this easier.

### Bibliography

- BRETCHNEIDER (G.). — Use of digital computers for the calculation of trunk-group for overflow traffic; *Nachrichtentech. Z Communication Journal*, No. 2, February 1963.
- CLOS (C.). — Automatic alternate routing of telephone traffic; *Bell Lab. Record*, 1954, No. 32, 2, pp. 51-57.
- ELLDIN (A.) and LIND (G.). — Elementary telephone traffic theory; *L M Ericsson Ordering* No. Dhu 105 A, Stockholm, Chapters 4 and 6.
- FREEMAN (A.H.) and GRAVELL (A.). — An application of digital computers in telecommunication network planning; *Elec. and Mech. Engng. Trans. Instn. Engrs., Aust.*, November 1963.
- FREEMAN (A.H.). — Network planning investigations using an electronic computer; *Fourth International Teletraffic Congress*, London, 1964.
- FUKUI, (Keno). — Processing by computers for network planning and design, *NTT Technical Publication D* — No. 8 and *JTR* 1967, Volume 9, No. 4.
- LE GALL (P.). — Réflexions sur la sélection conjuguée et sur diverses méthodes d'acheminement; *Commutation et Electronique*, No. 18, July 1967.
- LE GALL (P.). — Sur l'écoulement dirigé du trafic dans les grands réseaux téléphoniques interurbains; *Commutation et Electronique*, No. 20, January 1968.
- LEVINE (S.W.) and WERNANDER (M.A.). — Modular engineering of trunk groups for traffic requirements; *Fifth International Teletraffic Congress*, New York, 1967.
- Simple Procedure for Dimensioning High-usage Groups of Circuits; *Polish Administration*.
- RAPP (Y.). — Planning of junction network in a multi-exchange area. I. General Principles; *Ericsson Tech*; 1964, No. 20, 1, pp. 77-130.
- SUZUKI, (Terunobu) and YATANI, (Masako) (Miss). — Traffic table for a full availability trunk group with alternate routing; *ECLReport Extra Issue*, No. 13, October 1964.
- TÅNGE (I.). — Optimum methods for determining routes and number of lines in a telephone network with alternative traffic facilities; *TELE* 1957, 1, pp. 1-21 (in Swedish). (See also Document No. 19d, 6<sup>e</sup> and 7<sup>e</sup> Commissions d'étude due CCIF, Geneva, 1952-1954.)
- WILKINSON (R.I.). — Theories for toll traffic engineering in the USA, *Bell Syst. Tech. J.*, 1956, No. 35, pp. 421-514.
- WILKINSON (R.I.). — Simplified engineering of single stage alternate routing systems; *Fourth International Teletraffic Congress*, London, 1964.

### Recommendation E.523

#### STANDARD TRAFFIC PROFILES FOR INTERNATIONAL TRAFFIC STREAMS

The worldwide nature of the international telephone network, spanning as it does all possible time zones, has stimulated studies of the traffic streams between countries in different relative time locations. These studies have led to the development of standardized 24-hour traffic profiles which, theoretically based and verified by measurements, would be useful for engineering purposes. In fact, these concepts can be applied to a variety of network situations:

- i) variable access satellite working where a large number of traffic streams with possibly differing traffic profiles share the pool of satellite circuits;
- ii) combining of traffic streams on groups of terrestrial circuits which may be either high-usage or final choice routes;

- iii) detour routing of traffic between origin and destination countries to take advantage of prevailing low load conditions on the detour path.

In developing any such applications, account must be taken of the International Routing Plan (Recommendation E.171) and of accepted accounting principles (Recommendation E.250).

It must be recognized that the preferred basis for dimensioning consists of traffic profiles based on real traffic. Nevertheless, many countries have found the standard profiles presented in this Recommendation very useful where streams are too small to obtain reliable measurements or where no measurements are available.

For both-way profiles, two equivalent methods of presentation are given in chart and tabular form. In Figure 1/E.523 hour-by-hour traffic volumes are shown in diagrammatically as percentages of the total daily traffic volume; such percentages are particularly convenient for tariff studies. In Table 1/E.523, hourly traffics are expressed as percentages of the busy hour traffic, and this is convenient for engineering purposes. Time zone differences are given in whole hours only. Directional profiles are given in Tables 2/E.523 and 3/E.523.

Although tables are given for both-way and directional traffic streams, it must be emphasized that at this stage only the both-way profiles can be regarded as soundly supported by measurement. The directional profiles are theoretically based and supported by some measurements, but should be used with caution until adequate verification has been achieved.

The theoretical basis for the profiles presented here is contained in the Annex. It depends on a convenience function  $f(t)$  which represents the profile of *local* daily traffic, where of course no time zone difference exists. The function  $f(t)$  used for computation of the standard profile was derived by mathematical manipulation of measurements of the Tokyo-Oakland and Tokyo-Vancouver streams. Although these results have been supported by other measurements, it leaves open the possibility that the convenience function may vary from one country to another and that, strictly, these should be derived independently and then used to obtain a calculated profile for the international relation. It also seems that the convenience function for the country of destination should be given greater weight than that for the country of origin. These remarks suggest possible refinements, but are not quantified in this Recommendation.

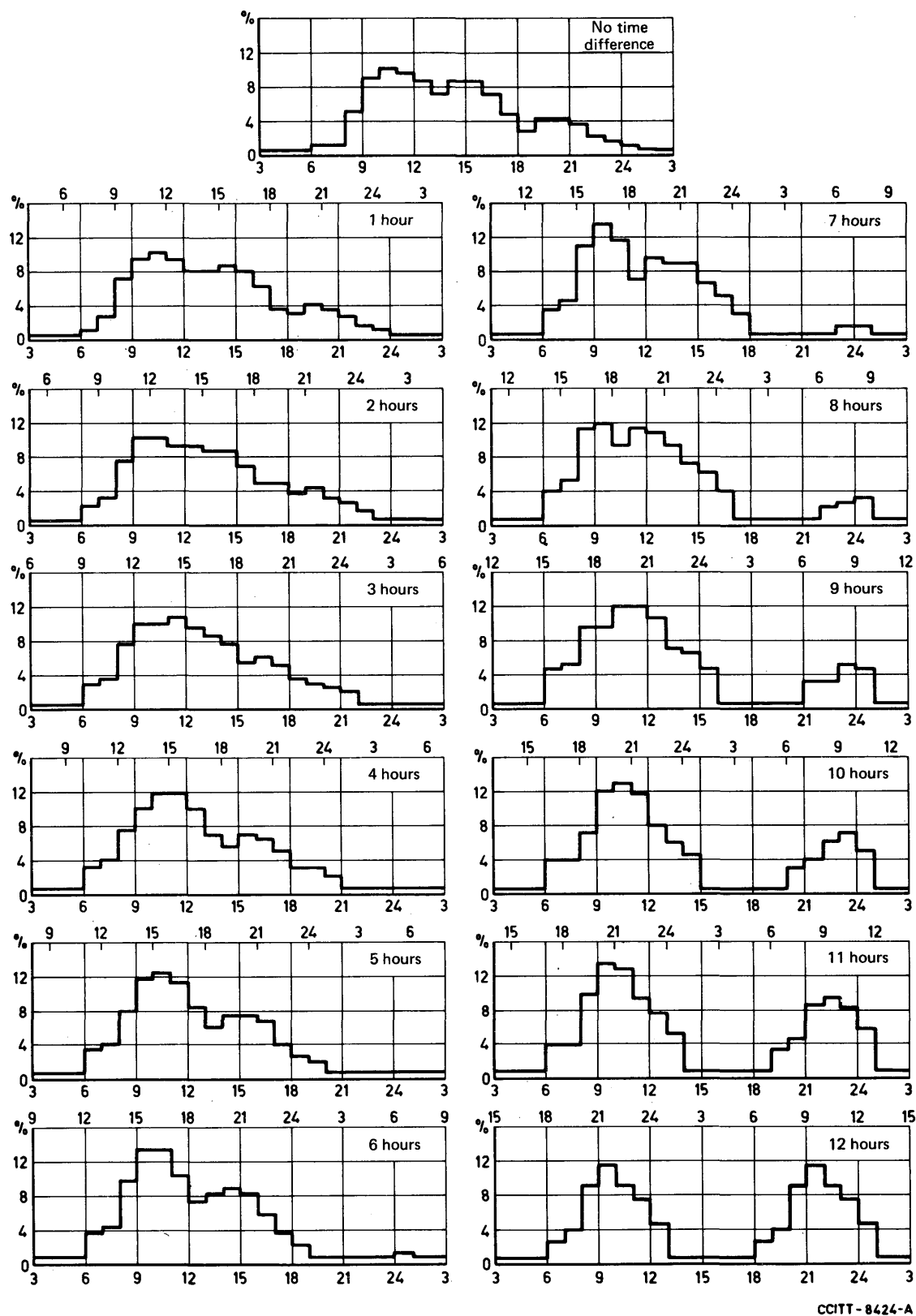
## Bibliography

CASEY (J. Jr.) and SHIMASAKI (N.). — Optimal dimensioning of a satellite network using alternate routing concepts; *Sixth International Teletraffic Convention*, Munich, 1970.

RAPP (Y.). — Planning of a junction network with non-coincident busy hours; *Ericsson Technics*, 1971, No. 1.

CABALLERO (P.A.) and DIAZ (F.). — Optimization of networks of hierarchical structure with non-coincident busy hours. *Seventh International Teletraffic Convention*, Stockholm, 1973.

OTHA (T.). — Network efficiency and network planning considering telecommunication traffic influenced by time difference. *Seventh International Teletraffic Convention*, Stockholm, 1973.



*Note.* — The vertical scale gives the hourly traffic volume as a percentage of the daily traffic volume. The horizontal scales show the local times.

FIGURE 1/E.523 — Standard hourly both-way traffic distribution patterns

TABLE 1/E.523 – Standard hourly bothway traffic patterns

	Local time in the more westerly country																								BH %
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
0	5	5	5	5	5	5	10	10	50	90	100	55	85	70	85	85	70	45	25	40	40	35	20	15	10.0
1	5	5	5	5	5	5	10	25	70	95	100	90	80	80	85	80	60	35	30	40	35	25	15	10	10.0
2	5	5	5	5	5	5	20	30	75	100	100	90	90	85	85	65	45	45	35	40	30	25	15	5	10.0
3	5	5	5	5	5	5	25	35	75	100	95	100	95	80	70	50	60	45	35	30	25	15	5	5	10.4
4	5	5	5	5	5	5	25	35	65	85	100	100	85	60	50	60	55	40	25	25	20	5	5	5	11.5
5	5	5	5	5	5	5	25	30	65	95	100	90	70	50	60	60	55	30	20	20	5	5	5	5	12.4
6	10	5	5	5	5	5	25	30	75	100	100	75	55	60	65	60	40	25	15	5	5	5	5	5	13.1
7	10	5	5	5	5	5	25	35	80	100	85	55	70	65	65	50	40	20	5	5	5	5	5	10	13.5
8	25	5	5	5	5	5	35	45	95	100	80	95	90	75	60	50	35	5	5	5	5	5	20	20	11.7
9	40	5	5	5	5	5	35	40	75	80	100	95	85	60	55	35	5	5	5	5	5	25	25	40	12.1
10	40	5	5	5	5	5	35	35	60	95	100	90	65	50	40	5	5	5	5	5	25	30	50	55	12.5
11	40	5	5	5	5	5	30	25	75	100	95	70	55	35	5	5	5	5	5	25	30	65	70	60	12.3
12	40	5	5	5	5	5	20	35	80	100	80	65	40	5	5	5	5	5	20	35	60	100	80	65	11.3

## Notes to Table 1/E.523

1. The 24-hour profile of both-way traffic between any two countries is read from left to right from the appropriate row of the table; all time differences can be expressed in the range 0-12 hours. Each entry is expressed as a percentage of the busy hour traffic.
2. The *more westerly* country of a traffic relation is the one from which we can proceed eastwards to the other through time zones not exceeding 12 hours.
3. For network planning studies, GMT would normally be used so that all traffic streams are processed time consistently. Clearly if the more westerly country is  $W$  hours ahead of GMT (ignoring the international dateline), then the traffic at 0000-0100 GMT is obtained from the row corresponding to the time difference between the two countries at the column headed  $W$ . Alternatively, the first entry in the appropriate row gives the relative traffic intensity for the hour (24- $W$ ) to (25- $W$ ) GMT.  
Example: For the traffic stream between the U.K. (GMT + 1 hour) and the central zone of U.S.A. (GMT + 18 hours), the time difference is 7 hours and the U.S.A. is regarded as the more westerly country, hence  $W = 18$ . Thus from the table, the traffic during 0000-0100 GMT is 5 % of the busy hour traffic, and the busy hour is 1500-1600 GMT.
4. The column headed "BH %" gives the busy hour traffic volume as a percentage of the daily traffic volume.

TABLE 2/E.523 – Diurnal distributions of eastbound international telephone traffic

		Local time in the more westerly country																								
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Time difference (in hours) between two countries	0	10	5	5	5	5	5	10	10	50	90	100	95	85	70	85	85	70	45	25	40	40	35	20	15	
	1	5	5	5	5	5	5	10	30	80	95	100	90	80	80	85	80	60	35	30	40	35	25	15	10	
	2	5	5	5	5	5	5	25	40	85	100	100	90	90	85	85	60	40	45	35	40	25	20	15	5	
	3	5	5	5	5	5	5	40	50	90	100	95	100	95	80	65	40	55	45	35	25	20	10	5	5	
	4	5	5	5	5	5	5	35	50	70	85	100	100	85	60	40	50	50	40	25	20	15	5	5	5	
	5	5	5	5	5	5	5	30	40	70	95	100	90	65	45	50	50	50	25	20	15	5	5	5	5	
	6	10	5	5	5	5	5	40	45	85	100	100	65	45	55	55	50	30	20	15	5	5	5	5	5	
	7	10	5	5	5	5	5	40	50	90	100	75	40	60	55	55	40	30	10	5	5	5	5	5	10	
	8	25	5	5	5	5	5	55	65	100	100	70	90	85	70	45	35	25	5	5	5	5	5	5	20	20
	9	50	5	5	5	5	5	40	45	70	75	100	100	85	55	50	35	5	5	5	5	5	25	35	60	
	10	65	5	5	5	5	5	45	45	60	95	100	90	60	45	35	5	5	5	5	5	25	30	75	100	
	11	65	5	5	5	5	5	40	40	75	90	80	55	40	25	5	5	5	5	5	20	25	80	100	95	
	12	55	5	5	5	5	5	20	40	65	70	50	40	20	5	5	5	5	5	20	25	70	100	90	80	

*Note.* – This table is based on  $p = 1.4$ ,  $q = 0.6$ , i.e. greater weight is given to the convenience function of the called party (see the Annex to this Recommendation).

TABLE 3/E.523 – Diurnal distribution of westbound international telephone traffic

		Local time in the more westerly country																							
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Time difference (in hours) between two countries	0	10	5	5	5	5	5	10	10	50	90	100	95	85	70	85	85	70	45	25	40	40	35	20	15
	1	5	5	5	5	5	5	10	20	60	95	100	90	80	80	85	80	60	35	30	40	35	25	15	10
	2	5	5	5	5	5	5	15	20	65	100	100	90	90	85	85	70	50	45	35	40	35	30	15	5
	3	5	5	5	5	5	5	10	20	60	100	95	100	95	80	75	60	65	45	35	35	30	15	5	5
	4	5	5	5	5	5	5	15	20	60	85	100	100	85	60	60	70	60	40	25	30	25	5	5	5
	5	5	5	5	5	5	5	20	20	60	95	100	90	75	55	70	70	60	35	20	25	5	5	5	5
	6	10	5	5	5	5	5	10	15	65	100	100	85	65	65	75	70	50	30	15	5	5	5	5	5
	7	10	5	5	5	5	5	10	20	70	100	95	70	80	75	75	60	50	30	5	5	5	5	5	10
	8	20	5	5	5	5	5	15	25	90	100	90	95	95	80	75	65	45	5	5	5	5	5	20	20
	9	25	5	5	5	5	5	30	35	80	85	100	95	85	65	60	35	5	5	5	5	5	20	20	25
	10	10	5	5	5	5	5	25	25	60	95	100	90	70	55	45	5	5	5	5	5	25	30	25	10
	11	15	5	5	5	5	5	10	10	65	95	100	80	65	45	5	5	5	5	5	25	35	40	35	25
	12	20	5	5	5	5	5	20	25	70	100	90	80	55	5	5	5	5	5	20	40	65	70	50	40

*Note.* – This table is based on  $p = 1.4$ ,  $q = 0.6$ , i.e. greater weight is given to the convenience function of the called party (see the Annex to this Recommendation).

## ANNEX

(to Recommendation E.523)

**Mathematical expression for the influence of time differences  
on the traffic flow**

A telephone call is initiated when a person wishes to call someone else, but both parties have to be on the line before the call is established. It is considered that a telephone call is made at a time which tends to be convenient for both the calling and called parties. The *degree of convenience* for making a telephone call is considered to be a periodical function of time  $t$ , whose period is 24 hours. When the time difference between both parties is zero, the degree of convenience is denoted by  $f(t)$ , where  $t$  is local standard time. The graphic shape of the basic function  $f(t)$  will be determined by the daily pattern of human activities, and will resemble, or fairly closely coincide with, the hour by hour traffic distribution in the national (or local) telephone network.

It is assumed that the hourly traffic distribution  $F_{\tau}(t)$ , when a time difference of  $\tau$  hours exists between the originating and called locations, is expressed as the geometric mean of convenience functions of two locations  $\tau$  hours apart:

$$f(t) = k \left\{ f(t) \cdot f(t + \tau) \right\}^{\frac{1}{2}} \quad (1)$$

where

$$k = 1 / \int_{24 \text{ hours}} \left\{ f(t) \cdot f(t + \tau) \right\}^{\frac{1}{2}} dt$$

The sign of  $\tau$  is positive when the time at the destination is ahead of, and negative when the time of destination is behind, the reference time.

The distribution of equation (1) represents the sum of the outgoing and incoming traffics. Expressions for the one-way hourly traffic distributions can also be obtained by extending the concept of convenience function as follows.

Define convenience functions both for the caller  $f_o(t)$  and for the called party  $f_i(t)$ . Then the one-way traffic distributions of east-bound and west-bound telephone calls, for the case of  $\tau$  hour time-difference, are similarly expressed as follows:

$$F_{\tau, \text{east}}(t) = k \left\{ f_o(t) \cdot f_i(t + \tau) \right\}^{\frac{1}{2}} \quad (2)$$

$$k = 1 / \int_{24 \text{ hours}} \left\{ f_o(t) \cdot f_i(t + \tau) \right\}^{\frac{1}{2}} dt$$

$$F_{\tau, \text{west}}(t) = k \left\{ f_i(t) \cdot f_o(t + \tau) \right\}^{\frac{1}{2}} \quad (3)$$

$$k = 1 / \int_{24 \text{ hours}} \left\{ f_i(t) \cdot f_o(t + \tau) \right\}^{\frac{1}{2}} dt$$

where  $t$  is the local standard time of the west station and  $\tau$  is positive.

It is natural that a caller makes a call considering the convenience of the called person, and therefore the convenience function of the called person  $f_i$  contributes more than the convenience of the caller  $f_o$  to the directional distribution  $F$ . They can be written as follows:

$$f_i(t) = k_1 \{f(t)\}^p, \quad f_o(t) = k_2 \{f(t)\}^q, \quad (4)$$

where:

$$p > q \quad \text{and} \quad p + q = 2,$$

and where  $k_1$  and  $k_2$  are normalizing coefficients to ensure that:

$$\int_{24 \text{ hours}} f_i(t) dt = 1, \quad \int_{24 \text{ hours}} f_o(t) dt = 1.$$

As to the values of  $p$  and  $q$  in equation (4), it has been found empirically that the convenience of the called side  $p$  is considerably larger than that of originating side  $q$ , and appropriate values are roughly  $p = 1.4$  and consequently  $q = 0.6$ .

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## SECTION 5

### GRADE OF SERVICE

#### Recommendation E.540

#### OVERALL GRADE OF SERVICE OF THE INTERNATIONAL PART OF AN INTERNATIONAL CONNECTION

1. The International Routing Plan envisages that international traffic relations may be served by any of the following routing arrangements:

- a) direct circuits;
- b) transit operation involving one or more transit centres for all connections,
- c) direct high-usage circuits with overflow via one or more transit centres.

In principle there would be merit in dimensioning international facilities to provide the same grade of service for all relations, however served. Practical considerations make it advisable to depart from one universal value.

2. Direct circuit groups are dimensioned, according to Recommendation E.520 on the basis of  $p = 1\%$  loss probability during the mean busy hour. An exception is permitted for small groups of very long international circuits for which  $p = 3\%$  loss probability is accepted for six or fewer circuits. As the traffic increases the grade of service improves progressively until  $p = 1\%$  loss value is reached for 20 circuits.

3. For the relations served exclusively by transit operation the grade of service will deteriorate with the number of transit centres in the connection. Measurements made on congestion in such circumstances suggest that the overall grade of service for up to six links in tandem is less than twice the congestion of any of the six links in the chain. Hence, for a series of routes, each dimensioned for  $p = 1\%$ , the overall grade of service should seldom exceed 2%. An East-West type of connection would have the advantage of different busy hours on the various links. Corresponding advantage would not apply to North-South circuits.

In the case of relations served by high-usage circuits the overflow traffic will route over at least two links and, hence, will be subject to the same deterioration of service as in the case for transit traffic. However, a substantial part of the traffic will be connected over the high-usage circuits and the overall grade of service will approximate that of the relations served solely by direct circuits.

It is desirable that at least one high-usage circuit should always be provided between a CT3 and its homing CT1, even though the circuit may not be wholly justified on economic considerations alone. However, such a circuit should not be provided unless there is a measurable amount of traffic which exists, or can be foreseen in the busy hour. The provision of such circuits would improve the transmission as well as the grade of service; these considerations should encourage an increase both in traffic and in the revenue-earning capacity of the circuits provided.

The overall grade of service for the international part of a connection is a contributory factor to the overall grade of service from the calling party in one country to the called party in another.

**Recommendation E.541****OVERALL GRADE OF SERVICE FOR THE INTERNATIONAL CONNECTIONS  
(SUBSCRIBER-TO-SUBSCRIBER)****1.     *Introduction***

The overall grade of service (subscriber-to-subscriber) on international connections — relating only to the phenomena of congestion in the entire network as a result of the traffic flow — depends on a number of different factors, such as the routing arrangements in the national and international parts of the connection, congestion allowed per switching stage, the methods used to measure traffic and compute the traffic base, and the time differences between the busy hours of the various links involved in the connection.

The most satisfactory way in which this grade of service could be described would be to give its distribution. The design average grade of service during the busy hour of the complete connection would be the most useful single parameter. However, until such time when continuous traffic measurements are carried out during the busy season in all parts of the network on a routine basis, it is not possible to compute this average grade of service. Therefore, at this stage it cannot be used as a criterion for the dimensioning of the network.

The only practical way of ensuring an acceptable overall grade of service on international calls is to specify an upper limit on the design loss probability per connecting link in the national network as is done for the links in the international network. (See Recommendation E.540.)

**2.     *General considerations***

Since the success of the international automatic service is highly dependent on the grade of service of all links involved in the connection from subscriber-to-subscriber it is desirable that the originating and terminating national network involved in the connection has grade of service standards comparable with those of the international network.

It is especially important that the links in the country of destination should have a good grade of service for handling the traffic, since high congestion in the terminating national network could have serious effects on the international network. High congestion in the network of the country of destination causes added retrials with consequent increased loading on common switching devices as well as increased occupation of the routes with ineffective calls.

**3.     *Design objectives***

It is recommended that the links in the national network should be designed for a loss probability <sup>1)</sup> not exceeding 1 per cent per link in the final choice route during its applicable busy hour. It is recognized however that in some countries additional congestion is permitted for the internal switching stages of the transit exchanges. It is also recognized that, where this recommended grade of service is not provided for the national service, it may not be economically feasible to provide it for international relations.

The maximum number of links in tandem used by an international connection is defined by Recommendations E.171 and Q.40.

Although the worst overall grade of service would be approximated by the sum of loss probabilities for individual links connected in tandem, on most calls the overall grade of service will be significantly better.

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<sup>1)</sup> The loss probability mentioned refers to busy hour traffic values as defined in Recommendation E.500.

*Notes*

- a) Alternative routing in the national and in the international networks provides on average a grade of service that is better than that provided in the theoretical final route.
- b) Non-coincidence of traffic peaks in the national and international networks will provide reduction in the overall grade of service compared with the sum of the design grade of service values per link.
- c) Time differences will also improve the resulting grade of service.
- d) The methods of measuring and calculating the traffic base for provisioning purposes in the national networks may be different in various countries and differ from the methods for the international network given in Recommendation E.500. This means that the national traffic values are not always comparable among themselves or with the values of the international network. Each Administration must estimate how its design traffic level compares with that recommended for the international network.
- e) The design grade of service value of each link will only apply if the traffic at each switching stage is equal to the forecast. In practice such a situation will seldom occur. Furthermore, the planning procedure normally is such that the specific grade of service should not be exceeded until the end of the planning period. In a growing network this means that the circuit groups during almost the whole planning period give a better service than the specified critical standard.

In conclusion, the overall grade of service depends on the accuracy of forecasts made and the planning procedure used, i.e. it depends on the interval between plant additions and on the specific traffic value in future to which the grade of service is related.

**Recommendation E.542**

**ACCEPTABLE REDUCTION IN THE NUMBER OF CIRCUITS OF A FINAL  
ROUTE IN THE EVENT OF A BREAKDOWN**

**1. *Maximum traffic loading***

1.1 It is the experience of Administrations that an acceptable automatic service on a final circuit group cannot be maintained if the traffic loading on the group exceeds a level corresponding to a calculated Erlang grade of service of 10%. Beyond this traffic loading, and especially owing to the cumulative effect of repeat attempt calls, the service rapidly deteriorates.

1.2 It is recommended, therefore, that this traffic loading be adopted as a criterion to determine whether special corrective measures, described in 3. below, should be introduced in those cases where it is expected that the abnormal conditions will persist for more than fifteen minutes.

**2. *Tolerated proportionate reduction in circuits***

2.1 The curves of Figure 1/E.542 indicates the proportionate reduction in circuits that may be tolerated for a short period, 15 minutes for example, under normal busy-hour conditions, on a full availability circuit group dimensioned for 1% Erlang loss, in accordance with the above traffic overload criterion. Table 1/E.542 gives the figures used to plot the curve.

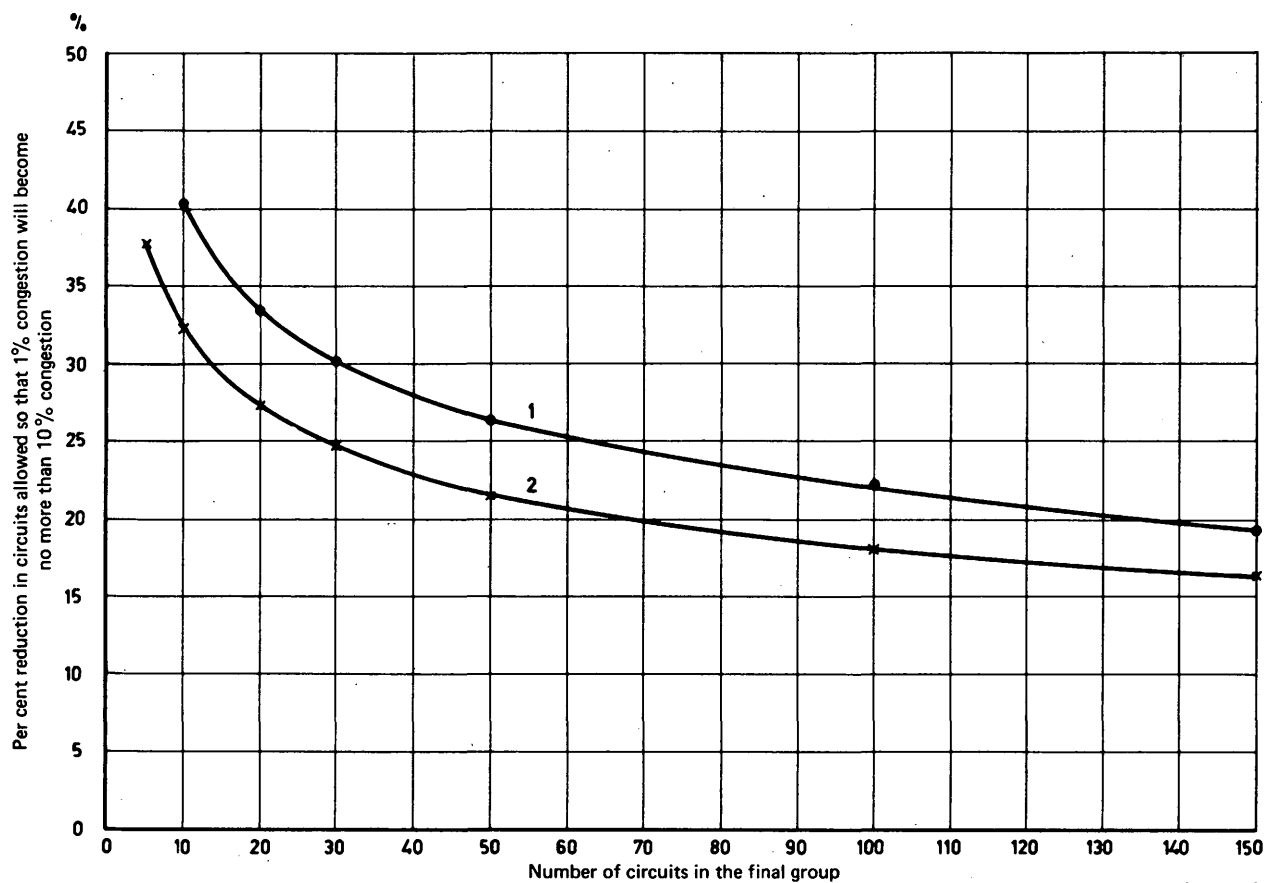


FIGURE 1/E.542 – Acceptable reduction in the number of circuits in a final group in the event of a breakdown

TABLE 1/E.542 – Acceptable % reduction in the number of circuits

Number of circuits	If originally operating at 1 % congestion, % reduction in circuits allowed to yield 10 % congestion	
	Random traffic (peakedness factor = 1.0)	Peakedness factor = 2.5
5	37.7	—
10	32.3	40.2
20	27.2	33.3
30	24.8	30.1
50	21.7	26.5
100	18.3	22.4
150	16.7	19.7

2.2 The curves of Figure 1/E.542 are intended merely as a guide. If the breakdown occurs during an exceptionally busy hour, the permissible proportionate reduction will be less. Conversely, if the breakdown occurs during an hour of light traffic a higher proportionate reduction in circuits could be tolerated. A higher reduction might also be acceptable after an appropriate oral announcement has been introduced. In the general case, a knowledge of the circuit occupancy will enable an estimate to be made of the prevailing Erlang loss figure, with the reduced number of circuits.

The permissible reduction in the case of large groups should not be exceeded, otherwise very serious congestion can result from repeated attempts.

### 3. *Corrective measures*

3.1 In order to minimize the effect of a breakdown the following procedures should be adopted:

3.1.1 Administrations should prepare plans for dealing with breakdowns on major routes. Such plans should include dispersal of traffic and prearranged alternatives for emergency use.

3.1.2 Alternative auxiliary routes, not normally economic for the relations affected, should be opened up. In such cases recourse should first be had to supplementary routing indicated in the International Routing Plan but other routings may need to be used. Adequate precautions should be taken to ensure that in no case will a call be routed through a CT previously traversed.

3.1.3 Where TASI systems are used, the number of TASI circuits on the affected route should be expanded but are not to exceed a 20% increase.

3.2 The traffic which would normally be offered to the final route affected by breakdown could be reduced in the following ways:

3.2.1 Calls encountering congestion are connected, via overflow circuits, to suitable recorded announcements. These announcements could state that a breakdown had occurred and give appropriate instructions to the callers.

3.2.2 In order to reduce the risk of spreading congestion, reports indicating breakdown should be sent by network management signals, as an example, to other centres in order that traffic may be re-routed away from the affected route when this is possible. Reports made for example by network management signals should be used to enable this announcement to be made at the originating centre.

*Note.* — This Recommendation refers to breakdowns on a final route; however, some of the procedures outlined above could be applied when a breakdown occurs on a high-usage route.

**LIST OF NEGATIVE DECISIONS  
TAKEN BY THE CCITT (OR THE CCIF)**

DECISIONS	REFERENCE
1. The publication of an <i>International List of Telephone Exchanges</i> by the ITU General Secretariat can be dispensed with.	Recommendation 12 <i>ter</i> , <i>Green Book</i> <sup>1)</sup> , Volume VI, p. 36.
2. A code for access to the international automatic network should not be standardized.	Recommendation 26 <i>ter</i> , <i>Green Book</i> , Volume VI, p. 73.
3. There is no case for allowing a terminal Administration to receive a higher quota for outgoing calls than for incoming calls in order to take its publicity expenses (canvassing) into account.	Recommendation 58, <i>Green Book</i> , Volume VI, p. 118.
4. There is no point in keeping statistics of circuit out-of-service times.	Recommendation 62 <i>bis</i> , <i>Green Book</i> , Volume VI, p. 130.
5. The principle of charging for ineffective international automatic calls should be rejected.	Result of the study of Question 5 examined in 1956-1958.
6. The queueing system in an international automatic transit exchange with seizing priority for automatic transit calls cannot be generally recommended.	Result of the study of Question 19 examined in 1956-1958.
7. There is no occasion to modify the arrangements in the <i>Instructions for Operators</i> so that, in demand working, speedier treatment is given to ordinary calls with respect to other calls.	Result of the study of Question 26 examined in 1956-1958.
8. There is no occasion to modify the arrangements in the <i>Instructions for Operators</i> to make obligatory the insertion of the caller's name on the call ticket in the case of a <i>préavis</i> call.	Result of the study of Question 27 examined in 1956-1958.
9. There is no reason to change the simple charging principle now applied, according to which one surcharge only is payable, irrespective of the number of special facilities requested.	Conclusion from the study of Supplementary Question D, examined in 1958-1960.
10. It would not be advisable to examine tariff standards for the intercontinental service on the basis of the principles mentioned in Recommendation E.51, as the tariffs in that service are not at present established according to distance.	Conclusion from the study of Question H/XIII, examined in 1960-1964. AFV <sub>1</sub>
11. The European International Telephone Traffic Statistics published by virtue of Recommendation E.82 (see Volume II <i>bis</i> of the <i>Red Book</i> ) should no longer appear but should be replaced by the worldwide statistics defined in new Recommendation E.82.	Conclusion from the study of Question 5/XIII, examined in 1960-1964.
12. It is not desirable, in the international telephone service, to apply a decreasing unit charge as a function of the duration of the telephone call.	Recommendation E.63, <i>Blue Book</i> , Volume II.
13. It is not desirable to introduce a new class of call at a reduced rate, called <i>deferred calls</i> in the international telephone service.	Recommendation E.64, <i>Blue Book</i> , Volume II.
14. There is no reason for granting a reduction in international telephone charges in favour of calls for the press.	Recommendation E.66, <i>Blue Book</i> , Volume II.

<sup>1)</sup> Volume VI of the *Green Book* is the outcome of the XVIIth Plenary Assembly of the CCIF, Geneva, 1954.

## **PART VI**

### **SUPPLEMENTS TO THE SERIES E RECOMMENDATIONS**

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## Supplement No. 1

## TABLE OF THE ERLANG FORMULA

Table of the Erlang loss formula  
(Erlang No. 1 formula, also called Erlang B formula)

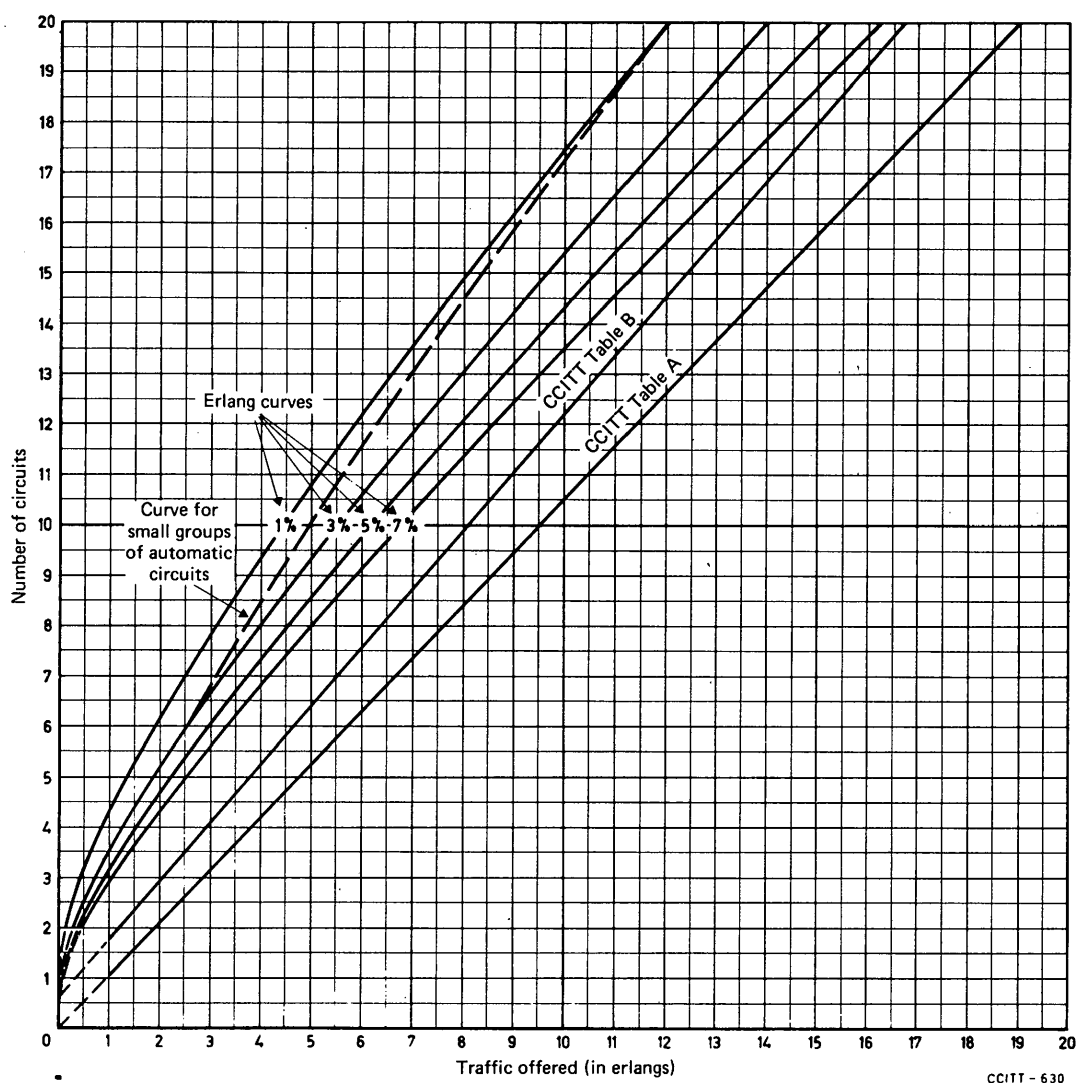
Loss probabilities: 1 %, 3 %, 5 %, 7 %.

Let  $p$  = the loss probability  
 $y$  = the traffic offered (in erlangs)  
 $n$  = the number of circuits

$$\text{Formula: } E_{1,n}(y) = p = \frac{\frac{y^n}{n!}}{1 + \frac{y}{1} + \frac{y^2}{2!} + \dots + \frac{y^n}{n!}}$$

$n$	$p = 1\%$	$p = 3\%$	$p = 5\%$	$p = 7\%$	$n$	$p = 1\%$	$p = 3\%$	$p = 5\%$	$p = 7\%$
1	0.01	0.03	0.05	0.08	51	38.80	42.89	45.53	47.72
2	0.15	0.28	0.38	0.47	52	39.70	43.85	46.53	48.76
3	0.46	0.72	0.90	1.06	53	40.60	44.81	47.53	49.79
4	0.87	1.26	1.53	1.75	54	41.50	45.78	48.54	50.83
5	1.36	1.88	2.22	2.50	55	42.41	46.74	49.54	51.86
6	1.91	2.54	2.96	3.30	56	43.31	47.70	50.54	52.90
7	2.50	3.25	3.74	4.14	57	44.22	48.67	51.55	53.94
8	3.13	3.99	4.54	5.00	58	45.13	49.63	52.55	54.98
9	3.78	4.75	5.37	5.88	59	46.04	50.60	53.56	56.02
10	4.46	5.53	6.22	6.78	60	46.95	51.57	54.57	57.06
11	5.16	6.33	7.08	7.69	61	47.86	52.54	55.57	58.10
12	5.88	7.14	7.95	8.61	62	48.77	53.51	56.58	59.14
13	6.61	7.97	8.84	9.54	63	49.69	54.48	57.59	60.18
14	7.35	8.80	9.73	10.48	64	50.60	55.45	58.60	61.22
15	8.11	9.65	10.63	11.43	65	51.52	56.42	59.61	62.27
16	8.88	10.51	11.54	12.39	66	52.44	57.39	60.62	63.31
17	9.65	11.37	12.46	13.35	67	53.35	58.37	61.63	64.35
18	10.44	12.24	13.39	14.32	68	54.27	59.34	62.64	65.40
19	11.23	13.11	14.31	15.29	69	55.19	60.32	63.65	66.44
20	12.03	14.00	15.25	16.27	70	56.11	61.29	64.67	67.49
21	12.84	14.89	16.19	17.25	71	57.03	62.27	65.68	68.53
22	13.65	15.78	17.13	18.24	72	57.96	63.24	66.69	69.58
23	14.47	16.68	18.08	19.23	73	58.88	64.22	67.71	70.62
24	15.29	17.58	19.03	20.22	74	59.80	65.20	68.72	71.67
25	16.13	18.48	19.99	21.21	75	60.73	66.18	69.74	72.72
26	16.96	19.39	20.94	22.21	76	61.65	67.16	70.75	73.77
27	17.80	20.31	21.90	23.21	77	62.58	68.14	71.77	74.81
28	18.64	21.22	22.87	24.22	78	63.51	69.12	72.79	75.86
29	19.49	22.14	23.83	25.22	79	64.43	70.10	73.80	76.91
30	20.34	23.06	24.80	26.23	80	65.36	71.08	74.82	77.96
31	21.19	23.99	25.77	27.24	81	66.29	72.06	75.84	79.01
32	22.05	24.91	26.75	28.25	82	67.22	73.04	76.86	80.06
33	22.91	25.84	27.72	29.26	83	68.15	74.02	77.87	81.11
34	23.77	26.78	28.70	30.28	84	69.08	75.01	78.89	82.16
35	24.64	27.71	29.68	31.29	85	70.02	75.99	79.91	83.21
36	25.51	28.65	30.66	32.31	86	70.95	76.97	80.93	84.26
37	26.38	29.59	31.64	33.33	87	71.88	77.96	81.95	85.31
38	27.25	30.53	32.62	34.35	88	72.81	78.94	82.97	86.36
39	28.13	31.47	33.61	35.37	89	73.75	79.93	83.99	87.41
40	29.01	32.41	34.60	36.40	90	74.68	80.91	85.01	88.46
41	29.89	33.36	35.58	37.42	91	75.62	81.90	86.04	89.52
42	30.77	34.30	36.57	38.45	92	76.56	82.89	87.06	90.57
43	31.66	35.25	37.57	39.47	93	77.49	83.87	88.08	91.62
44	32.54	36.20	38.56	40.50	94	78.43	84.86	89.10	92.67
45	33.43	37.16	39.55	41.53	95	79.37	85.85	90.12	93.73
46	34.32	38.11	40.54	42.56	96	80.31	86.84	91.15	94.78
47	35.22	39.06	41.54	43.59	97	81.24	87.83	92.17	95.83
48	36.11	40.02	42.54	44.62	98	82.18	88.82	93.19	96.89
49	37.00	40.98	43.53	45.65	99	83.12	89.80	94.22	97.94
50	37.90	41.93	44.53	46.69	100	84.06	90.79	95.24	98.99

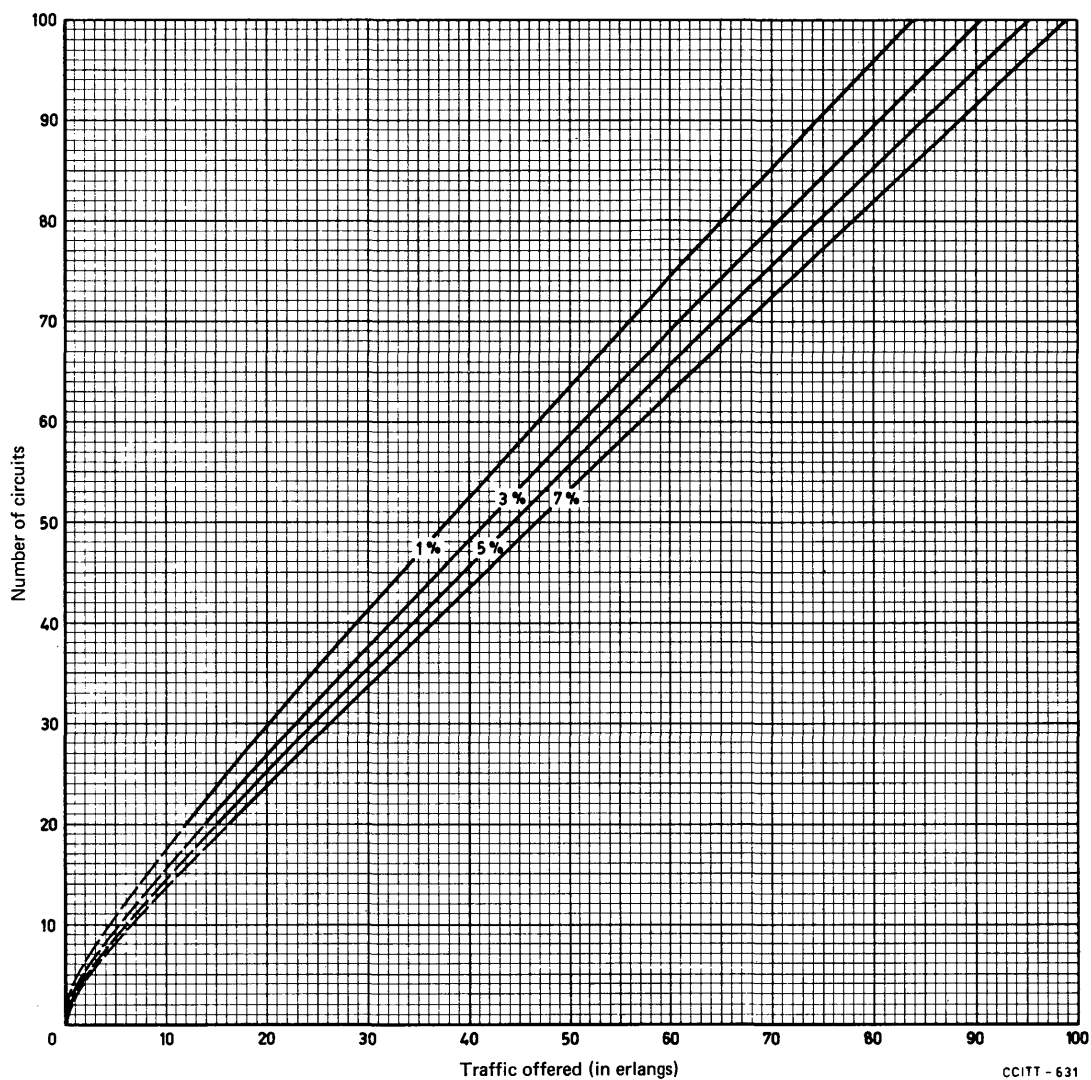
## Supplement No. 2

CURVES SHOWING THE RELATION BETWEEN THE TRAFFIC OFFERED  
AND THE NUMBER OF CIRCUITS REQUIRED

Relation between the traffic (in erlangs) offered and the number of circuits required in the case of:

- the curves A and B of Table 1/E.510;
- the Erlang formula ( $p = 1\%$ ,  $3\%$ ,  $5\%$  et  $7\%$ );
- the curve for small groups of automatic circuits (see Annex to Recommendation E.520).

FIGURE 1 – Number of circuits between 1 and 20



Relation between the traffic (in erlangs) offered and the number of circuits required in the case of the Erlang formula for ( $p = 1\%$ ,  $3\%$ ,  $5\%$  and  $7\%$ ).

FIGURE 2 – Number of circuits between 1 and 100

### Supplement No. 3

#### SPECIAL SERVICE OBSERVATION DATA, COLLECTION AND STATISTICAL ANALYSIS FOR MEASUREMENT OF CUSTOMER DIFFICULTIES IN THE INTERNATIONAL AUTOMATIC SERVICE

(The text of this Supplement appears in the *Green Book*, at the end of Volume II-A.)

## Supplement No. 4

## VARIOUS TONES USED IN NATIONAL NETWORKS

TABLE 1 — Ringing tone

Country	Frequency (Hz)	1 s ↔	Scale	1000 ms ↔
AFARS AND ISSAS . . . . .	$450 \pm 25$	—	—	—
ALGERIA . . . . .	25 or 50	—	—	—
GERMANY (F.R. of) . . . . .	$\begin{cases} 450 \text{ or } 425 \\ 425 \end{cases}$	—	—	—
ANGUILLA . . . . .	400/450	—	—	—
ARGENTINA . . . . .	$25 + 450$ $\times 16^{2/3}$	—	—	—
AUSTRALIA . . . . .	$400 \pm 20 \times 17$	—	—	—
AUSTRIA . . . . .	450	—	—	—
BAHAMAS . . . . .	$\begin{cases} 440/480 \\ 420/20 \text{ or } 400 \end{cases}$	—	—	—
BAHRAIN . . . . .	$\begin{cases} 400/450 \\ 133 \end{cases}$	—	—	—
BELGIUM . . . . .	$\begin{cases} 450 \\ \text{Exceptionally} \\ 450 \times 25^a \end{cases}$	—	—	—
BOTSWANA . . . . .	400/450	—	—	—
BRAZIL . . . . .	400 or 450	—	—	—
BURUNDI . . . . .	450	—	—	—
CAMEROON . . . . .	425	—	—	—
CANADA . . . . .	$\begin{cases} 420 \times 40 \\ \text{or} \\ 440^b + 480^b \\ 440^b + \\ 480^b/440^b \end{cases}$	—	—	—
CAYMAN . . . . .	$\begin{cases} 425/50 \\ 400/450 \\ 400/450 \end{cases}$	—	—	—
CHILE . . . . .	$16^{2/3}$	—	—	—
CYPRUS . . . . .	$400 \times 25$	—	—	—
KOREA (Republic of) . . . . .	$\begin{cases} 400 + 20 \\ 450 \text{ or } 425 \end{cases}$	—	—	—
IVORY COAST . . . . .	$\begin{cases} 50 \\ 425 \pm 25 \times 50 \end{cases}$	—	—	—
CUBA . . . . .	$\begin{cases} 420 + 40 \\ 450 \end{cases}$	—	—	—
DENMARK . . . . .	425	—	—	—
DOMINICA . . . . .	400/450	—	—	—
EL SALVADOR . . . . .	425	—	—	—

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TABLE 1 — Ringing tone (continued)

Country	Frequency (Hz)	1 s	Scale										1000 ms
EAST AFRICAN P. and T. Corp. (KENYA, UGANDA and TANZANIA)	$\left\{ \begin{array}{l} 133 + 17 \\ \text{or} \\ 400 + 17 \\ \text{or} \\ 400 + 450 \end{array} \right\}$												
SPAIN . . . . .	400												
UNITED STATES OF AMERICA . . . . .	$\left\{ \begin{array}{l} 420 \times 40 \\ \text{or} \\ 440^b + 480^b \end{array} \right\}$ $\left\{ \begin{array}{l} 440^b + \\ 480^b/440^b \end{array} \right\}^c$												
FIJI . . . . .	$\left\{ \begin{array}{l} 133 \times 16^{2/3} \\ 400 \times 25 \end{array} \right\}$												
FINLAND . . . . .	$\left\{ \begin{array}{l} 400 \text{ or } 450^d \\ 425 \pm 25^e \end{array} \right\}$												
FRANCE . . . . .	$425 \pm 25$												
FUJAIH . . . . .	400												
GHANA . . . . .	450 or 135												
GREECE . . . . .	450												
GUINEA . . . . .	450												
HUNGARIAN PEOPLE'S REP.	$425 \pm 25$												
INDIA . . . . .	$\left\{ \begin{array}{l} 133 + 16^{2/3} \\ 400 + 16^{2/3} \end{array} \right\}$												
INDONESIA . . . . .	435 or 450												
IRAQ . . . . .	400												
IRELAND . . . . .	$425 \times 50$												
ISRAEL . . . . .	$\left\{ \begin{array}{l} 400 \pm 8 \\ 400 \pm 8 \\ \text{or} \\ 450 \pm 9 \end{array} \right\}$												
ITALY . . . . .	$425 \pm 25$												
JAMAICA . . . . .	$\left\{ \begin{array}{l} 440 + 480 \\ 133 + 16^{2/3} \end{array} \right\}$												
JAPAN . . . . .	$\left\{ \begin{array}{l} 400 \times 16^{2/3}^d \\ 350 \times 33^{1/3} \end{array} \right\}$												
JORDAN . . . . .	$400 + 16^{2/3}$												
KUWAIT . . . . .	400												
LEBANON . . . . .	435												
LIBERIA . . . . .	425												
MALAYSIA . . . . .	$\left\{ \begin{array}{l} 400/20^d \\ 425/50^e \end{array} \right\}$												
MALAWI . . . . .	$\left\{ \begin{array}{l} 400 \\ 133 \end{array} \right\}$												
MADAGASCAR . . . . .	25												

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TABLE 1 — Ringing tone (continued)

Country	Frequency (Hz)	1 s ↔	Scale	1000 ms ↔
MALTA . . . . .	$\left\{ \begin{array}{l} 400 + 450 \\ 400 \times 25 \\ 400 \times 16^{2/3} \end{array} \right\}$	—	—	—
MOROCCO . . . . .	450	—	—	—
MAURITANIA . . . . .	50	—	—	—
MONTSERRAT . . . . .	400/450	—	—	—
MOZAMBIQUE . . . . .	400	—	—	—
NIGERIA . . . . .	400/450	—	—	—
NORWAY . . . . .	$\left\{ \begin{array}{l} 400 \text{ or } 450 \\ 425 \pm 25 f \end{array} \right\}$	—	—	—
NEW CALEDONIA . . . . .	$425 \pm 25 g$	—	—	—
NEW HEBRIDES . . . . .	$\left\{ \begin{array}{l} 400 \times 450 \\ \text{or} \\ 133 \times 16^{2/3} \end{array} \right\}$	—	—	—
NEW ZEALAND . . . . .	$\left\{ \begin{array}{l} (400 + 16^{2/3}) \\ \text{and } 400 + 25 \\ \text{to be eliminated} \\ 400 \times 33 \\ 400 + 450 \end{array} \right\}$	—	—	—
PAKISTAN . . . . .	$\left\{ \begin{array}{l} 450 \\ 400 + 16^{2/3} \end{array} \right\}$	—	—	—
NETHERLANDS . . . . .	$\left\{ \begin{array}{l} 425 \text{ or } 450 \\ \text{or } 25 + \\ \text{harmonics } h \end{array} \right\}$	—	—	—
POLAND (People's Rep. of) . . . . .	400	—	—	—
FRENCH POLYNESIA . . . . .	$450 \pm 25$	—	—	—
PORTUGAL . . . . .	400	—	—	—
QATAR . . . . .	$\left\{ \begin{array}{l} 400 + 450 \\ \text{or } 400 \end{array} \right\}$	—	—	—
RAS AL KHAIMAH . . . . .	$\left\{ \begin{array}{l} 400 \\ 400 \text{ or } 400/500 \end{array} \right\}$	—	—	—
SYRIA . . . . .	$\left\{ \begin{array}{l} 450/50 \\ 450/25 \end{array} \right\}$	—	—	—
ROUMANIA . . . . .	$\left\{ \begin{array}{l} 16^{2/3} \text{ or} \\ 450/25 \end{array} \right\}$	—	—	—
UNITED KINGDOM . . . . .	$\left\{ \begin{array}{l} 400 + 450 \\ 400 \times 25 \\ 400 \times 16^{2/3} \\ 133^{1/3} \times 16^{2/3} \end{array} \right\}$	—	—	—
ST. LUCIA . . . . .	$\left\{ \begin{array}{l} 400/450 \\ 400/450 \\ 420 + 40 \end{array} \right\}$	—	—	—
ST. VINCENT . . . . .	$\left\{ \begin{array}{l} 400/450 \\ 400/450 \end{array} \right\}$	—	—	—
SEYCHELLES . . . . .	$\left\{ \begin{array}{l} 400/450 \\ 400/450 \end{array} \right\}$	—	—	—
SHARJAH . . . . .	$\left\{ \begin{array}{l} 400 \\ 400/450 \text{ or } 450 \end{array} \right\}$	—	—	—

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TABLE 1 — Ringing tone (conclusion)

Country	Frequency (Hz)	1 s	Scale	1000 ms
SINGAPORE . . . . .	$400 \times 24$			
SOUTH AFRICA (Rep. of) . .	$400 \times 33\frac{1}{3}$			
SWEDEN . . . . .	$\begin{cases} 425 \\ 425^f \end{cases}$			
SWITZERLAND . . . . .	$\begin{cases} 425 \pm 25 \\ \text{or} \\ 500 \pm 25 \end{cases}$			
SURINAM . . . . .	$\begin{cases} 420 \times 40 \\ 450 \end{cases}$			
CZECHOSLOVAKIA . . . . .	450			
THAILAND . . . . .	400			
TUNISIA . . . . .	$425 \pm 25$			
TURKS AND CAICOS . . . .	$\begin{cases} 440 + 480 \\ 400/450 \end{cases}$			
U.S.S.R. . . . .	$\begin{cases} \text{At present :} \\ 450 \pm 50 \\ \text{In future :} \\ 425 \pm 25 \end{cases}$			
URUGUAY . . . . .	$\begin{cases} \text{At present :} \\ 450 + 25 \\ \text{and} \\ 450 \\ \text{In future :} \\ 450 \end{cases}$			
BRITISH VIRGIN ISLANDS .	400/450			
YUGOSLAVIA . . . . .	$\begin{cases} \text{At present :} \\ 450 \times 25 \\ \text{In future :} \\ 425 \pm 25 \end{cases}$			
ZAMBIA . . . . .	$400 + 450$			

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## EXPLANATORY NOTES TO TABLE I

In this Table :

$$f_1 \times f_2 = f_1 \text{ modulated by } f_2$$

$$f_1 + f_2 = f_1 \text{ plus } f_2$$

$$f_1 / f_2 = f_1 \text{ followed by } f_2$$

<sup>a</sup> The frequency is between 400 and 450 Hz.<sup>b</sup> New precise tone plan. Frequencies  $\pm 0.5\%$  of nominal values.<sup>c</sup> Special audible ringing tone.<sup>d</sup> Exchanges installed in 1970 or earlier.<sup>e</sup> Exchanges installed later than 1970.<sup>f</sup> New exchanges.<sup>g</sup> Sending : between 1.4 and 1.8 seconds. — Silence : between 3.0 and 3.8 seconds.<sup>h</sup> To be deleted in 1980.

TABLE 2 — Busy tone

Country	Frequency (Hz)	1 s ↔	Scale	1000 ms ↔
AFARS AND ISSAS . . . . .	450 ± 25	—	—	—
ALGERIA . . . . .	450	—	—	—
GERMANY (F.R. of) . . . . .	450 or 425 425	—	—	—
ANGUILLA . . . . .	400	—	—	—
ARGENTINA . . . . .	450	—	—	—
AUSTRALIA . . . . .	400 ± 20	—	—	—
AUSTRIA . . . . .	450	—	—	—
BAHAMAS . . . . .	{ 480/620 420 or 400 }	—	—	—
BAHRAIN . . . . .	400	—	—	—
BELGIUM . . . . .	450	—	—	—
BOTSWANA . . . . .	400	—	—	—
BRAZIL . . . . .	400 or 450	—	—	—
BURUNDI . . . . .	450	—	—	—
CAMEROON . . . . .	425	—	—	—
CANADA . . . . .	{ 600 × 120 or 480 <sup>a</sup> + 620 <sup>a</sup> }	—	—	—
CAYMAN . . . . .	{ 425 400 400 }	—	—	—
CHILE . . . . .	400	—	—	—
CYPRUS . . . . .	400	—	—	—
KOREA (Republic of) . . . . .	{ 450 133 or 400 }	—	—	—
IVORY COAST . . . . .	425 ± 25	—	—	—
CUBA . . . . .	{ 600 + 120 450 }	—	—	—
DENMARK . . . . .	425	—	—	—
DOMINICA . . . . .	400	{	—	—
EL SALVADOR . . . . .	425	—	—	—
EAST AFRICAN P. and T. Corp. (KENYA, UGANDA and TANZANIA) . . . . .	{ 400 }	{	—	—
SPAIN . . . . .	400	—	—	—
UNITED STATES . . . . .	{ 600 × 120 or 480 <sup>a</sup> + 620 <sup>a</sup> }	—	—	—
FIJI . . . . .	400	—	—	—
FINLAND . . . . .	425 ± 25	{	—	—

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TABLE 2 — Busy tone (continued)

Country	Frequency (Hz)	1 s ↔	Scale		1000 ms ↔						
FRANCE . . . . .	425 ± 25	—	—	—	—	—	—	—	—	—	—
FUJAIRAH . . . . .	400	—	—	—	—	—	—	—	—	—	—
GHANA . . . . .	400	—	—	—	—	—	—	—	—	—	—
GREECE . . . . .	450	—	—	—	—	—	—	—	—	—	—
GUINEA . . . . .	450	—	—	—	—	—	—	—	—	—	—
HUNGARIAN PEOPLE'S REP.	425 ± 25	—	—	—	—	—	—	—	—	—	—
INDIA . . . . .	400	—	—	—	—	—	—	—	—	—	—
INDONESIA . . . . .	435 or 450	—	—	—	—	—	—	—	—	—	—
IRAQ . . . . .	400	—	—	—	—	—	—	—	—	—	—
IRELAND . . . . .	400 or 425	—	—	—	—	—	—	—	—	—	—
ISRAEL . . . . .	$\begin{cases} 400 \pm 8 \\ 400 \pm 9 \end{cases}$	—	—	—	—	—	—	—	—	—	—
ITALY . . . . .	425 ± 25	—	—	—	—	—	—	—	—	—	—
JAMAICA . . . . .	$\begin{cases} 480 + 620 \\ 400 \end{cases}$	—	—	—	—	—	—	—	—	—	—
JAPAN . . . . .	400	—	—	—	—	—	—	—	—	—	—
JORDAN . . . . .	400	—	—	—	—	—	—	—	—	—	—
KUWAIT . . . . .	400	—	—	—	—	—	—	—	—	—	—
LEBANON . . . . .	435	—	—	—	—	—	—	—	—	—	—
LIBERIA . . . . .	425	—	—	—	—	—	—	—	—	—	—
MALAYSIA . . . . .	$\begin{cases} 400^b \\ 425^c \end{cases}$	—	—	—	—	—	—	—	—	—	—
MALAWI . . . . .	400	{	—	—	—	—	—	—	—	—	—
MADAGASCAR . . . . .	450	—	—	—	—	—	—	—	—	—	—
MALTA . . . . .	400	—	—	—	—	—	—	—	—	—	—
MOROCCO . . . . .	450	—	—	—	—	—	—	—	—	—	—
MAURITANIA . . . . .	425	—	—	—	—	—	—	—	—	—	—
MONTSERRAT . . . . .	400	{	—	—	—	—	—	—	—	—	—
MOZAMBIQUE . . . . .	400	—	—	—	—	—	—	—	—	—	—
NIGERIA . . . . .	400	—	—	—	—	—	—	—	—	—	—
NORWAY . . . . .	$\begin{cases} 400 \text{ or } 450^d \\ 425 \pm 25^e \end{cases}$	—	—	—	—	—	—	—	—	—	—
NEW CALEDONIA . . . . .	425 ± 25	—	—	—	—	—	—	—	—	—	—
NEW HEBRIDES . . . . .	400	{	—	—	—	—	—	—	—	—	—
NEW ZEALAND . . . . .	400	—	—	—	—	—	—	—	—	—	—
PAKISTAN . . . . .	$\begin{cases} 450 \\ 400 \end{cases}$	—	—	—	—	—	—	—	—	—	—

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TABLE 2 — Busy tone (conclusion)

Country	Frequency (Hz)	1 s	Scale				1000 ms				
		↔					↔				
NETHERLANDS . . . . .	{ At present : 425 or 450 425 <sup>e</sup>	—	—	—	—	—	—	—	—	—	—
POLAND (People's Rep. of) . .	400	—	—	—	—	—	—	—	—	—	—
FRENCH POLYNESIA . . . . .	450 ± 25	—	—	—	—	—	—	—	—	—	—
PORTUGAL . . . . .	400	—	—	—	—	—	—	—	—	—	—
QATAR . . . . .	400 or 450	{ —	—	—	—	—	—	—	—	—	—
SYRIA . . . . .	450	—	—	—	—	—	—	—	—	—	—
RAS AL KHAIMAH . . . . .	400	{ —	—	—	—	—	—	—	—	—	—
ROUMANIA . . . . .	133 or 450	—	—	—	—	—	—	—	—	—	—
UNITED KINGDOM . . . . .	400	—	—	—	—	—	—	—	—	—	—
ST. LUCIA . . . . .	{ 400 600 + 120	—	—	—	—	—	—	—	—	—	—
ST. VINCENT . . . . .	400	—	—	—	—	—	—	—	—	—	—
SEYCHELLES . . . . .	400	{ —	—	—	—	—	—	—	—	—	—
SHARJAH . . . . .	{ 400/450 400	{ —	—	—	—	—	—	—	—	—	—
SINGAPORE . . . . .	400	—	—	—	—	—	—	—	—	—	—
SOUTH AFRICA (Rep. of) . .	400	—	—	—	—	—	—	—	—	—	—
SWEDEN . . . . .	425	—	—	—	—	—	—	—	—	—	—
SWITZERLAND . . . . .	{ 425 ± 25 or 500 ± 25	—	—	—	—	—	—	—	—	—	—
SURINAM . . . . .	{ 600 × 120 450	—	—	—	—	—	—	—	—	—	—
CZECHOSLOVAKIA . . . . .	450	—	—	—	—	—	—	—	—	—	—
THAILAND . . . . .	400 450	—	—	—	—	—	—	—	—	—	—
TUNISIA . . . . .	425 ± 25	—	—	—	—	—	—	—	—	—	—
TURKS AND CAICOS ISLANDS . . . . .	{ 480 + 620 400	—	—	—	—	—	—	—	—	—	—
U.S.S.R. <sup>f</sup> . . . . .	{ At present : 450 ± 50 In future : 425 ± 25	—	—	—	—	—	—	—	—	—	—
URUGUAY . . . . .	450	—	—	—	—	—	—	—	—	—	—
BRITISH VIRGIN ISLANDS .	400	—	—	—	—	—	—	—	—	—	—
YUGOSLAVIA . . . . .	425 ± 25	{ —	—	—	—	—	—	—	—	—	—
ZAMBIA . . . . .	400 + 450	—	—	—	—	—	—	—	—	—	—

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## EXPLANATORY NOTES TO TABLE 2

In this Table:

$f_1 \times f_2 = f_1$  modulated by  $f_2$

$f_1 + f_2 = f_1$  plus  $f_2$

$f_1 / f_2 = f_1$  followed by  $f_2$

<sup>a</sup> New precise tone plan. Frequencies  $\pm 0.5\%$  of nominal values.

<sup>b</sup> Exchanges installed in 1970 or earlier.

<sup>c</sup> Exchanges installed later than 1970.

<sup>d</sup> The tone and the silent periods vary between 200 and 400 ms.

<sup>e</sup> New equipment.

<sup>f</sup> A signal of the same frequency and periodicity is used to indicate both a busy line and a busy subscriber.

TABLE 3 — Other tones  
(Reference, information, number unobtainable, congestion tones <sup>1</sup>)

Country	Frequency (Hz)	Scale									
		1 s							1000 ms		
GERMANY (F.R. of)	Special information tone . . .	950/1400/1800	—	—	—	—	—	—	—	—	—
	Congestion tone . . .	425	—	—	—	—	—	—	—	—	—
ANGUILLA	Dial tone . . . . .	25	—	—	—	—	—	—	—	—	—
	Number unobtainable tone . . .	400	—	—	—	—	—	—	—	—	—
	Congestion tone . . .	400	—	—	—	—	—	—	—	—	—
ARGENTINA	Dial tone . . . . .	450	—	—	—	—	—	—	—	—	—
AUSTRALIA	Number unobtainable tone . . . . .	400	—	—	—	—	—	—	—	—	—
	Recording tone . . . . .	1400 ± 100 <sup>a</sup>	—	—	—	—	—	—	—	—	—
	Congestion tone . . . . .	400 ± 20 <sup>b</sup>	—	—	—	—	—	—	—	—	—
AUSTRIA	Information tone . . . . .	950/1400/1800	—	—	—	—	—	—	—	—	—
BAHRAIN	Dial tone . . . . .	50 25, 33 or 50	—	—	—	—	—	—	—	—	—
	Number unobtainable tone . . .	400	—	—	—	—	—	—	—	—	—
	Congestion tone . . . . .	400	—	—	—	—	—	—	—	—	—
BELGIUM	Congestion tone . . . . .	450	—	—	—	—	—	—	—	—	—
	Information tone . . . . .	900/1380/1860	—	—	—	—	—	—	—	—	—
BOTSWANA	Number unobtainable tone . . .	400	—	—	—	—	—	—	—	—	—
BRAZIL	Number unobtainable tone . . . . .	400 or 450	—	—	—	—	—	—	—	—	—
	Dial tone . . . . .	400 or 450	—	—	—	—	—	—	—	—	—
BURUNDI	Dial tone . . . . .	150	—	—	—	—	—	—	—	—	—
	Special information tone . . . . .	150/450	—	—	—	—	—	—	—	—	—
CAMEROON	Routing tone . . . . .	425	—	—	—	—	—	—	—	—	—

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<sup>1</sup> It may be advantageous to provide the intervention of an assistance operator at the incoming international exchange in the event of receipt of these tones.

TABLE 3 — Other tones (continued)

Country		Frequency (Hz)	1 s	Scale										1000 ms
CANADA	Recorder (congestion) tone . . . . .	$\left\{ \begin{array}{l} 600 \times 120 \\ \text{or} \\ 480^c + 620^c \end{array} \right\}$	---											
	Dial tone . . . . .	$\left\{ \begin{array}{l} 600 \times 120 \\ \text{or} \\ 350^c + 440^c \end{array} \right\}$	---											
	Recall dial tone . . . . .	$350^c + 440^c$	---											
	Busy verification tone . . . . .	$d 440^c$	---											
	Executive override tone . . . . .	$440^c$	---											
	Confirmation tone . . . . .	$350^c + 440^c$	---											
	Intercept tone . . . . .	$440^c/620^c$	---											
	Recorder warning tone . . . . .	$1400^c$	---											
	Call waiting tone . . . . .	$440^c, f$	---											
CAYMAN	Dial tone . . . . .	425 or 50 or 25	---											
	Congestion tone . . . . .	400	---											
	Number unobtainable tone . . . . .	$\left\{ \begin{array}{l} 425 \\ 400 \end{array} \right\}$	---											
CHILE	Dial tone . . . . .	$\left\{ \begin{array}{l} 33\frac{1}{3} \text{ or} \\ 400 \times 33\frac{1}{3} \end{array} \right\}$	---											
	Waiting tone . . . . .	$\left\{ \begin{array}{l} (1100 + 900) \\ \times 10 \end{array} \right\}$	---											
CYPRUS	Dial tone . . . . .	50	---											
	Number unobtainable tone . . . . .	400	---											
KOREA (Republic of)	Dial tone . . . . .	450 or 400	---											
	Number unobtainable tone . . . . .	450	---											
	Ring back tone . . . . .	450 or 400	---											
IVORY COAST	Dial tone . . . . .	$425 \pm 25$	---											
	Routing tone . . . . .	$425 \pm 25$	---											
CUBA	Number unobtainable tone . . . . .	520	---											
	Congestion tone . . . . .	$600 + 120$	---											

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TABLE 3 — Other tones (continued)

Country	Frequency (Hz)	1 s	Scale	1000 ms
DENMARK	Information tone . . . . .	425 or 950/1400/1800	.....	.....
DOMINICA	Dial tone . . . . .	{ 33 50	.....	.....
	Congestion tone . . . . .	400	{ — — — — —	{ — — — — —
	Number unobtainable tone . . . . .	{ 400		
EL SALVADOR	Dial tone . . . . .	425	— — — — —	— — — — —
EAST AFRICAN P. and T. Corp. (KENYA, UGANDA)	Number unobtainable tone . . . . .	{ 400 400	— — — — —	— — — — —
and TANZANIA	Dial tone . . . . .	33 or 50	— — — — —	— — — — —
SPAIN	Information tone . . . . .	400	- - - - -	- - - - -
	Spare level . . . . .	400	- - - - -	- - - - -
UNITED STATES	Recorder (congestion) tone . . . . .	{ 600 × 120 or 480 c + 620 c }	- - - - -	- - - - -
	Dial tone . . . . .	{ 600 × 120 or 350 c + 440 c }	— — — — —	— — — — —
	Re-call dial tone . . . . .	350 c + 440 c	... — — — — —	... — — — — —
	Busy verification tone . . . . .	a 440 c	— — — — —	— — — — —
	Executive override tone . . . . .	440 c	— — — — —	— — — — —
	Confirmation tone . . . . .	350 c + 440 c	- - - - -	- - - - -
	Intercept tone . . . . .	440 c/620 c	{ - - - - -	{ - - - - -
	Recorder warning tone . . . . .	1400 c	— — — — —	— — — — —
	Call waiting tone . . . . .	440 c, f	— — — — —	— — — — —
FIJI	Dial tone . . . . .	33 or 50	— — — — —	— — — — —
	Trunk offer tone . . . . .	400	{ — — — — —	{ — — — — —
	Number unobtainable tone . . . . .	400	— — — — —	— — — — —
	Continuous ringing tone . . . . .	{ 133 × 16 <sup>2</sup> /3 or 400 × 25 }	— — — — —	— — — — —

TABLE 3 — Other tones (continued)

Country		Frequency (Hz)	1 s	Scale				1000 ms				
FINLAND	Information tone . . . . .	950/1400/1800	---	---	---	---	---	---	---	---	---	---
	Waiting tone . . . . .	950/950/1400	---	---	---	---	---	---	---	---	---	---
	Recording tone . . . . .	1400 ± 50	---	---	---	---	---	---	---	---	---	---
	Warning tone, operator intervening . . . . .	$\begin{cases} 400 \text{ or } 450^h \\ 425 \pm 25^f \end{cases}$	---	---	---	---	---	---	---	---	---	---
FRANCE	Routing or transfer tone . . . . .	$425$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
FUJAIRAH	Dial tone . . . . .	25	---	---	---	---	---	---	---	---	---	---
	Congestion tone . . . . .	400	---	---	---	---	---	---	---	---	---	---
	Number unobtainable tone . . . . .	400	---	---	---	---	---	---	---	---	---	---
GHANA	Number unobtainable tone . . . . .	$\begin{cases} 150 \text{ or } 450 \\ 400 \end{cases}$	---	---	---	---	---	---	---	---	---	---
GUINEA	Number unobtainable tone . . . . .	450	---	---	---	---	---	---	---	---	---	---
HUNGARIAN People's Rep.	Dial tone . . . . .	$\begin{cases} 425 \pm 25 \\ 850 \pm 25 \end{cases}$	---	---	---	---	---	---	---	---	---	---
	Information tone . . . . .	950/1400/1800	---	---	---	---	---	---	---	---	---	---
	Warning tone, operator intervening . . . . .	$425 \pm 25$	---	---	---	---	---	---	---	---	---	---
INDIA	Number unobtainable tone . . . . .	$\begin{cases} 400 \\ 400 \end{cases}$	---	---	---	---	---	---	---	---	---	---
IRAQ	Ring back tone . . . . .	133	---	---	---	---	---	---	---	---	---	---
IRELAND	Number unobtainable tone . . . . .	400 or 425	---	---	---	---	---	---	---	---	---	---
	Dial tone . . . . .	$33\frac{1}{3}$ or 50	---	---	---	---	---	---	---	---	---	---
ISRAEL	Information tone . . . . .	$\begin{cases} 100/1400/1800 \\ \pm 2\%^k \end{cases}$	---	---	---	---	---	---	---	---	---	---
JAMAICA	Dial tone . . . . .	$\begin{cases} 350 + 440 \\ 33\frac{1}{3} \end{cases}$	---	---	---	---	---	---	---	---	---	---
	Reorder (congestion) tone . . . . .	$480 + 620$	---	---	---	---	---	---	---	---	---	---
	Number unobtainable tone . . . . .	400	---	---	---	---	---	---	---	---	---	---

TABLE 3 — Other tones (continued)

Country		Frequency (Hz)	1 s	Scale		1000 ms								
JAPAN	Dial tone . . . . .	$\begin{cases} 400 \\ 400^l \\ 400^m \end{cases}$												
	Call waiting tone . .	$\begin{cases} 400 \times 16^n \\ 400^o \\ A \quad B \\ 400 \times 16, \quad 400^p \end{cases}$												
	Register re-call tone .	400												
	Function acknow- ledgement tone. . . .	400 <i>q</i>												
JORDAN	Number unobtain- able tone . . . . .	400												
KUWAIT	Dial tone . . . . .	33												
	Number unobtain- able tone . . . . .	400												
LEBANON . . . . .		435												
LIBERIA	Dial tone . . . . .	425												
	Number unobtain- able tone . . . . .	425												
MALAYSIA	Number unobtainable tone . . . . .	400												
		400												
MALAWI	Number unob- tainable tone . . .	400												
MADAGASCAR	Waiting tone . . .	450												
MALTA	Number unobtain- able tone . . . . .	400												
	Pay tone . . . . .	400												
	Equipment engaged tone . . . . .	$\begin{cases} \text{Normal} \\ \text{level} \\ 400 \\ \text{Reduced} \\ \text{level} \end{cases}$												
MOROCCO	Routing tone . . .	450												
MAURITANIA	Dial tone . . . . .	425												
	Routing tone. . . . .	425												
MONTSERRAT	Dial tone . . . . .	50												
	Congestion tone . . . . .	400												
	Number unobtainable tone . . . . .	400												



TABLE 3 — Other tones (continued)

Country		Frequency (Hz)	1 s ↔	Scale				1000 ms ↔				
MOZAMBIQUE	Number unobtainable tone	400	-----									
NIGERIA	Dial tone	400/450	=====									
	Number unobtainable tone	450	=====									
NORWAY	Special information tone	950/1400 r/1800	-----									
	Congestion tone	425 ± 25 r	-----									
NEW CALEDONIA Routing tone		425	.....									
NEW HEBRIDES	Number unobtainable tone	400	=====									
	Dial tone	33 <sup>1</sup> / <sub>3</sub> or 50	=====									
NEW ZEALAND	Number unobtainable tone	400	.....									
	Disconnect tone	{ 900 or 400	-----									
NETHERLANDS	Special information tones	{ 150/450 or 950/1400/1800 }	-----									
	Congestion tone	425	-----									
POLAND (P.'s Rep. of)	Congestion tone	400	-----									
	Information tone	950/1400/1800	-----									
FRENCH POLYNESIA Routing tone		450	.....									
PORTUGAL Number unobtainable tone		400	-----									
QATAR Number unobtainable tone		400/450	=====									
RAS AL KHAIMAN	Dial tone	25 and 50	=====									
	Congestion tone	400	-----									
	Number unobtainable tone	400	-----									
SYRIA	Re-call tone	450	=====									
	Number unobtainable tone	450	-----									

TABLE 3 — Other tones (continued)

Country		Frequency (Hz)	1 s	Scale 1000 ms									
ROUMANIA	Number unobtainable tone	$\left\{ \begin{array}{l} 400 \times 133 \\ \text{or} \\ 450 \end{array} \right\}$											
UNITED KINGDOM	Number unobtainable tone	400											
	Pay tone . . . . .	400											
	Equipment engaged tone . .	$400 \left\{ \begin{array}{l} \text{Normal level} \\ \text{Reduced level} \end{array} \right\}$											
	Dial tone . . . . .	$\left\{ \begin{array}{l} 33\frac{1}{3} \text{ or } 50 \\ \text{or} \\ 350 + 440 \end{array} \right\}$											
S. LUCIA	Dial tone . . . . .	$\left\{ \begin{array}{l} 50 \text{ or } 25 \\ \text{or} \\ 600 + 120 \end{array} \right\}$											
	Congestion tone . . . . .	$\left\{ \begin{array}{l} 400 \\ 400 \\ 600 + 120 \end{array} \right\}$											
	Number unobtainable tone . . . . .	$\left\{ \begin{array}{l} 400 \\ 600 + 120 \end{array} \right\}$											
S. VINCENT	Dial tone . . . . .	$\left\{ \begin{array}{l} 50 \\ 25 \end{array} \right\}$											
	Congestion tone . . . . .	400											
	Number unobtainable tone . . . . .	400											
SEYCHELLES	Dial tone . . . . .	$\left\{ \begin{array}{l} 50 \\ 25 \end{array} \right\}$											
	Congestion tone . . . . .	400											
	Number unobtainable tone . . . . .	400											
SHARJAH	Dial tone . . . . .	50 and 150											
	Congestion tone . . . . .	$\left\{ \begin{array}{l} 400 \text{ and } 450 \\ 400 \end{array} \right\}$											
	Number unobtainable tone . . . . .	$\left\{ \begin{array}{l} 400 \\ 400 \text{ and } 450 \end{array} \right\}$											

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TABLE 3 — Other tones (continued)

Country	Frequency (Hz)	1 s	Scale				1000 ms				
		↔					↔				
SINGAPORE	Dial tone										
	(i) DP telephone set . . . . .	400 × 50									
	(ii) Push-Button telephone set	400									
	Number unobtainable tone .	400	—	—	—	—	—	—	—	—	—
	Congestion tone	400	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
SOUTH AFRICA (Rep. of)	Trunk offering and test desk intrusion tone .	400	-	-	-	-	-	-	-	-	-
	Number unobtainable tone .	400	—	—	—	—	—	—	—	—	—
SWEDEN	Call office pay tone	900	-	-	-	-	-	-	-	-	-
	Information tone .	425 { 950/1400/1800 r }	.....	.....	.....	.....	.....	.....	.....	.....	.....
SWITZERLAND	Congestion tone .	425	-	-	-	-	-	-	-	-	-
	Information tone . . . . .	950/1400/1800	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
SURINAM	Information tone .	450/150	-	-	-	-	-	-	-	-	-
	Dial tone . . . . .	{ 600 × 120 150 }	—	—	—	—	—	—	—	—	—
THAILAND	Number unobtainable tone	400	.....	.....	.....	.....	.....	.....	.....	.....	.....
TURKS AND CAICOS ISLANDS	Dial tone .	{ 350 + 440 25 }	—	—	—	—	—	—	—	—	—
	Congestion tone .	{ 480 + 620 400 }	-	-	-	-	-	-	-	-	-
	Number unobtainable tone .	{ 480 + 620 400 }	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
U.S.S.R.	Information tone "waiting" s . . . . .	950/1400/1800 t	—	—	—	ЖДИТЕ	—	—	—	—	—
URUGUAY	Dial tone . . . . .	450	-	-	-	-	-	-	-	-	-

TABLE 3 — Other tones (conclusion)

Country		Frequency (Hz)	1 s	Scale 1000 ms									
BRITISH VIRGIN ISLANDS	Dial tone .	50 or 25											
	Congestion tone . . .	400											
	Number unobtainable tone .	400											
YUGOSLAVIA . . . . .		950/1400/1800											
ZAMBIA	Dial tone . . . . .	400 + 450											
	Number unobtainable tone/Information tone . . . . .	950/1400/1800											
	Congestion tone . .	400 + 450											

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## EXPLANATORY NOTES TO TABLE 3

In this Table :

$$f_1 \times f_2 = f_1 \text{ modulated by } f_2$$

$$f_1 + f_2 = f_1 \text{ plus } f_2$$

$$f_1 / f_2 = f_1 \text{ followed by } f_2$$

<sup>a</sup> Applied for 0.2 seconds every 15 seconds.<sup>b</sup> Every alternate pulse and attenuated by 10 dB.<sup>c</sup> New precise tone plan. Frequencies  $\pm 0.5\%$  of nominal values.<sup>d</sup> Warning — Operator intervening : 2 seconds burst followed by 0.5 second bursts every 15 seconds.<sup>e</sup> Applied for 0.5 second every 15 seconds. This time is not mandatory in some parts of Canada.<sup>f</sup> Applied for 0.3 second every 10 seconds.<sup>g</sup> Applied for 0.5 second every 15 seconds.<sup>h</sup> Exchanges installed in 1970 or earlier.<sup>i</sup> Exchanges installed later than 1970.<sup>j</sup> In principle, this tone is not retransmitted outside the French network. However, it may be retransmitted in the case of calls arriving at Paris via distant transit connections in the French network and for some nearby international relations. The French Administration is considering a device to put an end to this situation.<sup>k</sup> Alternating with a recorded announcement.<sup>l</sup> Pre-dial tone. Used in the PABX and centralized extension systems.<sup>m</sup> Second-dial tone. Used in the public telephone network for proceeding subsequent dialling. This is required for certain new services.<sup>n</sup> Sent once exclusively to the called party.<sup>o</sup> Sent to both parties in conversation following  $400 \times 16$  Hz tone.<sup>p</sup> Sent to the waiting party after original connection is transferred to the third party.<sup>q</sup> Sent after receiving the function code.<sup>r</sup> New equipment.<sup>s</sup> Alternating with the recorded announcement : "wait, please".<sup>t</sup> Duration of each frequency in the sequence :  $330 \pm 70$  ms, silence between each sequence :  $1000 \pm 250$  ms.

## Supplement No. 5

## NORTH AMERICAN PRECISE AUDIBLE TONE PLAN

Table 1 is a description of the audible tone plan in operation in the North-American network to:

- 1) achieve uniformity in the quality of audible tones;
- 2) minimize customer confusion as to meaning of audible tones;
- 3) enable machine recognition of audible tones for purposes of service observing, etc.

Basically, the plan provides four frequencies that are used, singly or in combination with particular cadences, to form the audible tone signals shown in Table 1 as well as some other special purpose, limited use signals.

TABLE 1

Tones	Frequencies <sup>a</sup> (Hz)				Power per frequency at exchange where tone is applied	Cadence
	350	440	480	620		
Dial tone	•	•			-13 dBm0	Continuous tone
Recall dial tone	•	•			-13 dBm0	3 bursts of 0.1 s followed by a continuous tone <sup>b</sup>
Busy tone			•	•	-24 dBm0	Burst 0.5 s/silence 0.5 s
Re-order tone			•	•	-24 dBm0	Burst 0.25 s/silence 0.25 s
Audible ringing tone		•	•		-19 dBm0	Burst 2 s/silence 4 s
		•	•		-16 dBm	Burst 1 s/silence 3 s <sup>c</sup>
Special audible ringing tone		•	•		-16 dBm	Burst 0.8 s } silence 3 s <sup>c, d</sup>
Call waiting tone		•			-16 dBm	Burst 0.2 s }
					-13 dBm0	A burst of 0.3 s every 10 s <sup>e</sup>
					-14 dBm	Station call waiting
					-14 dBm	2 bursts of 0.1 s <sup>b, c</sup>
					-14 dBm	Outside call waiting
					-14 dBm	3 bursts of 0.1 s <sup>b, c</sup>
Busy verification		•			-13 dBm0	Urgent call waiting
Executive override		•			-14 dBm	A 2.0 s burst followed by 0.5 s bursts every 15 s
Confirmation tone	•	•			-13 dBm0	A 3.0 s burst <sup>c</sup>
					-13 dBm0	0.1 s burst - 0.3 s burst <sup>b</sup>
Intercept tone		•		•	-14 dBm	3 bursts of 0.1 s <sup>b, c</sup>
					-14 dBm	Burst of 200 ms/silence of 200 ms alternately <sup>c</sup>

<sup>a</sup> Frequency limits are  $\pm 0.5\%$  of the nominal frequency.

<sup>b</sup> Bursts are separated by 100 ms.

<sup>c</sup> Used in PABX only.

<sup>d</sup> Tone burst consists of 0.8 s at 440+480 Hz, then 0.2 s at 440 Hz only, and indicates that the called party has been given the call waiting tone.

<sup>e</sup> Not repeated in PABX.

## Supplement No. 6

## TREATMENT OF CALLS CONSIDERED AS “TERMINATING ABNORMALLY”

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Afars and Issas	Ringing tone of low level		—	Service not provided	Ringing tone or busy tone	Ringing tone of low level	Busy tone	—
Algeria	Operator or ringing tone Recorded announcement proposed		Busy tone	Operator	Operator or busy tone or ringing tone			Busy tone
Germany (Federal Republic of)	Special information tone, alone or with a recorded announcement (use according to Recommendation E.180, 5.1, cases a) and c), Volume VI, <i>Orange Book</i> )			Operator or recorded announcement	Ringing tone or busy tone	Ringing tone (alone without any other indication) or special information tone, alone or with recorded announcement	Special information tone, alone or with a recorded announcement (use according to Recommendation E.180, 5.1, cases a) and c), Volume VI, <i>Orange Book</i> )	Busy tone
Argentina	Ringing tone		Normally operator; exceptionally, ringing tone	—	Ringing tone		Busy tone	
Australia	Operator, recorded announcement or number unobtainable tone		Operator or recorded announcement		Ringing tone, busy tone or recorded announcement	Number unobtainable tone, ringing tone or recorded announcement	Recorded announcement or number unobtainable tone	Congestion tone or recorded announcement
Austria	Operator or busy tone or special information tone, the latter if necessary also at the initiative of the operator	Busy tone or special information tone	Operator or recorded announcement or busy tone or special information tone; the latter may also be transmitted during the intervals of the announcement or if necessary on the initiative of the operator	Operator or recorded announcement or special information tone to be transmitted during the intervals of the announcement or on the initiative of the operator	Ringing tone or busy tone	Busy tone or special information tone	Busy tone	

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Bahamas	Recorded announcement	Recorded announcement or unobtainable tone	—	Operator intercepted	—	Recorded announcement or unobtainable tone		Fast busy tone
Belgium	Operator. In certain cases, ringing tone (information tone complemented by a recorded announcement is proposed)	Ringing tone. In certain cases (system 10 c), operator	Operator for individual cases ; recorded announcement in case of transfer of groups of subscribers	Operator	Ringing tone. In certain cases information tone or operator (system 10 c)	Ringing tone. In certain cases recorded announcement (system 10 c)	Information tone with or without recorded announcement	In certain cases congestion tone
Brazil	Number unobtainable tone or recorded announcement		Operator, number unobtainable tone or recorded announcement		Busy tone or ringing tone	Number unobtainable tone or recorded announcement		Busy tone
Burundi	Information tone			Operator	Ringing tone or busy tone			

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Cameroon	Ringing tone or recorded announcement			Ringing tone or operator	Ringing tone or busy tone	Recorded announcement or ringing tone		Recorded announcement or busy tone
Canada	Operator or recorded announcement*  * In many cases, the recorded announcement is followed by cut-through to an operator		New number from operator or automatic intercept system	Service usually provided by persons not in the employ of the Telephone Company	Operator, busy tone or ringing tone	Operator or recorded announcement	Operator, recorded announcement, busy tone, or re-order (congestion tone)	Re-order (congestion) tone or recorded announcement
Chile Telephone Company	Ringing tone	Ringing tone or recorded announcement	Operator or recorded announcement	Service not provided	Ringing tone or busy tone	Ringing tone	Busy tone	
Cyprus	Number unobtainable tone	Ringing tone	Operator	—	Busy tone or ringing tone	Number unobtainable tone		Busy tone
Korea (Rep. of)	Number unobtainable tone	Busy tone	Service not provided		Number unobtainable tone			Busy tone
Ivory Coast	Information tone with recorded announcement			Service not provided. Ringing tone	Information tone with recorded announcement			
Cuba	Ringing tone		Operator for individual cases; operator or recorded announcement in case of transfer of groups of subscribers	Service not provided	Ringing tone or busy tone	Ringing tone	Number unobtainable tone or congestion tone	Busy tone



Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Denmark	Information tone or ringing tone, or operator or recorded announcement			Operator or recorded announcement	Ringing tone	Information tone or ringing tone	Information tone	Busy tone
El Salvador	Busy tone	Ringing tone		Operator or ringing tone	Short circuit : busy tone. Interrupted line : ringing tone. Blocked line : busy tone	Ringing tone	Busy tone	
Spain	Special tone		Operator or recorded announcement	Operator or recorded announcement		Ringing tone	Special tone	
United States	Operator or recorded announcement  * In many cases, the recorded announcement is followed by cut-through to an operator.		New number from operator or automatic intercept system	Service usually provided by persons not in the employ of the Telephone Company	Operator, busy tone or ringing tone	Operator or recorded announcement	Operator, recorded announcement, busy or re-order (congestion) tone	Re-order (congestion) tone or recorded announcement
East African P. & T. Corp. (Kenya, Uganda and Tanzania)	Number unobtainable tone		Operator		Number unobtainable tone			Busy tone
Fiji	Operator or number unobtainable tone	Number unobtainable tone	Operator or number unobtainable tone	Service not provided	Number unobtainable tone. Continuous, busy or ringing tone	Ringing tone	Number unobtainable tone	Busy tone

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Finland	Ringing tone or operator or recorded announcement	Ringing tone or busy tone or recorded announcement	Operator or recorded announcement or ringing tone	Operator or recorded announcement	Ringing tone or busy tone	Ringing tone or busy tone	Busy tone or information tone	Busy tone. In certain cases no tone
France	Operator or recorded announcement			Operator	Operator or recorded announcement or busy tone or ringing tone	Operator or recorded announcement or busy tone or ringing tone		Busy tone or recorded announcement
Ghana	Number unobtainable tone		Ringing tone and operator	Number unobtainable tone	Ringing tone or busy tone	Number unobtainable tone		Busy tone
Guinea	Ringing tone			Operator	Busy tone or ringing tone	Number unobtainable tone		—
Hungary (People's Rep. of)	Operator or ringing tone		Ringing tone or recorded announcement	Operator	Busy tone or ringing tone	Ringing tone	Information tone (Recommendation E.180)	Busy tone
India	Number unobtainable tone		Operator or recorded announcement or number unobtainable tone	Service not provided	Number unobtainable tone			Busy tone
Ireland	Number unobtainable tone		Operator	Service not provided		Number unobtainable tone		Busy tone

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Israel		Information tone with a recorded announcement			Busy tone or ringing tone	Information tone with a recorded announcement	Busy tone	Busy tone alone or with a recorded announcement
Italy	Busy tone or ringing tone		Operator or recorded announcement	Operator or recorded announcement	Busy tone or ringing tone	Ringing tone	Busy tone	
Jamaica	Number unobtainable tone		Operator or recorded announcement	—	Number unobtainable tone or busy tone	Number unobtainable tone		Equipment engaged tone
Japan	Recorded announcement or operator			Recorded announcement or ringing tone	Recorded announcement or busy tone or ringing tone	Recorded announcement or operator	Recorded announcement	Busy tone or recorded announcement
Lebanon	Ringing tone (recorded announcement proposed)			Operator	Ringing tone (recorded announcement proposed)	Ringing tone	Special tone	Busy tone
Liberia	Ringing tone			Service not provided	Busy tone or ringing tone	Ringing tone	Number unobtainable tone	Busy tone
Madagascar	Ringing tone			Operator	Ringing tone		Busy tone	

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Malta	Operator or number unobtainable tone	Number unobtainable tone	Operator	Call answered by an operator or a private answering service or a call transferred to another subscriber	Number unobtainable tone			Busy tone
Morocco	Ringing tone or recorded announcement			Operator	Busy tone or ringing tone	Ringing tone or recorded announcement	Busy tone	
Mauritania	Ringing tone or operator			Operator	Ringing tone or busy tone	Ringing tone	Busy tone	
Mozambique	Ringing tone	Busy tone	Service not provided		Busy tone or ringing tone	Ringing tone	Busy tone	
Norway	Operator or recorded announcement or special information tone or busy tone or ringing tone			Operator or recorded announcement or special information tone or busy tone	Ringing tone or busy tone	Ringing tone or busy tone or special information tone	Special information tone or busy tone	Congestion tone or busy tone
New Caledonia	Operator or recorded announcement			Operator	Operator or recorded announcement or busy tone or ringing tone			Busy tone or recorded announcement
New Zealand	Number unobtainable tone or ringing tone	Number unobtainable tone	Operator or recorded announcement	Service not provided	Busy tone or ringing tone	Number unobtainable tone or ringing tone	Number unobtainable tone	Disconnect or recorded announcement

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Netherlands	Information tone or recorded announcement	Information tone	Information tone or recorded announcement	Service not provided	Information tone or ringing tone		Information tone or busy tone or recorded announcement	Busy tone or congestion tone
Poland (People's Rep. of)	Ringing tone						Special tone or busy tone	
Polynesia	Operator				Ringing tone or busy tone according to the fault	Ringing tone	Busy tone	
Portugal	Busy tone or number unobtainable tone	Busy tone or number unobtainable tone	Operator or busy tone for individual cases; recorded announcement in case of groups of subscribers	Service not provided	Ringing tone or busy tone	Busy tone or number unobtainable tone	Operator or busy tone or number unobtainable tone	Busy tone
Qatar	Number unobtainable tone		Operator		Number unobtainable tone			Busy tone
Roumania	"Spare line tone" or operator			Service not provided	Busy tone or ringing tone	"Spare line tone"		Busy tone
United Kingdom	Number unobtainable tone		Operator or recorded announcement	Call answered by an operator or a private answering service or a call transferred to another subscriber	Number unobtainable tone or busy tone	Number unobtainable tone		Equipment engaged tone or recorded announcement

Country of destination	Line out of service	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Singapore	Number unobtainable tone		Operator or recorded announcement		Ring tone or busy tone	Number unobtainable tone		Busy tone or congestion tone
South Africa (Rep. of)	Number unobtainable tone		Operator or recorded announcement		Ring tone or busy tone	Number unobtainable tone		Busy tone
Sweden	Operator or information tone				Ring tone or busy tone or no tone	Operator or information tone or no tone		Congestion tone or no tone
Switzerland	Operator or recorded announcement			Operator	Ring tone		Busy tone	
Surinam	Service not provided				Busy tone or ring tone	Ring tone or information tone	Recorded announcement or busy tone	Busy tone
Syria	Ring tone. Operator (proposed)	Number unobtainable tone	Operator or ring tone or recorded announcement	Ring tone. Operator (proposed)	Ring tone		"Barred level" tone	Busy tone
U.S.S.R.	Ring tone – recorded announcement proposed		Operator or recorded announcement proposed	Recorded announcement proposed	Busy tone if the line is short circuited. Ring tone in case of open circuit	Ring tone	Recorded announcement proposed	Busy tone

Country of destination	Ceased line	Line out of service	Changed number	Line connected to absent subscribers service	Faulty line	Spare numbers (no subscriber)	Spare level or spare code	Congestion in the inland automatic system
Uruguay	Ringing tone			Operator	Ringing tone or busy tone	Ringing tone	Busy tone	
Yugoslavia	Ringing tone; exceptionally special information tone		Normally ringing tone; exceptionally, operator or recorded announcement		Ringing tone or busy tone	Ringing tone; exceptionally special information tone	Busy tone or special information tone	Busy tone
Zambia	Operator			Service not provided	Recorded announcement or operator	Number unobtainable tone		Congestion tone

## Supplement No. 7

## INFORMATION ON TRAFFIC ROUTING IN THE INTERNATIONAL NETWORK

(Results from study in 1973-1976 of Question 11/XIII  
concerning actual connections of international telephone calls)

The basis for the data used in this study relates to paid international calls, each of which represents a subscriber-to-subscriber connection with some number of national and international circuits. It does not necessarily reflect 100% of the international traffic for any given country. In order to arrive at a distribution of the number of circuits encountered between the originating and terminating local exchanges in the international connection, the overall connection is divided into three major segments as follows:

- a) the originating national network (national extension);
- b) the international circuit configuration;
- c) the terminating national network (national extension).

The connection model for world telephone traffic may then be constructed by combining the data representing each segment.

In order to simplify combining the data for the connection model the following stipulations were requested:

- 1) In all cases, except those involving dissimilar originating and terminating national network configurations or dissimilar originating and terminating traffic volumes, outgoing international traffic only should be reported for the study. In those cases where significant differences do exist in numbers of circuits encountered or in traffic volumes, it would be valuable to provide the desired information for both outgoing and incoming traffic. If the information is unavailable, we must assume that incoming traffic duplicates outgoing traffic. In cases where such information is not available or cannot be estimated, outgoing traffic data would still be greatly appreciated.
- 2) The originating national network will be considered that portion of the overall connection between the originating local exchange and the international originating centre for the traffic under study.
- 3) The international configuration will consist of that portion of the overall connection between the international originating centre and the international destination centre for the traffic under study.
- 4) The terminating national network will consist of that portion of the overall connection between the international destination centre and the terminating local exchange for the traffic under study.

In order to provide the most reliable results; consideration must be given to all possible combinations of circuits through the national network. Once the spectrum of combinations is developed, a study of traffic patterns can provide the distribution of connections as a function of the number of circuits switched in tandem for various categories of distance.

For national networks of limited complexity, the assembly of data may be accomplished on a manual basis. However, networks of more complex configuration will no doubt require modelling of the network with computer-assisted call simulation.

The data contained in this Supplement represent data from twenty countries totalling more than 270 million estimated calls for 1973. The data are presented in the same format as used for collecting it from the individual participating countries.



## Outgoing international traffic

Number of circuits encountered in tandem between the originating local exchange and the international originating centre

The period of study to which data applies ..... 1972-1973

Estimated paid outgoing calls for 1973 ..... 274 056 546

Data derived by :

— manual techniques ..... 17  
 — computer modeling ..... 3

Crowflight distance from the local exchange to the international originating centre	Percent of total outgoing international traffic <sup>a</sup>	Percentage of total outgoing traffic in each distance category with the following numbers of circuits switched in tandem <sup>a</sup>						
		1	2	3	4	5	6	7
0-50 km	60.5	50.7	36.9	10.1	2.2			
50-1200 km	38.2	7.9	42.4	35.3	11.8	2.7		
Greater than 1200 km	1.2	9.0	34.3	43.5	11.9	1.0	0.4	

<sup>a</sup> If this distribution is significantly different for the various categories of distance in this table, please report as many different distributions as needed.

Note. — The international originating centre is the first CT in the originating (routing) chain of the traffic under study.

## Outgoing international traffic

Number of circuits encountered in tandem between the international originating centre and the international destination centre

The period of study to which data applies ..... 1972-1973

Estimated paid outgoing calls for 1973 ..... 249 678 660

Data derived by :

— manual techniques ..... 17  
 — computer modeling ..... 3

Crowflight distance from the international originating centre to the international destination centre	Percent of outgoing international traffic	Percentage of total outgoing traffic in each distance category with the following numbers of circuits switched in tandem						
		1	2	3	4	5	6	7
0-2500 km	88.4	96.2	3.8					
2500-5000 km	1.7	74.6	20.3	4.3	0.7			
5000-10 000 km	8.8	90.5	7.0	2.2	0.2			
Greater than 10 000 km	1.0	76.4	21.5	2.0	0.1			

## Notes

1. The international originating centre is the first CT in the originating (routing) chain of the traffic under study.
2. The international destination centre is the last CT in the terminating (routing) chain of the traffic under study.

## Incoming international traffic

Number of circuits encountered in tandem between the international destination centre and the terminating local exchange

The period of study to which data applies ..... 1972-1973

Estimated paid incoming calls 1973 ..... 273 687 562

Data derived by :

– manual techniques ..... 17  
 – computer modeling ..... 3

Crowflight distance from the international destination centre to the local exchange	Percent of total incoming international traffic <sup>a</sup>	Percentage of total incoming traffic in each distance category with the following numbers of circuits switched in tandem <sup>a</sup>						
		1	2	3	4	5	6	7
0-50 km	59.3	47.8	39.7	10.2	2.3			
50-1200 km	39.5	11.4	39.7	34.8	11.5	2.6		
Greater than 1200 km	1.3	9.0	25.0	52.1	13.2	0.9		

<sup>a</sup> If this distribution is significantly different for the various categories of distance in this table, please report as many different distributions as needed to reflect such differences, if possible.

Note. – The international destination centre is the last CT in the terminating (routing) chain of the traffic under study.

## ORIGINATING LOCAL EXCHANGE TO INTERNATIONAL ORIGINATING CENTRE

<i>Circuits</i>	<i>Total Calls</i>
1	92 760 029
2	106 699 819
3	55 316 945
4	16 452 479
5	2 812 025
6	13 863
7	1 386
<b>TOTAL</b>	<b>274 056 546</b>

## INTERNATIONAL ORIGINATING CENTRE TO INTERNATIONAL DESTINATION CENTRE

<i>Circuits</i>	<i>Total Calls</i>
1	237 557 834
2	11 296 777
3	736 381
4	87 285
5	163
6	220
<b>TOTAL</b>	<b>249 678 660</b>

INTERNATIONAL DESTINATION CENTRE TO TERMINATING LOCAL EXCHANGE

<i>Circuits</i>	<i>Total Calls</i>
1	90 173 139
2	108 174 133
3	55 919 175
4	16 631 337
5	2 789 778
<b>TOTAL</b>	<b>273 687 562</b>

The final combining of data has been done in such a manner as to show the probability of various numbers (N) of circuits in series which would be encountered in an international connection.

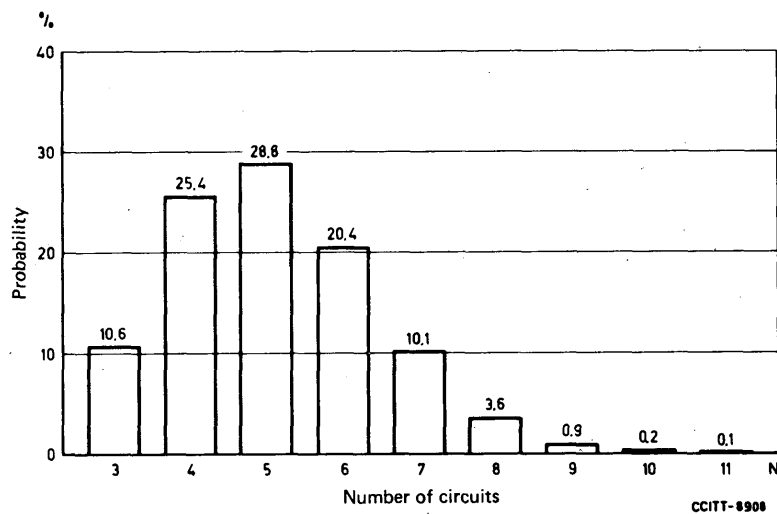


FIGURE 1 – Percent probability of N circuits in an international connection

From the histogram it may be observed that five (international or national) circuits occur most frequently in the international connection. Examination of the five circuit distribution shows that a connection made up of two national originating, one international and two national terminating circuits account for 50.9% of all connections with five circuits. Of such remaining five circuit connections 22.9% are made up of one national originating, one international and three national terminating circuits and 22.0% are made up of three national originating, one international and one national terminating circuits. It should be noted that connections with six, seven, eight, and even nine circuits are not too uncommon.

Supplement No. 8

USE OF COMPUTERS FOR NETWORK PLANNING AND CIRCUIT GROUP DIMENSIONING

In view of the almost universal interest in computers and their potential benefits, Study Group XIII has investigated the use of computers for network planning and circuit group dimensioning in the international network.

The general philosophy of the development of computer applications has evolved noticeably over recent years. Early optimism that computers offered a fast, flexible and cheap means of undertaking the initial design and implementation of an automated system, as well as subsequent modification to achieve system

enhancement, has given way to more cautious realism in the light of experience. Large integrated systems have been found to be more complex than expected, to require very substantial resources and elapsed time for their development and, once implemented, to be more inflexible and costly to modify. This latter consideration is in part due to the substantial amount of system testing which must be undertaken after even simple modifications have been carried out.

Current practice in the development of computer projects leans towards reasonably small projects which can be designed and implemented in a relatively short period, say, two years or less. This approach has the advantages of:

- ease of project management,
- early return for effort and cost expended,
- evolution of computer applications in relatively small and manageable steps.

#### *Tasks and activities suited to computer applications*

In general, the tasks suited for computer application are:

- a) complex and time-consuming calculations including, for example, iterations;
- b) simple repetitive operations on large volumes of data;
- c) storage and retrieval of data.

The following is a representative selection of the many fields of activity related to network planning which are suitable for application of computers; the list is not exhaustive, but indicative of the versatility and value of the modern computer.

- i) *Traffic measurement*; assembly and summarization of traffic data. — Recommendations E.500 and E.501 deal with these subjects from a quite general point of view. Much of the processing and summarizing work involved can be automated, thus allowing more accurate and comprehensive data to be obtained for planning purposes.
- ii) *Traffic forecasting*. — Recommendation E.502 deals with this subject in a general way. Various forecasting methods could be adapted for computer application with potentially great benefits, and many Administrations have developed suitable programmes.
- iii) *Dimensioning methods*. — Recommendation E.510, E.520, E.521 and E.522 give dimensioning methods suitable for manual processing. The theoretical results on which these practices are based lend themselves not only to manual methods but also to computer programming. Computer methods for circuit group dimensioning need not, of course, simply automate the current manual procedure; more accurate and sophisticated methods could be used.
- iv) *Basic theoretical studies*. — Studies include the study of the use of one-way and both-way circuits and the economic feasibility of alternative trunking or switching arrangements.
- v) *Network modelling and optimization*. — In this area, both general long-term studies and more specific short-term studies are undertaken.
- vi) *Network analysis and synthesis*. — These have many aspects including routing studies and studies of the dynamic or evolutionary nature of the network.
- vii) *Data storage*. — Various media for mass storage of data are available for use in association with computers; these permit the development of applications for the storage, retrieval, manipulation, summarizing, formatting and printout of information as best suits the particular activity being supported by the application.

### *Conclusion*

The general circumstances in which the international network is planned and extended are such that overall planning and network optimizations are not feasible at the present time. Telecommunication projects are planned, funded and implemented as a result of bilateral and multilateral studies and negotiations. The CCITT has an informative part in these processes through the Plan Committees which gather, reconcile, collate and disseminate information about the present state and likely future development of the network. Thus, whilst it might appear reasonable to make a wider use of computers to assist in planning the international network, in practice opportunities to do so are essentially limited by the constraining effects of the political and economic factors involved in negotiations between Administrations. In this respect it is important to make a clear distinction between theoretical studies for analysing and optimizing a network, and the pragmatic tasks of implementing and funding international telecommunication projects.

For those international relations where only point-to-point traffic is considered, the basic need is to convert the forecast traffics into circuit quantities which are mutually acceptable to the Administrations concerned. Under these circumstances, the assistance which computers can give to network planning activities appear to be limited to storing data, projecting traffic forecasts, and simple dimensioning.

Use has been made of computer assistance in the African pre-investment survey spanning fourteen countries and in the survey of twenty-six Mediterranean and Middle-East countries. These represent circumstances in which the use of a computer for planning studies involving many countries is feasible and indeed vital.

### **Supplement No. 9**

#### **AN EXPERIMENTAL TEST DESIGN FOR THE DETERMINATION OF INEXPERIENCED USER DIFFICULTIES IN SETTING UP INTERNATIONAL CALLS USING NATIONALLY AVAILABLE INSTRUCTIONS**

##### **1. *Object***

The object of the test is:

- to obtain information on inexperienced user difficulties, and
- to test the efficacy of different forms of instruction available for use in any country by observing, in a controlled laboratory environment, ordinary telephone users dialling live international calls. In this document dialling refers to both dial and push-button telephones, either of which may be used.

The tests will yield information on certain sources of difficulty:

- a) prior to dialling, i.e. in finding out the number and knowing how to make the call;
- b) during setting-up of the call, i.e. in dialling the number and dealing with the responses from the system.

##### **2. *Selection of subjects***

Subjects should preferably have no prior experience of international dialling. If this proves impossible, then people with limited experience should be used.

It is considered that a minimum of 32 subjects will be required to provide sufficient reliable information.

### 3. *Experimental procedure*

- a) The subject is seated at a desk on which the telephone is placed together with the telephone directories and other instructional information normally available to the subject in his own home.
- b) The experimenter asks the subject the questions contained in a pre-dialling questionnaire.

The object of this questionnaire is to ascertain the extent of the subject's experience and his knowledge of international dialling procedures.

- c) The subject is then given the written instructions for the experiment.

In these instructions it is specifically pointed out that:

- *It is essential that this task be performed exactly as it would be done at home.*
- The numbers the subject is asked to dial are connected to answering machines (such as the speaking clock) in the country he is calling.
- He will not be able to call an operator for assistance.

- d) When the subject is ready to begin, the experimenter presents the first number card and asks the subject to dial this number. On each number card the country name followed by a telephone number is written. The telephone number should be presented in the way recommended by the instructions of the country concerned.

- e) When the subject gets through to the correct number, the experimenter requests him to dial the next number.

If the subject makes the same error on two consecutive call attempts, he is prompted indirectly. The object of the prompt should be to make the subject go back to the instructions, not to tell him what to do.

If the subject has dialled correctly but has met with system congestion conditions, he is advised to continue with the next card number. After attempts have been made to obtain all the numbers, those meeting congestion should be tried again in rotation. If, after four correctly dialled attempts, a particular number cannot be reached due to congestion, the effort to reach that number should be abandoned;

- f) Having completed the task the experimenter asks the questions in a post-dialling questionnaire. The object of this questionnaire is to find out whether the subject's opinion on dialling of international calls has changed and what difficulties he encountered.

### 4. *Experimental design*

Subjects are asked to call eight numbers, one in each of eight countries. The order of presentation of the eight numbers should be varied between subjects according to a Latin square design. The total number of subjects will then be a multiple of eight; 32 is suggested as a minimum.

As far as possible experimenters should avoid periods of congestion when running their experiments.

*Note.* — A complete description of the experiment can be found in CCITT Contribution COM II-No. 93 of Study Period 1973-1976.

### 5. *Measurements and observations*

#### 5.1 *General*

A structured interview approach will be used, with the experimenter first logging subject performance on each call attempt and then, on the unsuccessful calls, interviewing the subject on the outcome.

### *Equipment*

The experimenter should have a means of checking digits as they are dialled. A digit display is suggested but other methods, e.g. data logger or pen recorder, may be used. Direct observation by the experimenter of the digits dialled is an exacting task, particularly if a push button telephone is used, and should be avoided.

The experimenter should have a parallel speech connection to the telephone line so that he may:

- a) monitor line conditions e.g. tones and announcements;
- b) intervene on the call where necessary.

A permanent record of the experiment should be kept. This may include tape recordings of:

- a) conversations between the subject and the experimenter, and
- b) telephone line conditions and system responses.

Timing information may be extracted from the latter recording, for example, by using a stop watch, but Administrations may wish to use a data logger or a computer to give a more comprehensive time/event history and hence more precise results.

## 6. *Publication of results*

Administrations which participate in this experiment are asked to make their results available, through the CCITT Secretariat, to the rapporteur entrusted with the study of the Question so that he may coordinate the results prior to publication as Study Group II contribution. The rapporteur will ensure the confidentiality of the information received as far as called countries are concerned by publishing only pooled information, unless he has obtained specific authority from relevant Administrations on particular aspects of their results.

Administrations wishing to conduct their experiment should contact the rapporteur to obtain details of the most recent experimental design and the telephone numbers that can be used.

## 7. *First results obtained in 1976*

Tests with this experimental design have been completed in four countries<sup>1)</sup>. The test has reliably isolated the major points of customer difficulty in dialling international numbers by artificially exaggerating their effects to some extent through the use of inexperienced subjects. Even with this exaggeration there remains at the end of a concentrated learning period enough evidence to regard the points of difficulty as sufficiently well established to seek ways of alleviating them. These findings are supported, even in detailed aspects, by the subjects' responses to the questionnaire given after the tests.

Of some 20 forms of difficulty, the most frequent error made on about 10% of call attempts was the failure to omit the national prefix. Less frequent but equally harmful aspects include omission of international prefix (about 1%), country code (1 to 2%) and trunk code (0.4 to 4.5%) together with several variants of these.

Other significant types of error include premature abandonment of calls for various reasons. One of these may be an embarrassment arising from the national use of second dial tones, i.e. when a subject "abandons" expecting dial tone during the setting-up of the international call, in other words when his expectancy is upset by departures from the procedures he normally follows in setting-up calls.

<sup>1)</sup> More detailed results may be found in Contribution COM II-No. 94 of study period 1973-1977.

Consideration of all the forms of error leads to the conclusion that upwards of 90% of error would be reduced, at least to some extent, by carefully worded forms of instruction.

Subject views on the ease of dialling international calls were suprising. Before the test, about 83% thought it would be easy or very easy. After the test, this percentage was increased to about 86% although appreciable difficulty was experienced in the test. This disparity between subjective opinion and actual performance needs to be investigated further.

It could also be concluded that the sensitivity of the test method is such that it could be used to test the efficacy of different forms of instruction proposed for use in any one country.

## Supplement No. 10

### LIST OF POSSIBLE SUPPLEMENTARY TELEPHONE SERVICES

This list of supplementary telephone services was prepared by the European Conference of Postal and Telecommunications Administrations (CEPT) and was presented to the CCITT to facilitate its study of such services. Since the studies in CEPT are continuing, this information presents the position at the beginning of 1976 and may change subsequently.

This Supplement includes an alphabetical index and a list of titles and definitions by category of service. The services indicated thus \* in the index quote tentative definitions under consideration by CEPT.

### ALPHABETICAL INDEX OF THE LIST OF SUPPLEMENTARY SERVICES

#### *Title of Service*

#### *Grouping Number*

#### A

Abbreviated dialling	1.1
Absent-subscriber service	4.1
Add-on conference	12.3.4
Administration selected service restriction in the outgoing direction	3.1.2
Alarm call service	2.1
Automatic booked call	2.2
Automatic credit card service	7.7
* Automatic personal call	6.10
* Automatic transferred charge call	7.9
Automatic transferred debiting of call charges	7.4
Automatic verbal announcement on charging data of calls	7.2



**B**

Babyphone	16.9
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**C**

Call barring	3.1
Call waiting	6.5
Call transfer on "busy"	6.3
Call transfer on "ringing tone, no reply"	4.4
Called-line free indication	6.7
Calling number indication	16.6
Centrex service	16.3
Coin box telephone service	7.8
Completion of calls to busy operators in public exchanges	6.2
Completion of calls to busy subscribers	6.1
Conference call	12.3
Customer recorded information service	8.3

**D**

Data transmission service	9.1
* Diary service	2.3
Direct dialling-in	13.1
Directory inquiries service	8.1

**E**

Emergency call service	10.1
Expediting of a call in progress	6.8

**F**

Facsimile	14.1
Forced backward clearing of subscriber's line	16.4
Freefone service	7.5

**G**

General telecommunications information service	8.2
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**H**

Hot-line service	1.2
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**I**

Incoming call barring	3.1.3
Interception of calls	15.1

**J****K****L**

Lecture call	12.4
Logging of incoming calls	4.5

**M**

Malicious call trace	16.2
Meet-me conference	12.3.5
* Message relay	16.11
Mobile telephone	11.1

**N****O**

Operator-controlled conference call	12.3.1
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**P**

PBX-line hunting	6.9, 13.2
Permanent subscriber's number	15.2
Pick-up facility	11.2
Printed record on duration and charge of call	7.3
Priority	6.6
Public recorded information service	8.4
Push-button data transmission	9.2

**Q****R**

Radio paging service	11.3
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**S**

* Selective accounting	7.10
Simple computing service	9.3
Subscriber-controlled booked conference call	12.3.2
Subscriber-controlled occasional conference call	12.3.3
Subscriber-controlled transfer of calls to an answering machine	4.2, 5.1
Subscriber selected service restriction in the outgoing direction	3.1.1
Subscribers' alpha-numerical display	16.7
Subscribers' alpha-numerical display — incoming information	16.7.2
Subscribers' alpha-numerical display — outgoing information	16.7.1
Subscribers' alpha-numerical display — outgoing and incoming information	16.7.3
Subscribers' meter showing call charge	7.1
Switching-in not permitted	16.5

**T**

Tele-alarm service	16.10
* Telephones on transport systems	11.4
Three party service	12.1
Transfer of a call in progress	12.2
Transfer of calls to another number	4.3
Transmission of a verbal message	16.1

**U**

Universal access numbers	16.8
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**V**

Viewphone	14.2
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**W**

Wait on "busy"	6.4
Wide area telephone service	7.6

## LIST OF TITLES AND DEFINITIONS IN GROUPING ORDER

1. *Rapid call set-up services*

- 1.1 *Title:* Abbreviated dialling  
*Definition:* A subscriber can dial a short code which is converted in the originating exchange into a form which will establish connection with the local, national or international number required.
- 1.2 *Title:* Hot-line service  
*Definition:* A connection between two (telephone) stations established for the purpose of telephone, telegraph, data transmission or facsimile via the public (telephone) switched network permitting interconnection with minimal delay upon detection of the calling condition from the originating terminal.

2. *Call booking services*

- 2.1 *Title:* Alarm-call service  
*Definition:* An operator or automatic device calls a given telephone number, at a time specified in advance by the subscriber, and makes an appropriate announcement.
- 2.2 *Title:* Automatic booked call  
*Definition:* With prior indication from a subscriber, a call may be made automatically from his telephone termination to a particular telephone number or service (excluding the alarm-call service) at a specific date and time.
- 2.3 *Title:* Diary service  
*Brief description:* With prior indication from a subscriber, a call is made automatically to his telephone number at a specific date and time and, when an answer condition is detected, a recorded message is connected to his telephone termination to remind him of a particular event, e.g. the birthday of a relative.
- Two versions of the service are envisaged:
- a) The recorded message is dictated to the recording equipment by the subscriber in each individual case.
- b) The recorded message is selected from a variety of pre-stored messages.

3. *Call restriction services*

- 3.1 *Title:* Call barring  
*Definition:* The ability to prevent all or certain calls to/from a telephone line.
- 3.1.1 *Title:* Subscriber selected service restriction in the outgoing direction  
*Definition:* The possibility for a subscriber to prevent all or certain types of outgoing calls and/or service control operations from his telephone line. The subscriber can select one of a number of types prescribed by the Administration when he applies the restriction.
- 3.1.2 *Title:* Administration selected service restriction in the outgoing direction  
*Definition:* The possibility for the Administration to prevent all or certain types of outgoing calls and/or service control operations from his telephone line.

- 3.1.3 *Title:* Incoming call barring
- Definition:* The ability of the Administration or the subscriber to prevent all or certain incoming calls to a telephone line.
4. *Absent subscriber services*
- 4.1 *Title:* Absent-subscriber service
- Definition:* At a subscriber's request, calls made to his number during a specified period can be intercepted at the exchange and transferred to:
- a) absent-subscriber service operators, or
  - b) an answering machine at the exchange, giving appropriate information to the caller and alternately periods of special information tone, or
  - c) the special information tone.
- 4.2 *Title:* Subscriber-controlled transfer of calls to an answering machine
- Definition:* A call to a subscriber's number is automatically transferred to an answering machine in the public exchange, when the subscriber has requested the service by dialling a special code.
- 4.3 *Title:* Transfer of calls to another number
- Definition:* Calls to a subscriber's number, during a certain period, are automatically transferred to another number (restrictions due to transmission conditions may exist).
- 4.4 *Title:* Call transfer on "ringing tone, no reply"
- Definition:* A call to a subscriber's number is automatically transferred to another number, or one of several numbers, on encountering "ringing tone, no reply".
- 4.5 *Title:* Logging of incoming calls
- Definition:* The restriction of details of all incoming calls to a particular telephone line (e.g. caller's number, time ringing commences, time of answer or time of abandonment, time of release but excluding the recording of speech).
5. *Do not disturb services*
- 5.1 *Title:* Subscriber-controlled transfer of calls to an answering machine
- Definition:* See Service No. 4.2.
6. *Call completion services*
- 6.1 *Title:* Completion of calls to busy subscribers
- Definition:* A call to a busy number may be completed when both called number and caller are free and without the caller generating a second call or waiting on the line.
- 6.2 *Title:* Completion of calls to busy operators in public exchanges
- Definition:* A call to the operator which encounters the busy condition may be completed when both the caller and an operator are free and without the caller generating a second call or waiting on the line.

- 6.3 *Title:* Call transfer on "busy"  
*Definition:* A call to a subscriber's number is automatically transferred to one or more predetermined alternative numbers at the home exchange or any other exchange when the called number is engaged.
- 6.4 *Title:* Wait on "busy"  
*Definition:* A subscriber making a call to a busy number holds the call and is connected when the number is free.
- 6.5 *Title:* Call waiting  
*Definition:* A subscriber A whose termination is in the active state associated with a call to subscriber B is given a call waiting indication (CWI) that a caller subscriber C, is attempting to obtain connection. He may either:
- a) ignore or reject the indication and continue with the existing call, or
  - b) terminate the existing call and answer subscriber C, or
  - c) hold the existing call and answer subscriber C, thus the three party service functions (see 12.1) are available to the to the extent that they are provided in the system.
- Note.* — A version of this service which permits the caller to impose the CWI on any called line may also be considered.
- 6.6 *Title:* Priority  
*Definition:* In telephone exchanges provision is made to give preferential treatment to certain calls in the order of path or circuit selection.
- 6.7 *Title:* Called-line free indication  
*Definition:* At fixed intervals the exchange automatically checks whether a telephone number the service user has dialled before but found busy is still busy. As soon as the number is found free an indication is given to the service user, who then would have to repeat his call attempt.
- 6.8 *Title:* Expediting of a call in progress  
*Definition:* Intervention by an operator, interrupting a call in progress, in order to allow another incoming call to be offered.
- 6.9 *Title:* PBX line hunting  
*Definition:* The automatic selection of a free line from a group of subscriber lines, on receipt of a call to the subscribers' telephone number(s). The subscriber may have the ability to inhibit this automatic selection under certain conditions.
- 6.10 *Title:* Automatic personal call  
*Brief description:* With prior indication from a subscriber an operator may be associated with an automatically dialled call at the appropriate stage to determine if the wanted person is available.

## 7. *Call charge services*

### a) *Charging information-services*

- 7.1 *Title:* Subscribers' meters showing call charge  
*Definition:* Meters at the subscribers' premises showing call charge units debited.
- 7.2 *Title:* Automatic verbal announcement on charging data of calls  
*Definition:* This service gives to the caller an automatic verbal announcement on charging data concerning outgoing calls or special services and facilities.

- 7.3 **Title:** Printed record on duration and charge of call
- Definition:** This service gives to the calling subscriber, after having applied a given activating procedure, a printed record of charging data for outgoing calls or for the use of special services and facilities.
- b) *Charging debiting services*
- 7.4 **Title:** Automatic transferred debiting of call charges
- Definition:** The automatic debiting to a subscriber's account of charges for calls made from any telephone by persons nominated by that subscriber and identified by the use of a secret code.
- 7.5 **Title:** Freefone service
- Definition:** A subscriber can be allocated a special (Freefone) number and the charge for all calls to this number are paid by him instead of by the callers.
- 7.6 **Title:** Wide area telephone service
- Definition:** For a flat-rate charge a subscriber may make an unlimited number of calls within a prescribed area from a particular telephone termination without the registration of call charges.
- 7.7 **Title:** Automatic credit card service
- Definition:** Payment of call charges is made by placing a credit card in a specially adapted telephone.
- 7.8 **Title:** Coin box telephone service
- Definition:** A service offered by means of a special equipment permitting outgoing telephone calls after insertion of adequate coin(s) or token(s) and, without payment, incoming calls.
- 7.9 **Title:** Automatic transferred charge call
- Brief description:** With prior indication and mutual agreement between the two parties, the automatic debiting to a called subscriber's account of relevant charges for a call made to his telephone number.
- 7.10 **Title:** Selective accounting
- Brief description:** A number of separate telephone accounts are associated with an exchange termination and the account to which charges for a particular call are to be debited is identified when making the call.

## 8. *Information services*

- 8.1 **Title:** Directory enquiries service
- Definition:** Callers can be informed of subscribers' telephone numbers and, possibly, also of their names and addresses.
- 8.2 **Title:** General telecommunications information services
- Definition:** A service given by operators using the most common languages, explaining the telecommunication services and facilities in a country (e.g. international call prefix, trunk codes, call numbers to various special telecommunications services, call charges).
- 8.3 **Title:** Customer recorded information service
- Definition:** This service gives to the customers the possibility of distributing information transmitted from recording equipment to calling subscribers.

- 8.4 *Title:* Public recorded information service
- Definition:* Recorded information of public interest provided by the telecommunications Administrations, possibly in cooperation with appropriate public or private institutions, is given to subscribers calling the respective service numbers.
9. *Data services*
- 9.1 *Title:* Data transmission service
- Definition:* The transmission of data between two terminals via the public (telephone) network.
- 9.2 *Title:* Push button data transmission
- Definition:* The transmission of data by means of a keyphone to another terminal via the public telephone network.
- 9.3 *Title:* Simple computing service
- Definition:* This service provides for simple arithmetic computations for subscribers by the use of telephone sets and of programme capacity in computerized exchanges.
10. *Emergency call services*
- 10.1 *Title:* Emergency call service
- Definition:* A caller is given a fast and easy means of giving information about an emergency situation to the appropriate emergency organization (e.g. fire brigade, police, ambulance).
11. *Mobile subscriber services*
- 11.1 *Title:* Mobile telephone
- Definition:* A public radio-telephone service which, by means of a transportable equipment, gives both-way access:
- to the public telephone network via one base station,
  - to other mobile telephone stations via one or more base stations.
- 11.2 *Title:* Pick-up facility
- Definition:* A subscriber being away from his telephone can pick up a call on his line by dialling his own number and/or possibly a special code from any other telephone, after having been informed by means of a paging system that there is such a call.
- 11.3 *Title:* Radio paging service
- Definition:* This service gives to the user the possibility of receiving personally from any telephone in a public network by radio, notice, with or without a spoken message, wherever he may be in a given area and provided he has the necessary portable equipment.
- 11.4 *Title:* Telephones on transport systems
- Brief description:* Both-way telephone access between the public telephone network and public transport vehicles such as railway trains and aircraft and available to the public.



12. *Multiparty services*12.1 *Title:* Three party service*Definition:*

A subscriber who is engaged on an established call can set up another call to a third party. The subscriber may then make use of the following options in any appropriate order:

- a)* Switch from one call to the other as required, secrecy being provided between the two calls.
- b)* Release one call and retain the other.
- c)* Introduce a common (three-way) speech path.
- d)* Transfer the original call to the enquiry termination and release.

Where the number of options available to a subscriber is limited, the following restrictive forms of the service may be provided:

Hold for enquiry; options *a)* and *b)*.

Three party connection; options *a)*, *b)* and *c)*.

Transfer of a call in progress; options *a)*, *b)* and *d)*.

12.2 *Title:* Transfer of a call in progress*Definition:*

See Service No. 12.1 — Three party service.

12.3 *Title:* Conference call*Definition:*

A conference call is a call between more than two participants.

*Note.* — This service does not include the three party connection offered as an option of the "Three party service" (12.1).

12.3.1 *Title:* Operator controlled conference call*Definition:*

A conference call set up by an operator on a customer's request.

12.3.2 *Title:* Subscriber controlled booked conference call*Definition:*

A conference call, which is established by means of an automatic device, which is programmed in advance and which can be activated at any moment by the caller.

12.3.3 *Title:* Subscriber controlled occasional conference call*Definition:*

A conference call which is established by means of an automatic device which is programmed by the caller for each occasion.

12.3.4 *Title:* Add-on conference*Definition:*

A conference call established by the caller setting up several calls one by one to different subscribers, which are successively connected to a common speech path. Further parties may be added at any time at the discretion of the caller. A called party will not be allowed to add a further party.

12.3.5 *Title:* Meet-me conference*Definition:*

A number of subscribers can, by prior arrangement, each make a telephone call at an agreed time to a common point within the telephone network; i.e. they all dial the same telephone number thereby establishing a conference call.

12.4 *Title:* Lecture call*Definition:*

A lecture call is an established connection between one caller and two or more parties, in which the speech path is used in a unidirectional way from the caller to the other connected parties. The call may be set up either by an operator or by an automatic device programmed by the caller from his own telephone.

13. *Services to PBXs provided by public exchange*13.1 *Title:* Direct dialling-in

*Definition:* Calls can be dialled from a telephone connected to the public network directly to extensions on a PABX.

13.2 *Title:* PBX line hunting

*Definition:* See Service No. 6.9.

14. *Visual services*14.1 *Title:* Facsimile

*Definition:* The black and white reproduction of a document or a picture transmitted over a telephone connection.

14.2 *Title:* Viewphone

*Definition:* This service provides for real-time picture transmission, more or less comparable in quality to television transmission, in direct combination with telephone calls.

15. *Administrative services*15.1 *Title:* Interception of calls

*Definition:* Calls which, for reasons such as those listed below, cannot reach the wanted number may be intercepted and diverted to an operator, an answering machine or a tone to give the caller appropriate information.

- a) Change of a particular number including advice of new number.
- b) Renumbering of a group of numbers or a change of dialling code.
- c) Wrong information in telephone directory.
- d) Dialling of an unallocated code.
- e) Dialling of a number or numbers allowed by the numbering plan but not yet allocated or no longer in service.
- f) Route(s) out of order.
- g) Route(s) congested.
- h) Subscriber's line temporarily out of order.
- i) Suspension of service owing to non-payment.

15.2 *Title:* Permanent subscriber number

*Definition:* The possibility of a subscriber, having moved from one location to another, to retain his telephone number.

16. *Miscellaneous*16.1 *Title:* Transmission of a verbal message

*Definition:* At the request of a caller (whether a subscriber or not), a short message is transmitted by an operator, either to one or several telephone numbers at a specified time, or to a specified person (whether a subscriber or not) when he calls the operator.

- 16.2 Title:** Malicious call trace
- Definition:** At the discretion of the Administrations, assistance is given to ascertain the origin of malicious, nuisance or obscene calls.
- 16.3 Title:** Centrex service
- Definition:** The provision to subscribers, by means of a specially equipped public telephone exchange, of services normally available only in PABXs (e.g. internal dialling of PABX type, operators' desk, direct access to the network, direct dialling-in, transfer of calls).
- 16.4 Title:** Forced backward clearing of subscriber's line.
- Definition:** A subscriber engaged on an incoming call can clear his line independently of the caller, thus avoiding possible malicious blocking. After such clearing the line is free for new incoming as well as outgoing calls.
- 16.5 Title:** Switching-in not permitted
- Definition:** The barring of access from the network to an engaged subscriber's line.
- 16.6 Title:** Calling number indication
- Definition:** A service whereby the calling subscriber's number can be identified by means of a visual or verbal indication at the called terminal.
- 16.7 Title:** Subscribers' alpha-numerical display  
(Formerly: Visual called number)
- Definition:** The visual display at a subscriber's telephone terminal of information sent to or received from the public telephone network. This display may comprise:
- 16.7.1 Title:** Subscribers' alpha-numerical display — outgoing information
- Definition:** Dialed call routing or control information prior to sending to the network and data prior to sending over an established connection to a distant telephone termination.
- 16.7.2 Title:** Subscribers' alpha-numerical display — incoming information
- Definition:** The telephone number of the calling termination on incoming calls and data received over an established connection from a distant telephone termination.
- 16.7.3 Title:** Subscribers' alpha-numerical display — outgoing and incoming information
- Definition:** A combination of 16.7.1 and 16.7.2.
- 16.8 Title:** Universal access numbers
- Definition:** A customer with several installations in different parts of the country can be reached from anywhere in the country by dialling one given number. Calls from subscribers on exchanges in predetermined areas of the country will be routed to installations chosen (with certain restrictions) for the area in question by the customer having the facility.
- 16.9 Title:** Babyphone
- Definition:** A service providing for a call to be made to a telephone in the "off-hook" condition for the purpose of audible supervision at the called subscriber's premises.

- 16.10 *Title:* Tele-alarm service
- Definition: The automatic transmission via the public telephone network to a predetermined terminal, of information indicating that abnormal conditions exist at a given location.
- 16.11 *Title:* Message Relay
- Brief description: A caller, whether a subscriber or not, may dictate a message into recording equipment and require that it is passed to a particular telephone number by the following morning.

## **PART VII**

### **QUESTIONS CONCERNING THE OPERATION AND QUALITY OF THE TELEPHONE SERVICE ALLOCATED TO STUDY GROUP II FOR THE PERIOD 1977-1980**

(For the annexes to these Questions, reference should be made  
to Contribution No. 1 of the period 1977-1980 of Study Group II)

**LIST OF QUESTIONS CONCERNING THE OPERATION AND QUALITY OF THE  
TELEPHONE SERVICE ALLOCATED TO STUDY GROUP II  
FOR THE PERIOD 1977-1980**

Question No.	Title
1/II	Application of the <i>Instructions for the International Telephone Service</i> and any amendments required
2/II	Use of computers to supply information requested on foreign numbers of telephone subscribers
3/II	Credit card usage in the telephone service
4/II	Customer performance in fully automatic working in the worldwide telephone network
5/II	Standardization of symbols and other aspects of subscriber equipment to meet human factor needs
6/II	Instructions for users of the worldwide telephone network
7/II	Standardization of subscriber control procedures for supplementary telephone services
8/II	Revision of Recommendation E.402 relating to the <i>List of international telephone routes</i>
9/II	Future developments in the maritime service (Question to be studied by Joint Working Party SMM)
10/II	Revision of draft Recommendations E.190/F.110 and E.260/F.111 (Question to be studied by Joint Working Party SMM)
11/II	Interconnection of the different international mobile telephone services — mainly of the maritime mobile service — and the international telephone network
12/II	The International Telephone Numbering Plan
13/II	Review of the World Routing Plan
14/II	Standardization of tones
15/II	Observations on the quality of the international service
16/II	Procedures for traffic measurement and computation
17/II	Grade of service objective in case of failure in an international trunk group
18/II	Criteria for the application of network management actions
19/II	Rejection rate in originating international switching centres
20/II	Grades of service in analogue/digital international telephone exchanges

**Question 1/II — Application of the “Instructions for the International Telephone Service” and any amendments required**

*(Permanent Question)*

*(Continuation of the study of Question 1/II, considered during the period 1973-1976)*

**Question 2/II — Use of computers to supply information requested on foreign numbers of telephone subscribers**

*(Continuation of the study of Question 7/II, considered during the period 1973-1976)*

Recommendation E.115 describes the existing methods of providing customers and operators in one country with information on telephone subscribers' numbers in another country.

However, increasing use is made in different countries of computers with interrogation systems, which already give information to inquiry-service operators.

It is felt that it would be advisable to consider now whether access to such computers should be standardized, in order to permit at a future stage an inquiry-service computer in one country to obtain information from the corresponding computer in another country.

*Note.* — Annexes 1 and 2 below contain the texts of two preliminary draft Recommendations which summarize the conclusions of the study of this Question during the 1973-1976 period.

**ANNEX 1**

*(to Question 2/II)*

**Preliminary draft Recommendation on the international telephone information service**

**ANNEX 2**

*(to Question 2/II)*

**Preliminary draft Recommendation on the use of a computer system for international telephone information service operators**

**Question 3/II — Credit card usage in the telephone service**

Considering that the present Recommendations for credit cards limit their use to calls to and from the country which issued them:

- 1) is it desirable to develop the credit card system and to make the cards usable on a wider scale?
- 2) if so, how can this objective best be achieved?
- 3) what amendments or additions to the existing Recommendations would be necessary?

***Reasons for the study***

1. In the previous study period (1973-1976) Study Group II examined a Question (Question 6/II) on the establishment of transferred account telephone calls for press correspondence on sporting and political events. This Question met with a negative response. Some delegates, however, felt there was a demand for a credit card of a wider nature for all subscribers, possibly issued by the ITU.

2. It was also considered that it might be possible to accomplish the necessary billing and accounting within the framework of the current arrangements applied for the reverse charge<sup>1)</sup> telephone service and that these points should be studied.

3. During the last study period the credit card arrangements for the telegraph service were expanded to allow any type of telegraph service from any participating telegraph office to any address. If this concept were adopted in the telephone service it might be possible to have a single card covering all telecommunications services. In this case, study would need to proceed in conjunction with Study Group I.

#### **Question 4/II — Customer performance in fully automatic working in the worldwide telephone network**

*(Continuation of the study of Question 8/II, 1973-1976)*

Considering the customer difficulties in using the international automatic telephone network and the economic losses caused by customer errors:

- what are the particular sources of these difficulties and what can be done to isolate and reduce them?
- what amendments would accordingly be required in the Series E Recommendations, in particular Recommendations E.113 and E.425?
- what human factor problems should be considered before new customer services are introduced in the (worldwide) telephone network and what can be done to resolve them?

The Annex below recapitulates the studies carried out in the 1973-1976 period.

#### **ANNEX**

**(to Question 4/II)**

#### **Recapitulation of the studies carried out in the 1973-1976 period**

#### **Question 5/II — Standardization of symbols and other aspects of subscriber equipment to meet human factor needs**

*(Continuation of the study of Question 10/II, 1973-1976)*

In order to improve customer performance in the worldwide telephone service, what symbols and other aspects of subscriber equipment (such as layout of buttons, colour, etc.) should be standardized to simplify the use of this service?

Symbols to indicate the various possible uses of the telephone network will not only appear on subscribers' telephone equipment, but also on letterheads, telephone directories, etc. To avoid subscriber confusion, standardization should not only apply to telephone equipment but also to these other situations.

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<sup>1)</sup> "Reverse charge" includes collect, credit card, collect pay phone and third number paying calls.



**Question 6/II – Instructions for users of the worldwide telephone network**

*(Revised text of Question 9/II studied in the 1973-1976 study period)*

In view of the continuous need to improve and develop customer performance in the efficient use of national and international dialling services, both in their own countries and as foreign travellers:

- what can be done to help users use the telephone service more effectively by providing written instructions (for example, instructions printed in telephone directories, in special booklets and in coin telephone facilities) or other types of guidance (for example, recorded announcements and universal non-verbal signs), with the overall object of increasing customer satisfaction and achieving cost savings for Administrations?
- what human factor tests can be proposed to check the efficacy of different types of instruction in order to ensure that internationally proven forms are available to Administrations?

*Note.* – Recommendation E.113 outlines principles and guidelines for Administrations in the preparation of user instructions.

**Question 7/II – Standardization of subscriber control procedures for supplementary telephone services**

*Considering*

- a) that Recommendation E.165 was issued to prevent proliferation of subscriber control procedures;
- b) that the three schemes of control procedures referred to in the Recommendation are still evolving and have some common features;
- c) that subscribers who travel will be less inconvenienced if control procedures for certain supplementary services do not change from one country to another;
- d) that human factor problems are involved and control procedures should be optimized in that respect in order to avoid customer difficulties and consequently economic losses caused by customer errors;

which characteristics of subscriber control procedures for supplementary telephone service should be standardized?

**Question 8/II – Revision of Recommendation E.402 relating to the “List of international telephone routes”**

*Considering* the need for Administrations to have at their disposal useful and meaningful information on international telephone traffic routing;

*noting* the substantial quantity of data already being collected for the telephone service under various Recommendations and by the Plan Committees;

*bearing in mind* the time-consuming effort expended by the ITU Secretariats and the Administrations in the preparation of these data, and the considerable expense entailed in publication and dissemination;

*noting* the general desire to avoid unnecessary duplication of telephone data;

should Recommendation E.402 be revised?

**Question 9/II (16/I-16/III) – Future developments in the maritime service***(Question to be studied by Joint Working Party SMM)*

Considering Resolution Mar2-22 and Resolution Mar2-23 of the WAMRC (Geneva, 1974), the effects of future developments on maritime telecommunications services should be studied, including the following specific points:

- 1) Single operator working:
  - a) effects on operating procedures,
  - b) effects on accounting and charging methods.
- 2) Automatic operation:
  - a) effects on operating procedures,
  - b) effects on accounting and charging methods.
- 3) Development of specific operating, accounting and charging principles and procedures that are not yet covered by existing texts and that may be required by the maritime mobile satellite service.

It was not possible to complete the work begun during the period 1973-1976 on certain aspects of the operation and tariffs of the maritime mobile service. Extracts from the report of the final meeting of Joint Working Party SMM for that study period are given in the Annex below.

**ANNEX***(to Question 9/II)*

**Extracts from the Report of the Final Meeting of  
Joint Working Party SMM (April 1976)**

**Question 10/II (17/I-17/III) – Revision of draft Recommendations E.190/F.110-E.260/F.111***(Question to be studied by Joint Working Party SMM)*

1. Improvements or adjustments to meet the special requirements of the maritime service.
2. Consideration of the studies of Study Groups I and II (and of any other Study Groups if appropriate) with a view to making allowance, where necessary, for new concepts examined by these Study Groups and avoiding inconsistencies in Recommendations relating to the same service.

**Question 11/II – Interconnection of the different international mobile telephone services – mainly of the maritime telephone service – and the international telephone network***(Continuation of the study of Question 15/XIII considered in 1973-1976)**Considering*

- a) that several international organizations are considering automatic maritime telephone service for application on a worldwide basis;
- b) that other international mobile telephone services may also be involved;
- c) that various proposals for initial services are being formulated and further evolution is foreseen;

d) that such services could be required to interwork with the international automatic telephone network and be correlated with the numbering plan, the routing plan and the various quality of service criteria;

e) that the different proposals tend to raise somewhat similar problems and that studies in CCITT may facilitate compatible solutions in terms of possible integration into the international public telephone network,

what new Recommendations are required and what additions and/or modifications to existing Recommendations are needed to provide for interconnection of the different international mobile telephone services and the international network?

## ANNEX

(to Question 11/II)

### Status report on the study of Question 15/XIII at the end of the 1973-1976 study period

#### Question 12/II – The International Telephone Numbering Plan

The World Plan Committee has drawn the attention of Study Group XIII to the difficulties regarding the administration of the International Numbering Plan (Recommendation E.161). Study Group XIII has recognized this need and has drafted the following Question to be studied during the study period 1977-1980, by the new Study Group II:

##### *Considering*

- a) the drastic reduction of the country codes still spare in the World Numbering Plan, particularly of two-digit codes;
- b) the uneven distribution of these spare codes among the various world numbering zones;
- c) the emergence of international services – the maritime mobile service, for example – requiring the use of the briefest possible codes taken from the World Numbering Plan;
- d) the difficulty encountered in selecting the length of a country code when allocating such codes, what changes, if any, should be introduced to Recommendation E.161 to meet these requirements and/or to overcome these difficulties.<sup>2)</sup>

#### Question 13/II – Review of the World Routing Plan

##### *Considering*

- a) the existing topology of the international telephone network, which does not correspond very closely to the hierarchical structure outlined in Recommendation E.171(Q.13) of the CCITT *Green Book*;
- b) the advantages in transmission and post dialling delay gained when the routing of international calls is as direct as possible;
- c) that circular routing of international telephone calls should be strictly avoided;
- d) the need to limit the number of circuits in tandem making up a telephone connection to ensure satisfactory quality of service;

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<sup>2)</sup> Studies regarding integrated services digital network which are being carried out by the CCITT may lead to additional requirements and other changes in the International Telephone Numbering Plan.

- e) the desirability of flexible routings in order, for example;
    - to take account of non-coincidence of busy hours,
    - to take full advantage of technological developments such as SPC, new signalling systems, etc.,
    - to permit adequate physical diversity;
  - f) the importance of routing considerations in the preparation of developmental plans for the international telephone network;
  - g) the importance of the efficient use of network plant, and also of economic, tariff, service quality, and other factors in the routing of calls,
- what new or modified rules or constraints should be recommended for the routing of calls in the international telephone network?

#### Notes

1. The routing plan must permit effective management of the network; nevertheless it is desirable to make a clear distinction between standard routing rules and emergency routing procedures that may be used in executing network management strategies.
2. Plans for integration of the mobile telephone services, such as maritime services, into the automatic international network need to be kept in mind.
3. Factors influencing the uses of satellite circuits in the international telephone network should be considered. These include double hop connections (see Recommendation Q.41), operational performance of demand assignment satellite circuits, and any planned internal re-routing in DA satellite systems.
4. It also should be noted that the rules for the apportionment of charges (Recommendation E.250) have a most influential, although implicit, relation to the international routing plan.
5. The results of studies within CCITT concerning the Integrated Digital Network (IDN) and the Integrated Services Digital Network (ISDN) may indicate factors that should be considered in the study of the international routing plan.

#### Question 14/II – Standardization of tones

In response to the Questionnaire of CCITT Circular No. 174 (study period 1973-1976) concerning the standardization of dial and post answer service tones, positive interest was shown by many Administrations and the majority of replies felt that dial tones should be standardized.

#### Recognizing this and *considering*

- a) that standardization of tones might lead to more efficient use of the network;
  - b) that the present specifications for tones in Recommendation E.180, their variety of frequencies and cadences being partially recommended and partially accepted, may be found to be incomplete and too broad in view of the increasing use of the international automatic service;
  - c) that new tones may be required for new services;
  - d) that the introduction of new standard tones will have economic and organizational implications;
  - e) that some Administrations have already embarked on a standardization of tones and hence may find it impracticable, in the foreseeable future, to adopt any new standards;
  - f) that other Administrations may be about to embark on a programme of tone standardization;
  - g) that there is therefore an increasingly urgent need to rationalize international standards in this area,
- what tones should be standardized and what recommendations should be developed or revised?

*Notes*

1. In considering this Question, the interrelation between tones and recorded announcements should be kept in mind so that, if possible, Recommendations for recorded announcements might also be made.
2. In the course of the study and with a view to reducing customer confusion, consideration should be given to human factor requirements. Close cooperation is needed with Study Group XI concerning the technical requirements of such tones and/or announcements (see Annexes 1 and 2).
3. Cooperation with Study Group XVIII on tones and announcements may be necessary.
4. The CCITT Secretariat has prepared a contribution for the 1977-1980 study period containing a summary of the replies to Circular No. 174 as a basis for further study.

## ANNEX 1

(to Question 14/II)

**Extracts from views expressed by Working Party II/5 (Human Factors)  
at its meeting of 26-30 May 1975**

## ANNEX 2

(to Question 14/II)

**Extracts from views expressed by Study Group XI  
at its final meeting in February 1976**

**Question 15/II – Observations on the quality of the international service**

Considering that observations on the quality of international service should:

- reflect as faithfully as possible the quality of service experienced by users;
- comprise objective data, avoiding subjective interpretation on the part of the observer after the simplest of training;
- allow for the use of the widest possible range of observation equipment, from the simplest to the most complicated;
- allow effective analysis of service quality <sup>3)</sup>, and central processing of results;
- take into account that different signalling systems may produce different visual or audible indications to an observer for the same call disposition.

how far should Table 1/E.422 of this Volume be revised in order to meet the need for accurate evaluation of the quality of international service?

*Note.* – During the review of Table 1/E.422 other amendments to the contents of Recommendations E.420 and E.421 may be seen to be required.

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<sup>3)</sup> For example, the distinction between subscriber busy and congestion in the network.

**Question 16/II – Procedures for traffic measurement and computation***(Continuation of the study of Question 5/XIII considered in 1973-1976)*

The measuring procedure and traffic values recommended at present are given in Recommendation E.500 (Q.80) of the *Green Book*.

Similarly, the definition of the nominal properties of traffic flow is, at present, based on the concept of the mean busy hour and related only to the volume of traffic carried.

*Considering*

- a) that there are two objectives of traffic measurements, namely:
    - to provide information to assist in the forward planning of the international network, and
    - to provide information on which to assess the current performance of the international network;
  - b) that present parameters for the measurement of traffic may not provide a sufficient indication of traffic characteristics;
  - c) that the cost of collection and analysis of traffic data may be high;
  - d) that because of time differences providing traffic peaks at different points of time in different countries, traffic values are required for more hours of the day; in principle, a 24-hours' profile would be required;
  - e) that a more complete description of the traffic as regards grade variations (peaks) and a definition of corresponding new objectives of grade of service might be required;
  - f) that methods of measuring and expressing the traffic flows should conform to a reliable calculation method and should be easy to use and understand, account being taken of both the theoretical aspects and the practical difficulties involved, especially those concerned with the combination of different parcels of traffic;
  - g) that computers are likely to be used more extensively for traffic data processing,
- what new or revised procedures for measurement and computation of the traffic data should be established to provide the information necessary for planning, dimensioning and managing the international network, including the transit exchanges?

**ANNEX***(to Question 16/II)***Extract from the reply to Question 5/XIII in 1976****Question 17/II – Grade of service objective in case of failure in an international trunk group***(Review of Recommendation E.542)**Considering*

- a) that Recommendation E.542 establishes an acceptable reduction of circuits in the event of a breakdown for automatic traffic;
- b) that this reduction applies only to the first 15 minutes after breakdown;
- c) that the CMBD has requested that the new Study Group II examine point 4 of Question 2/CMBD (see Note 1 and the text of point 4 of Question 2/CMBD below);

d) that this can be an important principle in the planning of international transmission facilities and should therefore be reviewed from time to time,

what changes, if any, should be made to Recommendation E.542?

*Note 1.* — It is desirable to consider whether individual grades of service objectives be recommended for different classes of failures (frequency, duration, number of circuits affected) in international trunk groups.

*Point 4 of Question 2/CMBD*

*Availability of telephone service from the standpoint of traffic engineering considerations relevant to the availability of a connection (Study Group II)*

*Note 2.* — It should be noted that a parallel study covering the international exchanges is proposed under the new Question 20/II.

**Question 18/II — Criteria for the application of network management actions**

*(Continuation of the study of Question 4/XIII considered during the study period 1973-1976)*

The criteria for initiating network management actions described in Recommendation E.410 were developed in an environment of limited experience with international network management and were based on a minimal number of formal contributions.

*Considering*

- a) that in order to prevent the spread of congestion and permit effective network management actions, variations in traffic must be quickly and easily recognized;
- b) that a number of different parameters are presently observed for measuring such variations;
- c) that a variety of traffic data collection systems is used in the international network;
- d) that although the present scope of automatic alternate routing in the international network is limited, experience in network management is needed to develop sound recommendations;
- e) that while the development of standard parameters for the evaluation of variations in traffic and for the application of network management remain long-term objectives, such standardization may not be adopted universally for some time;

what additional criteria and evaluation procedures can be devised to determine the application of network management actions to permit earlier and wider participation in the practical introduction of international network management?

Accordingly, all Administrations are requested to submit contributions describing their methods and experiences in network management, giving particular attention to the measurements or criteria that they use. Administrations' views on the effectiveness of these criteria and methods together with suggestions on how they might be supplemented or improved would also prove invaluable in answering the question.

Furthermore, Administrations are urged to participate in and report on joint network management ventures in order to make further progress in establishing effective international network management.

ANNEX

(to Question 18/II)

**Results of the studies carried out during the period 1973-1976 on  
Question 4/XIII — Criteria for application of network management actions**

**Question 19/II — Rejection rates in originating international switching centres***Considering*

- a) that observations on outgoing international routes (see Recommendation E.422) give insufficient information on the rejection rates observed at originating international switching centres;
  - b) also, that test calls for international traffic give only a partial answer;
  - c) that a significant part of the causes of rejection may be due to functional reasons, such as interrelation between time-outs, interworking procedures and lay-out of equipment;
  - d) that dimensioning is difficult under these circumstances;
1. To what extent can rejection rates (i.e. the ratio of ineffective call attempts to total number of call attempts) be observed for live traffic on specific routes (see Note 1)?
  2. To what degree can a rejection rate be subdivided according to causes of rejection (see Note 2)?
  3. Can recommendations be given for rejection rate objectives, and if so, what objectives should be specified?

*Note 1.* — The observations are intended to be made in the originating international switching centre. All the call attempts, or a statistically sufficient number of call attempts, over a given route should be counted when the analysis of the dialled number in the originating international centre correctly determines the routing.

*Note 2.* — When the rejection rate is high, its subdivision is of importance to determine the main reasons of rejection of the call attempts.

*Note 3.* — For the purposes of this analysis, an ineffective call attempt is one which does not result in an answer signal received.

**Question 20/II — Grades of service in analogue/digital international telephone exchanges***Considering*

- a) that traditionally, CCITT Recommendations have been limited to international exchanges in the international telephone network;
  - b) that for a period of time the network will continue to operate in an analogue environment, followed by a considerable period during which it will operate in a mixed analogue and digital environment;
  - c) that the relativities between cost and grades of service for switching and transmission in analogue and digital environments may be different;
  - d) that overloading may result in a greater proportional increase in the loading of common-control equipments than in the loading of the speech network;
  - e) that the number of ineffective call-attempts, each of which also occupies the common-control equipment for the same time as an effective (charged) call, may increase the congestion in the switching stages of the network;
  - f) that the traffic capacity may also depend on the accepted reliability of the equipment;
  - g) that grade-of-service standards may be influenced by the introduction of integrated services,
1. What functional components concerned with the grades of service of common-control systems, of any type, should be the subject of CCITT Recommendations in order to ensure an acceptable distribution of grades of service throughout the international telephone network?



2. Should any such Recommendations include general loss or delay standards or both, which should be met by any type of common-control switching system, and specify safeguards against their differing degrees of sensitivity to overload and failure conditions?

3. If so, what grade-of-service dimensioning standards should apply in the existing analogue environment, and in a mixed analogue and digital environment, for current and future international exchanges?

4. To what extent can measurement procedures, to monitor these grade-of-service dimensioning standards, be identified?

*Note.* — The question is basically intended to provide a Recommendation for international exchanges. The study, however, should also give rise to proposals for grade of service standards for designing national exchanges for inclusion in an improved version of Chapter VII, Part A, of the GAS 1 handbook on national automatic networks.

#### ANNEX

(to Question 20/II)

**Reply given by Study Group XIII, in 1973-1976, to Question 14/XIII.  
Internal blocking characteristics in digital exchanges**

